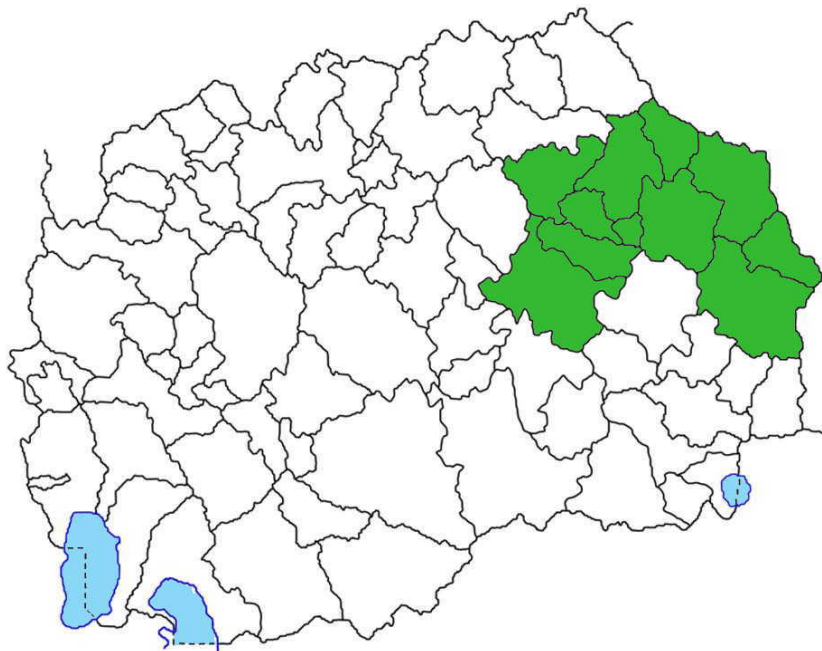
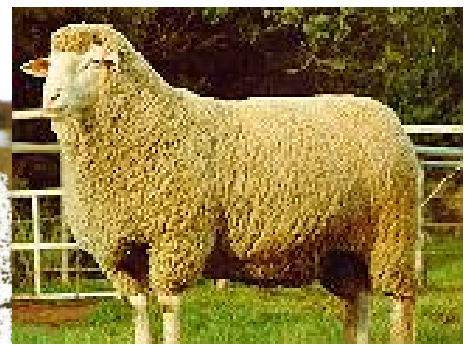


STUDY

ON ESTABLISHING REGIONAL REPRO-CENTER FOR SHEEP AND GOATS IN THE EAST PLANNING REGION



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Ordering party: Center for development of the East planning region
Str. "Vancho Prkje" no. 119, Shtip 2000
Telephone: (032) 386 408
Fax: (032) 386 409
E-mail: eastregion@rdc.mk
Website: www.rdc.mk/eastregion

Contracting party: "Moja zemja" DOOEL, village Openica – Ohrid,
Address: str. "Settlement without street system" vill. Openica,
Ohrid

Review: University "St. Kliment Ohridski" – Bitola
Faculty of Veterinary Medicine – Bitola
Str. Prilepska, bb, 7000, Bitola

Expert team: Ass. Prof. Ph.D. Nikola Pacinovski – Team leader
Prof. Ph.D. Trajan Dojchinovski
M.Sc. Svetlana Petrovska
Prof. Ph.D. Ljupcho Kochoski
Prof. Ph.D. Nikola Kozarovski
Prof. Ph.D. Elena Dumova-Jovanoska

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FOREWORD

The refinement of sheep and goats represents a system of measures leading to enlargement of productivity and breeding value. With other words, the basic principles of the refinement of sheep and goats are based on the desire of the breeders, and that is the animals in every succeeding generation, according to their racial and production capacities to overcome its predecessors to a smaller or greater extent.

In the animal-breeding science, there are two ways of enlarging, i.e. advancing of animals' productivity traits:

- by continuous improvement of paragenetic factors, in other words the breeding conditions and

- by improvement of genetic potential.

On the other hand, the genetic potential of the animals could be improved in two ways:

- by permanent and continuous selection of the heads and

- by crossbreeding with other breeds.

A selection as a continuous process is the most inevitable way of making genetic progress in the population, and according to some authors, the most favourable for maintaining biological diversity too. But this method is quite slow as a result of the biological restriction during the reproduction of the sheep and the goats as well as the generation interval. For that purpose, crossbreeding enables faster progress of the genetic material. But this method also has certain minuses, for example, constant disposal of high-quality pure-bred

heads, etc. Regardless of the fact which one from this two ways would be applied, the goal is mating high-quality male and female heads (according to the system "best with best"), in order to get animals with higher production traits in the following generation. During the one-time development of these two animal-breeding sectors in the Republic of Macedonia, especially from the beginning of the second half of the 20th century, the most used and fastest method for improving of genetic potential is the method "crossbreeding with other breeds", while the selection within one population was rarely used as a method of genetic improvement, especially when it comes to measures supported by the State.

The numerous repro-centers mentioned in the Study are in that favour too. Anyway, from all of them, the best experience is using the type Merinolandschaf in the field of sheep breeding and the types Alpine and Saanen in the field of goat breeding. Because of that, this Study suggests forming repro-centers with these types.

Additional impulse for development of these important stock-breeding sectors in the country, as well as in the East planning region (EPR) is the Common basis programme for stock-breeding for the period 2011–2020, as a national strategic document in this field. The team working on this document considers that it has shown a real situation about the conditions in the abovementioned two strategic stock-breeding sectors in the region. In addition to that, the weaknesses have

been discovered while suggestions for overcoming them have been given.

On the other hand, the document offers possibilities for further development of specific programs or action plans, perhaps at the level of municipalities, so the problems within each local unit (municipality) could be fully and thoroughly identified and discovered, for the sole purpose-cre-

ating optimal conditions for further development of these stock-breeding sectors.

Our hope is that by determining the existing condition and presenting ideas for overcoming them would be helpful for the sheep and goat breeding not only in the EPR, but also in the whole state, to further develop, enhance their competitiveness and prepare for admission in EU.

Yours faithfully,
Ass.Prof. Nikola Pacinovski
Team leader

Individuals who participated in the preparation of the Study of establishing regional repro-center for sheep and goats in the East Planning Region

Ass. Prof. Ph.D. Nikola Pacinovski, – Team leader
 Prof. Ph.D. Trajan Dojchinovski
 M.Sc. Svetlana Petrovska
 Prof. Ph.D. Ljupcho Kochoski
 Prof. Ph.D. Nikola Kozarovski
 Prof. Ph.D. Elena Dumova-Jovanoska

Individuals and institutions who helped in the preparation of the Study of establishing regional repro-center for sheep and goats in the East Planning Region

M.Sc. Elena Eftimova	Ss. "Cyril and Methodius" University in Skopje, Institute of animal-breeding
Ph.D. Natasha Mateva	Ss. "Cyril and Methodius" University in Skopje, Institute of animal-breeding
B.Sc. Zoran Naletoski, Agricultural Engineer	Ss. "Cyril and Methodius" University in Skopje, Institute of animal-breeding
M.Sc. Marina Petrovska	Faculty of Agricultural Sciences and Food – Skopje
B.Sc. Marija Mojsosvska, Environmental Engineer	
B.Sc. Liljana Achkovska, Forest Engineer	
Natasha Markovska, Doctor of Veterinary Medicine	
Jordanco Levkov, Doctor of Veterinary Medicine	Local self-government Cheshinovo–Obleshevo
Vera Arsova	Local self-government Cheshinovo–Obleshevo
B.Sc. Emil Vasilev, Geology Engineer	Center for development of East Planning Region
B.Sc. Ljupco Madzirov, Agricultural Engineer	State Statistical Office
Kiril Angelov, B.Sc. in Philosophy	State Statistical Office
DVM Ilir Veseli	Agency for Food and Veterinary, Department of Health and Animals, Unit for identification and registration of domestic animals

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1. STUDY

ON ESTABLISHING REGIONAL REPRO-CENTER FOR SHEEP AND GOATS IN THE EAST PLANNING REGION

1.1. INTRODUCTION

Sheep and goat breeding in the East Planning Region (EPR) as well as in the Republic of Macedonia are animal-breeding sectors with centuries old tradition. Their development is influenced firstly by environmental and then by social factors. Environmental factors in most regions of the country, including the EPR, created a kind of vegetation that is most suitable for breeding sheep and goats, so the population in these areas adapted and operated such type of business. The social element is second, because of the fact that the sheep and goats were the basic source of existence of the population through the centuries.

The production systems in sheep and goat breeding (extensive and intensive) are as a result of the climatic conditions, economic traits as well as the projected size of the farm. In the Republic of Macedonia dominant is stationed extensive system of sheep breeding (85–90%) with a small part of semi nomadic system (10–15% of sheep), although lately there have been certain efforts of intensifying sheep breeding in a certain number of new farms. In one part of the farms, starting from mid-May to early November, the sheep live at the high-mountain pastures, while during the rest of the year at winter pastures.

The sheep-breeding system in the Mediterranean area, at medium dairy sheep breeds, usually has a double course of production (excluding wool because of the low interest and the low cost), where two-thirds (or three quarters) of income are due to the milk while a third (or one quarter) of income is as a result of meat production.

Sheep and goats consume only plant foods, mainly from pastures, shrubs, etc., so the food with low nutritional and energetic value is transformed into products with high protein values: meat, milk, wool and leather. In some countries, sheep and goats are the only pastureland animals who seek the food by themselves, with a minimum help of the man (pastures with natural boundaries, special fences, etc.). Because of the conversion of natural plant food in high quality food for

human population, as well as clothing, it could be said that the sheep and goat breeding are the cheapest and most economical animal-breeding industries.

Sheep breeding in the Republic of Macedonia is a traditional business, where the main products are: dairy lambs and sheep milk (that is delivered to the dairy or processed into soft white sheep cheese or sheep yellow cheese – cashkavall). Should mention the fact that great part (60–70%) of milk production is processed at home, and the rest is delivered to the dairies. The other products like yogurt, curd, sheep meat, dried veal and wool are treated as less important and less profitable products.

The economies of many countries in the world, both developed (Australia, New Zealand) and that in development (Asia), depend basically on sheep breeding.

Worldwide, there are nearly two billion sheep and goats (1.939.243.000), and monitored since 1999, the number of sheep and goats worldwide is in continual mild growth (Table 1).

According to the FAO Statistical Yearbook from 2010, the sheep and the goats are still counted together. The country with largest number of sheep and goats in 2009 was China with 281.015.000 heads, followed by India with 191.726.000, Sudan with 94.825.000, Pakistan with 85.700.000 and Australia as fifth with 72.740.000 sheep and goats (Chart 1).

The number of sheep and goats in each of the other countries shown in Table 1 is below 50.000.000.

According to FAO data, the total production of milk (cow, sheep, goat and other) worldwide in 2009 is 696.554.000 tons. On the other hand, the largest producer of sheep milk in the world is China with 1.724.000 tons produced in 2010, while the largest producer of goat milk in the world is India with 4.3 million tons. The following table (Table 2) shows the countries that are major producers of sheep and goat milk in 2010 worldwide.

Table 1

*Number of sheep and goats in some countries in the world
between 1999–2009 (000 heads)*

Ordinal number	State	Year				
		2009	2008	2007	2003–2005	1999–2001
1.	World	1.939.243	1.950.708	1.942.504	1.869.021	1.794.848
2.	China	281.015	285.813	283.880	293.324	276.134
3.	India	191.726	190.721	189.725	186.792	182.983
4.	Sudan	94.825	94.200	93.931	91.294	84.595
5.	Pakistan	85.700	83.853	82.038	79.447	71.533
6.	Australia	72.740	82.938	88.711	103.478	116.843
7.	Ethiopia	47.941	46.901	47.827	32.674	20.796
8.	Mongolia	38.926	38.332	35.338	22.739	25.376
9.	New Zealand	32.466	34.184	38.572	39.722	42.828
10.	South Africa	31.347	31.623	31.347	31.867	35.248
11.	Great Britain	30.878	33.226	34.041	35.740	41.290
12.	Turkey	29.568	31.749	32.260	31.989	37.072
13.	Brazil	26.000	25.984	25.690	25.046	23.777
14.	Indonesia	25.968	24.753	24.330	21.042	19.928
15.	Kenya	23.776	24.386	23.395	22.582	18.828
16.	Spain	21.983	22.912	25.086	26.016	26.946
17.	Russia	21.770	21.503	19.675	16.951	15.026

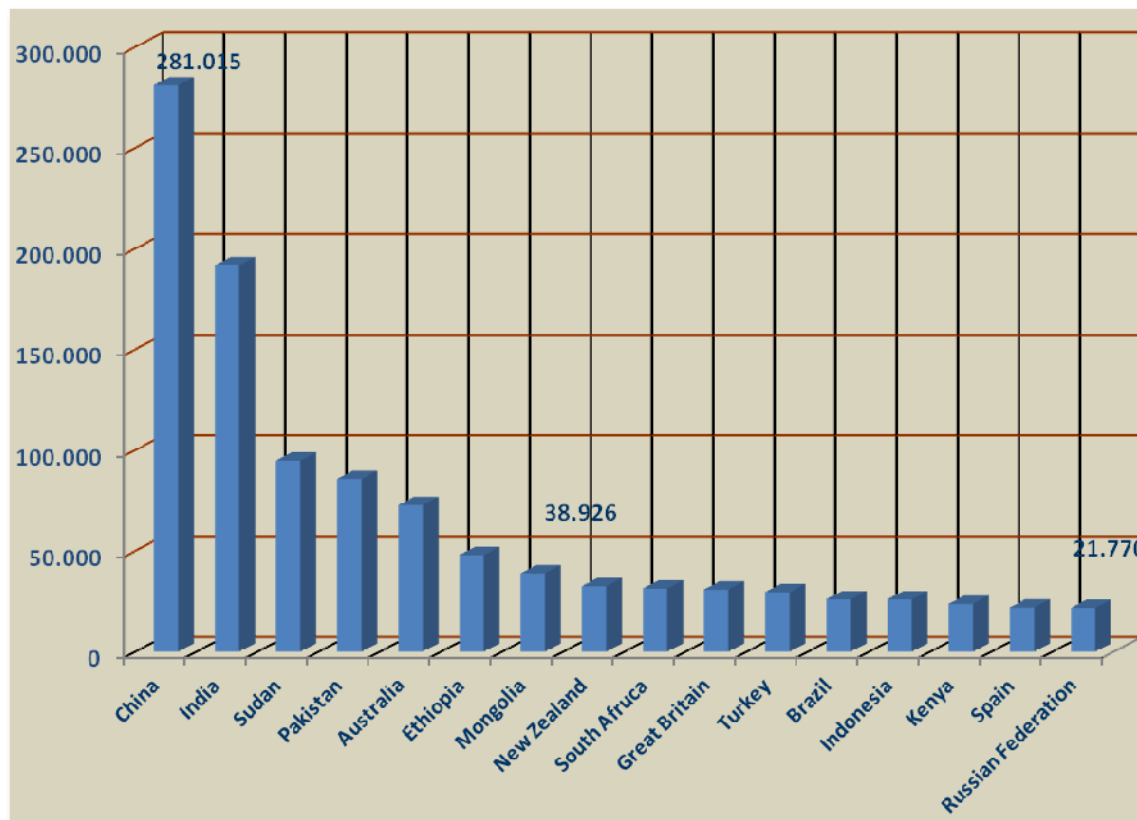


Chart 1. States with the largest number of sheep and goats in the world in 2009 overview

Table 2

Largest producers of sheep and goat milk in the world for 2010

Ordinal number	State	Sheep milk, (mil. tons)	Realised value (in 1000 \$)	Ordinal number	State	Goat milk (mil. tons)	Realised value (in 1000 \$)
1.	China	1724000	671349	1.	India	4300000	1442994
2.	Greece	855000	332948	2.	Bangladesh	2496000	837607
3.	Turkey	816832	318085	3.	Sudan	1601900	521438
4.	Romania	651317	253631	4.	Pakistan	739000	247993
5.	Syria	643000	250393	5.	France	645176	216172
6.	Somalia	590400	229910	6.	Somalia	500600	167991
7.	Italy	600100	206428	7.	Spain	602000	163997
8.	Iran	479200	186607	8.	Iran	452100	151715
9.	Sudan	452100	167251	9.	Greece	470000	141950
10.	Spain	585190	161295	10.	Mali	347000	116446
11.	Algeria	231300	90071	11.	Niger	287135	96356
12.	France	259240	85375	12.	Indonesia	281328	94408
13.	Afghanistan	207384	80758	13.	Turkey	272811	91549
14.	Mali	160000	62306	14.	China	277500	88760
15.	Niger	131007	51015	15.	Algeria	248400	83358
16.	Indonesia	122316	47631	16.	Russia	240000	80539
17.	Mauritania	115500	44977	17.	Mexico	161796	54295
18.	Egypt	97700	38045	18.	Brazil	148149	49715
19.	Bulgaria	85001	33100	19.	Jamaica	146200	49061
20.	Portugal	81030	31554	20.	Syria	139000	46645

According to the information in Table 2, after China, the largest producers of sheep milk in Europe are Greece (855.000 tons), Turkey (816.832 tons), Romania (651.317

tons), Italy (600.100 tons), Spain (585.190 tons) and France with 259.240 tons of sheep milk produced in 2010 (Chart 2).

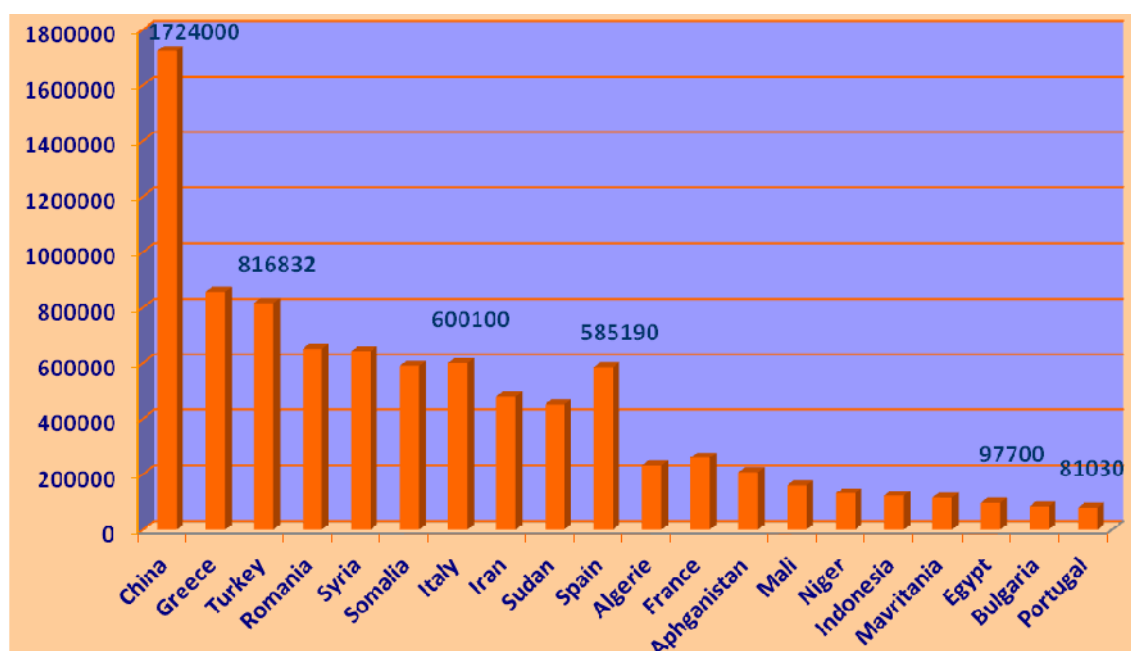


Chart 2. States with the greatest production of sheep milk in the world in 2010 overview

Almost the same countries are also the major producers of goat milk in 2010 in Europe, with a slight change in the order: France (645.176 tons), Spain (602.000 tons), Greece (470.000 tons) and Turkey with 272.811 tons of goat milk (Chart 3). It could be

that the largest producers of sheep and goat milk in Europe and worldwide are mainly the Mediterranean countries, where these two animal-breeding sectors have centuries-old tradition, as in our country.

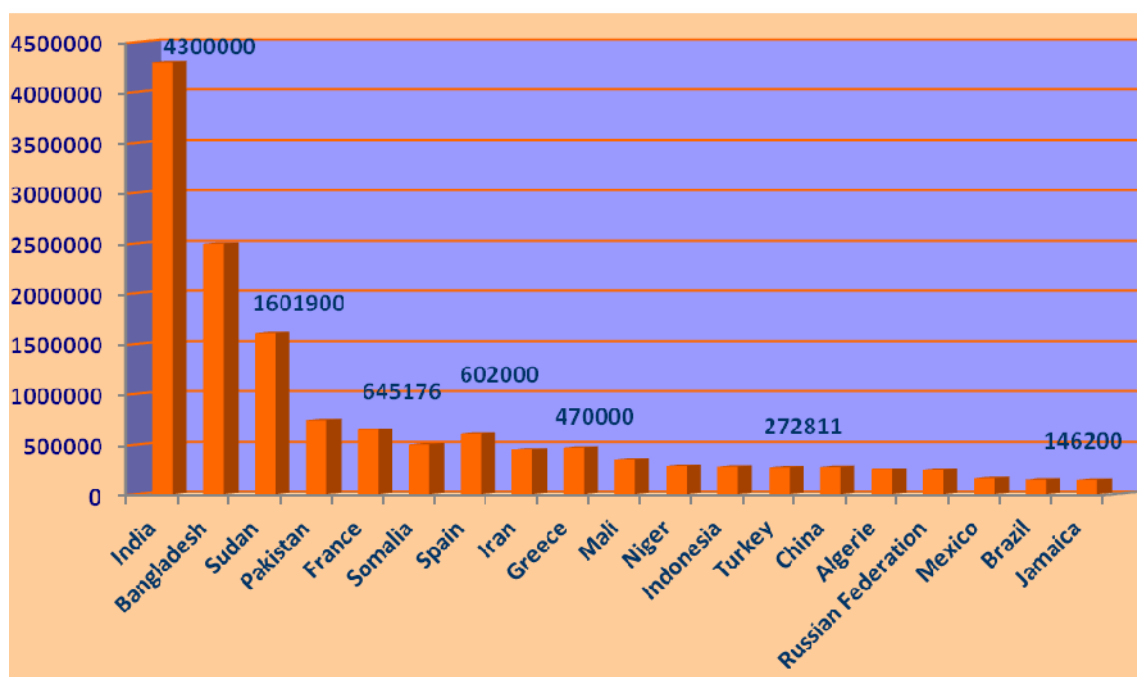


Chart 3. States with the greatest production of goat milk in the world in 2010 overview

The total production of sheep and goat meat in the world in 2009 is 13.048.000 tons, while beef 61.838.000 tons. Although, compared to the beef, the amount is significantly smaller, for some countries sheep and goat meat sales (especially the lamb and kid's meat), provides important foreign exchange earnings, and thus existence of millions of families.

Sheep breeding in the Republic of Macedonia is a traditional animal-breeding branch, typical mostly for highlands, because these animals can use those pasture resources that other animals can't. It is the same with goats too, except that they require more places with shrubs because of their predisposition to browsing. Modest in their demands (feeding and accommodation), sheep and goats for centuries have been a basic source for production for many rural households, both in highlands and in lowland areas.

One very important limiting factor for development of the animal-breeding industries in

EPR is the current factual situation in this region characterized by a huge number of abandoned or semi-derelict highlands villages and the fact that 66% of the population is concentrated in the urban areas. An additional problem for development of these animal-breeding industries in the country is the small number of people that want to be engaged in these industries. Because of that, one of the most important factors to revive sheep and goat breeding in this region is the income or profits that could be derived from the production, which must be quite stimulus, so part of the population could decide to eventually return to rural areas. As an alternative to the development of these animal-breeding industries is the possibility to start or eventually increase the amount of sheep and goat production in rural areas, by persons who reside out of rural areas. Of course, the income or profits of these two animal-breeding sectors would not be possible without the improvement and increasement of production traits of sheep and

goats. It shouldn't be forgot the need to provide basic preconditions, such as: availability of decent road (paved or swabbed), access to drinking water and electricity. In other words, these are the key factors and reasons that people left these places, centuries-old homes of their ancestors. Such is the case in almost all rural areas in the Republic of Macedonia.

Sheep and goat breeding by their nature are branches for which the best conditions

have therural areas. Taking into consideration the EPR with its 11 municipalities (Berovo, Vinica, Delchevo, Zrnovci, Karbinci, Kochani, Makedonska Kamenica, Pehcevo, Probishtip, Cheshinovo–Obleshevo and Shtip), covers 217 settlements, of which 209 are rural areas, clearly talk about the possibility and the potential for development of these two animal-breeding sectors in this region.

1.2. RESOURCES FOR DEVELOPMENT OF SHEEP AND GOAT BREEDING

1.2.1. RESOURCES FOR DEVELOPMENT OF SHEEP AND GOAT BREEDING IN THE REPUBLIC OF MACEDONIA

According to the Statistical Office data for 2010 (Statistical Yearbook 2006–2010), the total agricultural area of R. Macedonia is 1.121.000 ha, of which 611.000 ha are pastures and the rest (509.000 ha) is ploughed land and gardens. 415,000 ha of the total cultivable area are ploughed land and gardens, 14,000 ha orchards, 21.000 ha vineyards and 59,000 ha represent meadows. The remaining 1,000 ha are ponds, reed land and fishponds.

Taking into consideration its production, the capacity of pastures in the Republic of Macedonia (Figure 1) ranges from 2–5 sheep or goats/ha. According to the total pasture area of our state (611,000 ha), the breeding capacity is nearly 3.000.000 sheep and goats. Historically, the largest number of sheep raised on the territory of the Republic of Macedonia was 2,490,000 heads in 1989.



Figure 1. Pasture on Shar Mountain (Ph.D. Nikola Pacinovski, 2011)

From the existing 415.000 ha ploughed land and gardens in 2010, 277.000 ha (66.75%) were planted, 1.000 ha (0.24%) were nurseries, while the remaining 137.000 ha (33%) were fallows and uncultivated ploughed land. The fact that almost one third (33%) of the ploughed land and gardens are not cultivated, i.e. they represent fallows, is quite high percentage and indicates that it should be done a lot more for improving the agricultural production, as well as to additionally motivate the farmers for the more intense and planned cultivation of soil. The land fertility should be taken into consideration too.

The planted areas in R. Macedonia in 2010 were represented with the following cul-

tures : cereals crops (163.000 ha), fodder crops (36.000 ha), industrial crops (27.000 ha) and vegetables (51.000 ha).

Because of the importance of some cereals in developing sheep and goat breeding, the following table (Table 3) shows the total area sown with cereal crops in the Republic of Macedonia in 2010 by type and production.

The most represented of the total cereal crops sown in the state in 2010 were the wheat (79.946 ha), barley (42.959 ha) and maize with 28.644 ha, followed by rice (4.126 ha), rye (3.590 ha) and oats with 2.763 ha (Chart 4).

Table 3

Sown areas and production of cereal crops in the Republic of Macedonia in 2010

Ordinal number	Crop	Sown areas (ha)	Production (tons)	Average (kg/ha)
1.	Wheat	79.946	243.137	3.044
2.	Barley	42.959	126.315	2.951
3.	Maize	28.644	129.045	4.508
4.	Rice	4.126	25.700	6.230
5.	Rye	3.590	8.850	2.465
6.	Oats	2.763	5.479	2.008

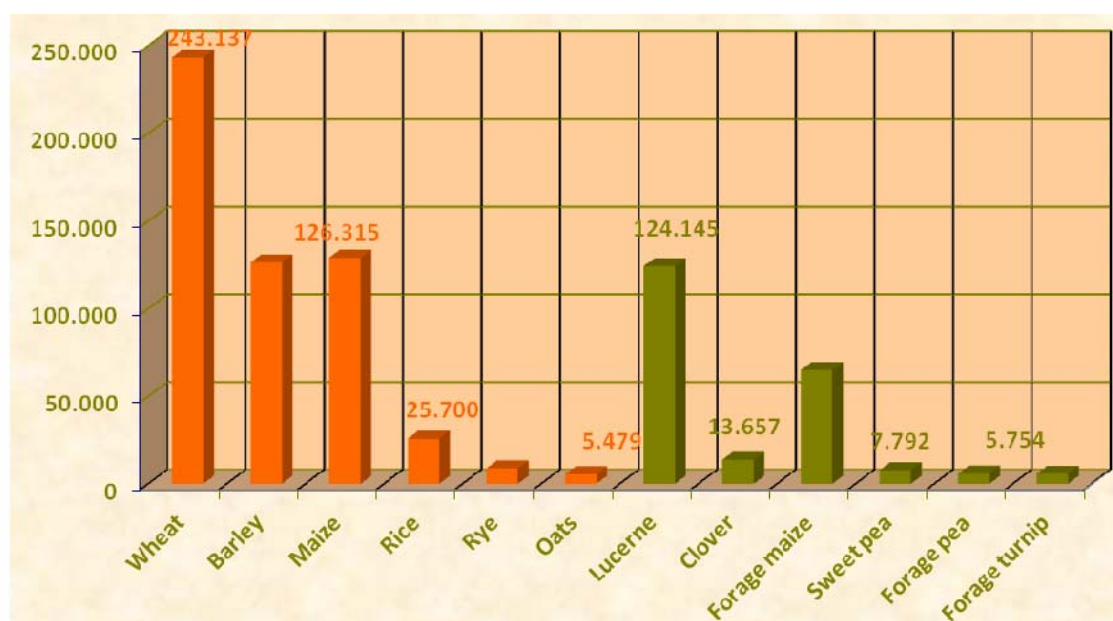


Chart 4. Cereal and fodder crops production in the Republic of Macedonia in 2010

Given that from the cereal crops represented, mostly for feeding sheep and goats is used barley, the total production of barley from sown area in 2010 (42.959 ha) was 126.315 tons, or 2,951 kg/ha. Also, taking into consideration the average annual need of barley used in the Republic of Macedonia for feeding sheep and goats is around 100 kg/head, it results that with this production capacity could be bred 1,260,000 sheep and goats, as opposed to the existing 769.000 sheep and 80.000 goats that are registered by the Department to identify and registration of domestic animals within the Agency for Food and Veterinary in 2010. The existing 137.000

ha of uncultivated area should be counted too, that, theoretically, has a capacity for producing additional cereal crops including barley. Also, there should be mentioned the fact that a significant number of individual farms that work with breeding sheep or goats use corn or wheat as food or energetic forages.

Bearing in mind that in addition to cereal crops, an important base for development of animal-breeding production, especially of sheep and goat breeding are fodder crops. The total sown areas per crops and production in the Republic of Macedonia in 2010 are shown in the following table (Table 4):

Table 4

Sown areas and production of fodder crops in the Republic of Macedonia in 2010

Ordinal number	Crop	Sown area (ha)	Mass of production (tons)	Average (kg/ha)
1.	Lucerne	19.408	124.145	6.397
2.	Clover	3.065	13.657	4.484
3.	Forage maize	2.669	64.870	26.084
4.	Sweet pea	2.450	7.792	3.184
5.	Forage pea	1.867	5.863	3.206
6.	Forage turnip	513	5.754	11.217

As Table 4 says, the most represented fodder crops in 2010 on national level were lucerne (19.408 ha) and clover (3.065 ha), with average production of 6.397 or 4.484 kg / ha (Chart 4). Bearing in mind that for nourishment of sheep and goats is mainly used hay of alfalfa, clover, sweet pea and Forage pea, the total production of hay from these 4 crops was 151.457 tons. Given that the aver-

age annual need of hay per head of sheep and goat is 100 kg, it results that with this scale of production, could be bred 1.515.000 sheep and goats at the territory of the Republic of Macedonia. Anyway we should keep in mind that the produced quantities are not intended only for sheep and goats, but also for other domestic and economically useful animals, primarily for animal.

1.2.2. RESOURCES FOR DEVELOPMENT OF SHEEP AND GOAT BREEDING IN THE EPR (EAST PLANNING REGION)

EPR covers the basin of the river Bregalnica and occupies 14% of the territory of the Republic of Macedonia, with total area of 3537 km². Total agricultural land in this region is 162.480 ha, i.e. 14.5% of the total agricultural area in the country (Table 5). 84.840 ha or 52.2% of that area are pastures. Considered according to the average of sheep and goats per ha of pasture (2–5 heads/ha), the capacity

of the pastures in the EPR is 169.680 to 424.200 sheep and goats. The current number of 128.000 sheep and 20.000 goats in 2011 shows number that is far below the existing capacity for breeding these species in this region. Ploughed land and gardens participate with nearly 40% in the total agricultural area, while in the total cultivable area with 84% (Chart 5).

Table 5

Total area for development of sheep and goat breeding in the EPR in 2010 (ha)

Ordinal number	Municipality	Agricultural area (ha)	Cultivable area		Pastures (used area)	
			Plough land and gardens (ha)	Meadows (used area) (ha) (tons)	(ha)	(tons)
1.	Berovo	43618	8273	3971 11015	30175	15514
2.	Vinica	9750	6830	601 1233	1760	1295
3.	Delchevo	14590	9246	836 1041	3867	1913
4.	Zrnovci	1564	1426	8 22	80	53
5.	Karbinci	5950	5293	78 94	472	259
6.	Kochani	21947	6011	201 415	15433	9130
7.	M. Kamenica	4870	3159	302 283	1288	1195
8.	Pehchevo	11998	3031	1637 2938	6750	2877
9.	Probishtip	10045	6806	590 738	2268	476
10.	Cheshinovo–Obleshevo	7128	6098	88 248	721	855
11.	Shtip	31020	8276	117 215	22026	14109
Total		162480	64449	8429 18242	84840	47676
Average per ha		/	/	/ 2164	/	562

This clearly indicates the potential that this region possesses for development of these two animal-breeding branches. By all means, it should be considered everyday expanding of the plough land at the expense of pastures, which are turned into arable land. Significant reduction of the pasture area is made by the latest activities of afforestation of many mountainous and semi-mountainous areas in the state, including the EPR, which once again confirms the fact that the resources for breeding sheep and goats in the country permanently reduce. Thus, the existing sheep and goats' breeders are facing serious problems in breeding, primarily because grazing area is diminishing for various reasons.

A potential for development of these animal husbandry industries, especially the goat breeding are the forests (already existing forests) which in EPR cover 135.378 ha or 13% of total forests in the Republic of Macedonia, which is 38% of the total territory of the region. The breeding of any kind of useful animals is

prohibited because it could cause severe damages.

According to the urbanization, the region covers 217 settlements, of which 209 seats are rural settlements. The total number of residents in this region is 181.858, and population density is 51 resident/km². This region has almost four times less population growth, compared to the population growth in the country. Due to the permanent process of depopulation, there is a large number of displaced settlements i.e. villages with around 100 inhabitants and villages with particularly high index of aging. This situation led to a concentration of approximately 66% of the population in the urban areas

Dominant agricultural branch in the East Planning Region is crop production. The most important cereal crop is rice. Since this region is known as the largest producer of rice, it covers about 95% of total rice production in the Republic of Macedonia. Thus these rice fields after the harvest could be used for grazing sheep and goats.

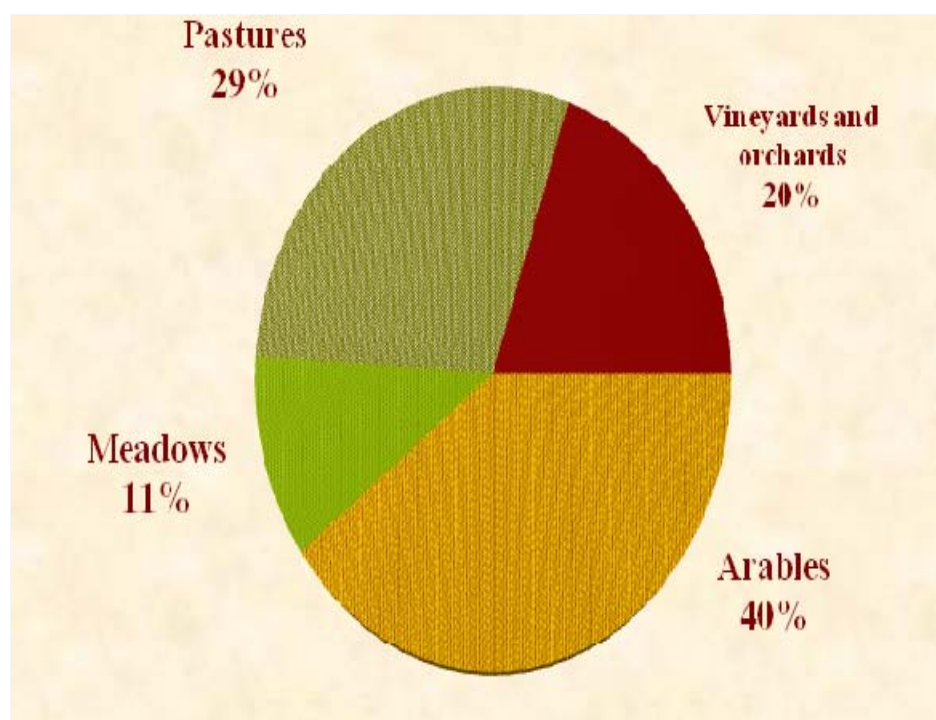


Chart 5. Total area for development of sheep and goat breeding in the EPR in 2010

Besides rice, there is solid representation of other cereal crops like barley, wheat and maize (Table 6). The most represented cereal crop in the region is wheat with 7863 ha, followed by barley (7503 ha), rice (4075 ha), maize (2868 ha), rye (1987 ha) and oats sown on 657 ha in 2010 (Chart 6). Bearing in mind that the total area of plough land and gardens in the EPR is 64.449 ha, under cereal crops in 2010 were near 39%. Particular place in agriculture also have early vegetables, fruit-growing and viticulture. Analyzing by municipalities, cereal crops in 2010 were mostly represented in the municipality Cheshinovo–Obleshevo (4327 ha), Kochani (4042 ha) and Shtip (3342 ha). In the other municipalities the overall representation of these cultures was under 3000 ha).

It could be concluded that this region has high potential for development of animal-breeding, especially sheep and goat breeding–branches that have a great potential for export. A special emphasize is put on the development of dairy and meat industry.

The most represented fodder crops in 2010, as a resource for development of sheep

and goat breeding in EPR were alfalfa (2211 ha) and sweet pea (471 ha), with average production of 5145 i.e. 3070 kg /ha (Table 7). The total production of four fodder crops used for feeding sheep and goats (alfalfa, clover, sweet pea and Forage pea) in this region for 2010 is 2716 tons (Chart 6). Taking into account the same calculation of 100 kg hay per head of sheep/goat annually, follows that the region annually produces fodder base only for 27.160 heads of sheep and goats, which is far from its capacity. Since the quantities produced are used not only for sheep and goat breeding but also for other economically useful animals (animal), it further reduces the capacity of raising sheep and goats. This could be solved by increasing the area under fodder crops, especially sweet pea and Forage pea, which can provide significant feed base every year for development of sheep and goat breeding.

Monitored by municipalities, the largest area planted with fodder crops in 2010 has the municipality Cheshinovo–Obleshevo again (696 ha), followed by Shtip and Delchevo with 568 i.e. 346 ha.



Chart 6. Production of cereal and fodder crops in the EPR in 2010

Table 6

Sown areas and production of cereal crops in the EPR in 2010

Ordinal number	Municipality	Crop												Total by municipalities	
		Wheat		Barley		Maize		Rice		Rye		Oats			
		ha	tons	ha	tons	ha	tons	ha	tons	ha	tons	ha	tons	ha	tons
1.	Berovo	465	1118	115	182	95	280	/	/	1040	2804	110	131	1825	/
2.	Vinica	323	884	235	623	290	1377	190	1015	55	115	30	62	1123	/
3.	Delchevo	863	2756	873	2770	709	1604	/	/	280	718	271	580	2996	/
4.	Zrnovci	267	1024	414	1561	331	2871	23	157	5	16	4	12	1044	/
5.	Karbinci	680	2130	1283	4351	67	440	300	1956	4	10	6	7	2340	/
6.	Kochani	769	2521	819	2460	284	2340	1997	12893	84	238	89	203	4042	/
7.	Makedonska Kamenica	118	352	247	737	87	74	/	/	133	327	28	60	613	/
8.	Pehchevo	530	1027	125	189	67	160	/	/	345	783	100	113	1167	/
9.	Probishtip	1195	3131	697	1960	134	166	80	289	15	30	13	26	2134	/
10.	Cheshinovo–Obleshevo	1115	5568	975	4013	752	6466	1460	9107	23	69	2	7	4327	/
11.	Shtip	1538	4637	1720	5629	52	229	25	150	3	8	4	5	3342	/
Total by crop		7863	25148	7503	24475	2868	16007	4075	25567	1987	5118	657	1206	24953	97521
Average kg per ha		/	3198	/	3262	/	5581	/	6274	/	2576	/	1836	/	/

Table 7

Sown areas and production of fodder crops in the EPR in 2010

Ordinal number	Municipality	Crop												Total by municipalities	
		Clover		Alfalfa		Sweet pea		Forage pea		Forage maize		Forage turnip			
		ha	tons	ha	tons	ha	tons	ha	tons	ha	tons	ha	tons	ha	tons
1.	Berovo	/	/	166	763	7	35	/	/	/	/	11	106	184	/
2.	Vinica	/	/	12	53	4	9	4	8	/	/	/	/	20	/
3.	Delchevo	/	/	267	591	60	144	6	12	/	/	13	130	346	/
4.	Zrnovci	/	/	74	642	4	27	2	5	/	/	1	18	81	/
5.	Karbinci	4	48	271	2612	12	44	3	7	39	718	3	34	332	/
6.	Kochani	/	/	225	1226	86	337	3	18	/	/	/	/	314	/
7.	Makedonska Kamenica	/	/	51	102	3	7	/	/	/	/	/	/	54	/
8.	Pehchevo	18	/	134	422	27	58	4	8	/	/	7	45	190	/
9.	Probishtip	8	8	62	174	51	128	2	4	/	/	/	/	123	/
10.	Cheshinovo–Obleshevo	/	/	482	2395	209	653	5	13	/	/	/	/	696	/
11.	Shtip	53	306	467	2396	8	4	5	10	35	360	/	/	568	/
Total by crop			362	2211	11376	471	1446	34	85	74	1078	35	333	2908	14680
Average kg per ha			4361	/	5145	/	3070	/	2500	/	14567	/	9514	/	/

1.3. NUMBER OF SHEEP AND GOATS IN RM AND EPR**1.3.1. NUMBER OF SHEEP AND GOATS
IN THE REPUBLIC OF MACEDONIA**

Sheep breeding in our country after the independence of the state is characterized by a significant decline in the number of sheep. This situation is mainly as a result of the migration of rural population in the cities and industrial centers, while considering the sheep breeding as less valuable existential occupation. The situation with the goats during the 90's was more dramatic, taking into consideration the Law on prohibition of goat breeding in the period from 1947–1989, when almost 90% of nearly 500.000 goats were killed. There should be mentioned the fact that in this animal-breeding branch, the smallest investment can open job positions, which to some extent can reduce the unemployment. Also,

the state must play a significant role here in finding new modalities related to financing, in terms of granting loans with very favorable interest rates, to individuals who will express interest in building farms and purchase of animals.

While some animal-breeding branches like pig breeding and poultry experienced a genuine advance in biotechnical view, sheep breeding, and to great extent goat breeding, mainly remained on the same level or developed very slowly. In some aspects, these branches can be defined as worsened.

The number of sheep in the Republic of Macedonia was 2.490.000 heads in 1989 of which 1.720.000 heads were sheep, 620.000

lambs and the rest were rams and sheep for slaughtering. This number remained almost unchanged until 1995, when in fact happened a kind of collision in stock-breeding (animal breeding, sheep breeding and goat breeding),

but mostly in sheep breeding as export-oriented branch (Table 8). The same table shows the number of the sheep in the Republic of Macedonia in the period from 1960–2004.

Table 8

rsheep in RM from 1960–2004

Year	Categories			Total
	Lambs younger than 1 year	Breeding sheep	Rams and other sheep	
1960	452.600	1.575.063	104.541	2.132.204
1970	380.577	1.391.085	91.075	1.862.737
1980	552.888	1.401.443	103.192	2.057.523
1990	522.507	1.612.527	162.081	2.297.115
1995	423.337	1.736.717	159.851	2.319.905
2000	290.051	887.057	73.578	1.250.686
2001	317.427	896.769	70.903	1.285.099
2002	279.893	882.823	71.114	1.233.830
2003	326.748	827.435	85.147	1.239.330
2004	339.734	1.005.271	87.364	1.432.369

*Source: State Statistical Office

From the table it could be noticed that the number of sheep in 1995 was 2.319.905 heads, while in 2000 fell to 1.250.686 heads, or lowered 1.069.219 heads of sheep, which is almost 50% decline from the previous number.

In other words, in 1995 foot-and-mouth disease officially emerged among the animal, a disease which affects only double-hoof animals that also include animal, sheep and goats. For these reasons in 1996 the EU banned the export of lamb meat from Macedonia, which traditionally was exported to Italy, Greece and Croatia (as the main export destinations) for decades, causing the price of live weight lamb to fall very low. Due to the low prices of lamb, manufacturers began to reduce the number of sheep, i.e. to sell them massively. The data back then show that the price of 1 kg lamb live weight dropped to just 60 denars, which literally was unacceptable price for our farmers (sheep breeders).

Despite such unfavorable conditions that existed in the first decade of independence, we can say that today the situation is at least

partly stabilized, although it is far from satisfactory. Our priority as a profession was the situation in these two stock-breeding sectors if don't improve, at least to stay the same level.

Number of the sheep in the Republic of Macedonia in the period 2006–2011 is shown in Table 9 (Chart 7).

According to data shown in Table 9, the number of sheep in the period from 2006–2011 is characterized by continual slight decline. A great decline in the number of sheep occurred from 2006 to 2007 when the number of sheep decreased from 1.248.801 to 817.536 heads. It is 431.265 heads of sheep less or 34.53%. The reasons for this are mentioned above.

Historically, Republic of Macedonia as part of the former Yugoslav community was the country with largest number of sheep. Within the former Socialist Federal Republic of Yugoslavia, Republic of Macedonia took the first place with 2.300.000 sheep that was 30% of the total number, second was Republic of Serbia without the provinces (24,25%) and Bosnia and Herzegovina as third with 19,50%.

Actually, these three republics had around 75% of the sheep in former Yugoslavia. In Croatia were bred about 10% of the sheep, Montenegro 6,5%, Kosovo and Vojvodina

each had about 5% while in Slovenia sheep breeding was not very developed, with only 30.000 sheep. This data dates from 1988.

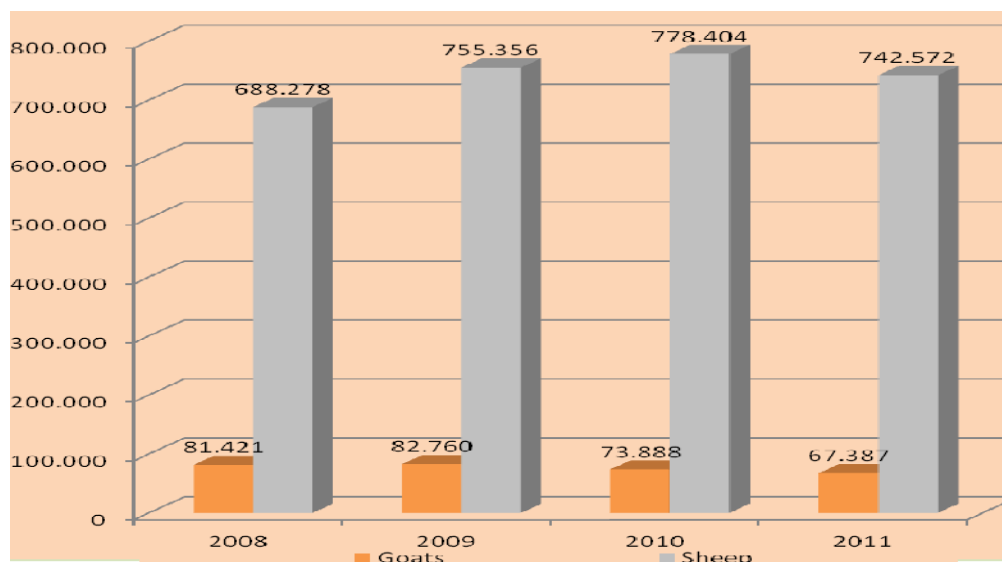


Chart 7. Number of sheep and goats in the Republic of Macedonia from 2008–2011

Table 9

Number of sheep in RM from 2006–2011

Ordinal number	Year	Breeding sheep	Total
1.	2006	858.684	1.248.801
2.	2007	551.379	817.536
3.	2008	587.625	688.278
4.	2009	521.524	755.356
5.	2010	568.301	778.404
6.	2011	542.077	742.572

Generally, the decline of the sheep was noticed even when Republic of Macedonia was part of SFRY. In former Yugoslavia, the total number of sheep in 1955 amounted 12.000.000 heads, while in 1980 fell to 7.350.000 heads, and in 1986 increased to 7.700.000 sheep. Bearing in mind that in the world there were around 1.600.000.000 sheep and goats, the population in former Yugoslavia represented 0.5% of the global population or 5.6% of the total number of sheep and goats in Europe, taking eighth place in Europe in 1988. In this period the number of goats were not recorded because it was believed that on turf they are totally liquidated. Gener-

ally, as it was observed by the breeders, the sheep can provide significant profit. In other words, the sheep could be bred and used with much lower cost compared to other species.

The situation is similar in goat breeding. Namely along with the progress of stock-breeding and stock-breeding production, it became clear that sheep and goat breeding and their use is the only way to also use the spacious mountainous and other pastures, as well as deagrarianised arable surfaces.

The number of goats in Republic of Macedonia in the period from 2008–2011 is shown in Table 10.

Table 10

Number of goats in RM from 2008–2011

Ordinal number	Year	Total number of goats
1.	2008	81.421
2.	2009	82.760
3.	2010	73.888
4.	2011	67.387

Source: Agency for Food and Veterinary

Similarly as the information about sheep, according to data in Table 10, the number of goats in the period from 2009–2011 is in con-

tinuous decline. The only slight increase was from 2008 to 2009 (Chart 7).

1.3.2. NUMBER OF SHEEP AND GOATS IN THE EPR (EAST PLANNING REGION)

The following table (Table 11) shows the number of the sheep in the EPR from 2006–2011, by municipalities, according to the data

from Agency for Food and Veterinary, Department for identification of domestic animals.

Table 11

Number of sheep in East Planning Region by municipalities from 2007–2011

Ordinal number	Municipality	2006	2007	2008	2009	2010	2011
1.	Shtip	/	/	/	31.820	30.810	32.472
2.	Berovo	/	/	/	23.067	20.732	20.410
3.	Probishtip	/	/	/	17.190	16.409	15.938
4.	Karbinci	/	/	/	14.441	14.060	14.102
5.	Vinica	/	/	/	9.552	9.769	10.822
6.	Pehchevo	/	/	/	10.254	9.609	9.353
7.	Cheshinovo–Obleshevo	/	/	/	9.469	7.801	7.644
8.	Delchevo	/	/	/	6.090	7.756	7.236
9.	Kochani	/	/	/	6.265	5.150	5.299
10.	M. Kamenica	/	/	/	3.706	3.759	3.772
11.	Zrnovci	/	/	/	1.340	884	918
Total number in EPR		/	140.327	110.146	135.203	128.749	129.977
Total number in RM		1.248.801	817.536	688.278	755.356	778.404	742.572
% participation of EPR		/	17,16	16,00	17,90	16,54	17,50

Analyzed by years, the number of sheep in EPR in the period from 2007–2011 is characterized by alternate increase and decrease. More accurately, the number decreased in the

period from 2006–2008, followed by slight increase in 2009, a decline in 2010 and again a slight increase in 2011 (Chart 8). The largest decline happened between 2007–2008 (for

30.000 sheep), but the following year this figure almost compensated. In a word, the figure constantly oscillates up and down, but it is important that it remains between 120.000 and

130.000 heads. The percentile participation of the number of sheep in the EPR, in terms of total number of sheep in the country ranges from 16% in 2008 to 17.90% in 2009.

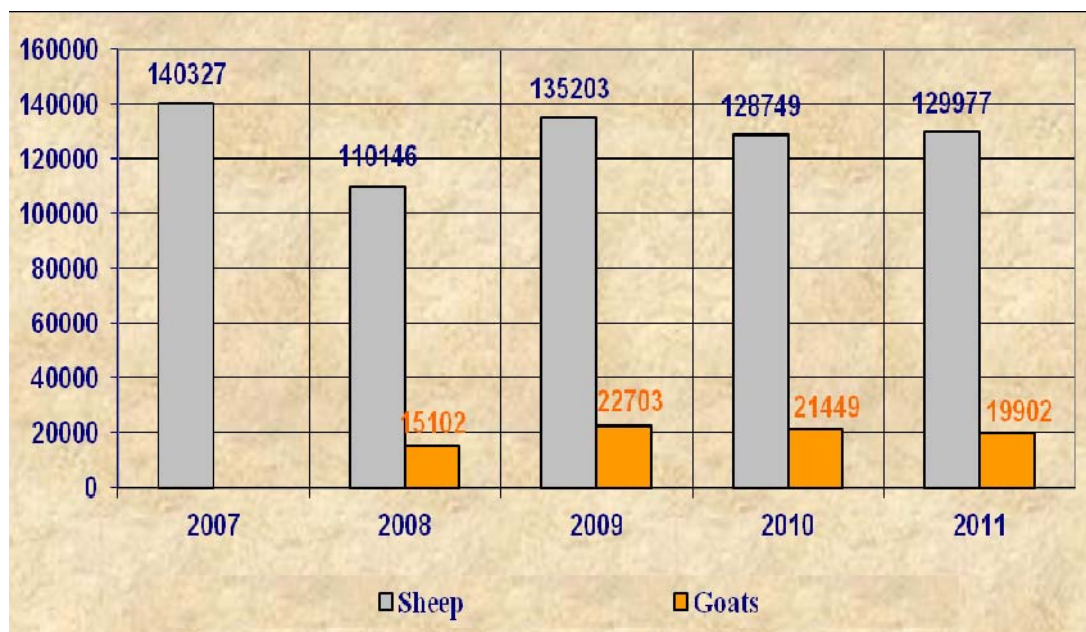


Chart 8. Number of sheep and goats in the EPR from 2007–2011

According to data in Table 11, the current total number of sheep in the EPR (from 2011) is 129.977 heads. Within the region, the largest number of sheep are bred in Shtip (32.472), second municipality is Berovo (20.410), third is Probishtip (15.938), followed by: Karbinci (14.102), Vinica (10.822), Pehchevo (9.353), Cheshinovo–Obleshevo (7.644), Delchevo (7.236), Kochani (5.299), Makedonska Kamenica (3.772) and the last municipality is Zrnovci with 918 heads of sheep.

Percentual share of each municipality in the total number of sheep bred in the EPR in 2011 (127.966) is: Shtip (25,38%), Berovo (15,95%), Probistip (12,45%), Karbinci (11,02), Vinica (8,46), Pehcevo (7,31), Ceshinovo–Obleshevo (5,97), Delcevo (5,65), Kocani (4,14), Makedonska Kamenica (2,95) and Zrnovci participate with 0,72% in the total number of sheep in EPR.

The following table (Table 12) shows the number of farms or folds where sheep are raised in each municipality in the EPR, in 2011. Data are obtained from the Agency for

Food and Veterinary, Department for labeling and identification of domestic animals.

According to Table 12, the total number of sheep farms in the EPR is 1303. Most farms (folds) are located in Berovo (368), while least of all in Zrnovci (9). Second municipality by the number of sheep farms is Pehcevo (147), and followed by: Probistip (141), Delcevo (137), Stip (126), Karbinci (83), Ceshinovo–Obleshevo (79), Vinica (78), Makedonska Kamenica (69) and Kocani with 66 sheep-folds.

The average number of sheep per farm (fold) in the EPR is 98. The largest number of sheep per farm has Stip (258), and the lowest Delcevo (53). Second municipality is Karbinci with 170 heads, followed by: Vinica (139), Probistip (113), Zrnovci 102, Ceshinovo–Obleshevo (97), Kocani (80), Pehcevo (64) and the municipalities Berovo and Makedonska Kamenica with average 55 sheep per farm. If we analyze the average number of sheep per flock in the entire region (98), we can say that it is not so low and can provide existence for a family of four. But every flock that has less than 80 milking heads can not provide it.

The following table (Table 13) shows the number of the goats by municipality from 2008–2011 according to the Agency for Food and Veterinary. The numerical condition for

2006 and 2007 is not shown because the Project for marking sheep and goats by the Agency launched in 2008.

Table 12

Number of sheep farms by municipalities in East Planning Regionu in 2010/2011

Ordinal number	Municipality	Sheep in 2011	Number of farms	Average sheep by farm
1.	Berovo	20.410	368	55
2.	Pehcevo	9.353	147	64
3.	Probistip	15.938	141	113
4.	Delcevo	7.236	137	53
5.	Stip	32.472	126	258
6.	Karbinci	14.102	83	170
7.	Cesinovo–Oblesevo	7.644	79	97
8.	Vinica	10.822	78	139
9.	M. Kamenica	3.772	69	55
10.	Kocani	5.299	66	80
11.	Zrnovci	918	9	102
Total		127.966	1.303	98

Table 13

Number of goats by municipality in East Planning Region from 2008–2011

Ordinal number	Municipality	2006	2007	2008	2009	2010	2011
1.	Vinica	/	/	/	3.966	3.646	3.865
2.	Delcevo	/	/	/	2.432	2.493	2.473
3.	Karbinci	/	/	/	1.944	2.122	2.418
4.	Berovo	/	/	/	1.816	1.923	2.166
5.	Kocani	/	/	/	3.156	2.161	2.138
6.	Probistip	/	/	/	1.964	1.874	1.984
7.	M. Kamenica	/	/	/	2.037	2.751	1.926
8.	Stip	/	/	/	1.408	1.107	1.396
9.	Cesinovo–Oblesevo	/	/	/	1.017	647	647
10.	Zrnovci	/	/	/	425	416	620
11.	Pehcevo	/	/	/	529	299	269
Total number in EPR		/	/	15.102	22.703	21.449	19.902
Total number in the Republic of Macedonia		/	/	81.421	82.760	73.888	67.387
% participation of EPR		/	/	18,55	27,43	29,03	29,53

According to the data in Table 13, the total number of goats in EPR in 2011 is 19.902 heads (Chart 8). Within the region, the greatest number of goats during 2011 had the Municipality of Vinica (3.865), followed by the Municipality of Delcevo with 2.473 heads of goats, while third is Karbinci (2.418). Ordering by number of the goats follow: Berovo (2.166), Kocani (2.138), Probistip (1.984), Makedonska Kamenica (1.926), Stip (1.396), Cesinovo–Oblesevo (647), Zrnovci (620) and Pehcevo with 269 goats.

The percentage of each municipality in the total number of goats living in the EPR in 2011 (19.902) is the following: Vinica (19,42%), Delcevo (12,43%), Karbinci (12,15%) Berovo (10,88%), Kocani (10,74%), Probistip (9,97 %), Makedonska Kamenica (9,68%), Stip (7,01%), Cesinovo–Oblesevo (3,25%), Zrnovci (3,12%) while Municipality of Pehcevo participates with 1,35% in the total number of goats the EPR.

Analyzed by year, the number of goats in EPR show a sharp increase from 2008 (15.102) in 2009. (22.703), followed by continuous fall in 2010 (21.449) and 2011 (19.902).

The percentile share of the number of goats in the EPR, in relation to the total number of goats in the Republic of Macedonia ranges from 18,55% in 2008 to 29,53% in 2011. Also, compared to all other planning regions, EPR has the largest number of goats in the country, followed by Southeast (14.114 goats), Northeast (11.510), Vardar (8.046), Pelagonium (5.567), etc. The number of the goats in EPR for 2006 and 2007 is not shown because the Project for marking sheep and goats by the Agency for Food and Veterinary was not started yet.

The following table (Table 14) shows the number of goat farms or farms in each municipality of the EPR, in 2011.

Table 14

Number of goat farms by municipalities in East Planning Region in 2010/201

Ordinal number	Municipality	Goats in 2011	Number of farms	Average number of goats per farm
1.	Vinica	3.865	1093	4
2.	Kocani	2.138	511	4
3.	M. Kamenica	1.926	451	4
4.	Delcevo	2.473	402	6
5.	Probistip	1.984	366	5
6.	Berovo	2.166	304	7
7.	Cesinovo–Oblesevo	647	254	3
8.	Zrnovci	620	152	4
9.	Stip	1.396	124	11
10.	Karbinci	2.418	91	27
11.	Pehcevo	269	52	5
Total		19.902	3.800	5

Most farms (properties) for goats are located in Vinica (1093), followed by: Kocani (511) Makedonska Kamenica (451), Delcevo (402), Probistip (366) Berovo (304), Cesinovo–Oblesevo (254) Zrnovci (152), Stip (124), Karbinci (91) and Pehcevo with 52 goat farms (Table 5).

According to the same table (Table 14), the average number of goats per farm in the EPR is 5. The largest number of goats per farm has the Municipality of Karbinci (27),

second is Stip with 11 goats per farm followed by Berovo (7), Delcevo (6), Probistip (5), Pehcevo (5), Macedonian Kamenica (4), Kocani (4), Zrnovci (4), Vinica (4) and Cesinovo–Oblesevo with the lowest average number of goats per farm (3). After all, the numbers themselves say that we can not speak of commercial farms that produce products for the market, but farms that produce mainly for domestic needs.

1.4. BREED STRUCTURE OF SHEEP AND GOATS IN RM AND EPR

According to data in Table 15, in the total number of sheep in the Republic of Macedonia confirmed on 01.10.2011 (769.348 heads) by the Agency for Food and Veterinary, most common sheep breed in R. Macedonia is Ovcepole type of pramenka (205.400), participating with 26,70% in the total number of sheep in the country. In the next group belong the sheep with undefined breed (another) with 164.881 heads (21.43%),

Sharmountain sheep with 20,94% share in the total number (161.131), Cross-breeds with breed Merinolandschaf (127.794), Merinolandschaf (75.844) Cross-breeds with breed Awassi (30.845) Awassi (2.673), Karakachan type of pramenka (604), East Friesian sheep (87), Cross-breeds with East Friesian sheep (81) and Pleven black-head sheep is represented with 8 heads.

Table 15

Breed structure of sheep in Republic of Macedonia in 2010/2011

Ordinal number	Breed	Numerical condition	% share in the total number
1.	Ovcepolian sheep	205.400	26,70
2.	Other	164.881	21,43
3.	Sharmountain sheep	161.131	20,94
4.	Cross-breeds Merinolandschaf	127.794	16,61
5.	Merinolandschaf	75.844	9,86
6.	Cross-breeds Awassi	30.845	4,01
7.	Awassi	2.673	0,35
8.	Karakachanian sheep	604	0,08
9.	East Friesian sheep	87	0,01
10.	Cross-breeds with East Friesian	81	0,01
11.	Pleven blackhead sheep	8	0,001
TOTAL		769.348	100

Source: Agency for Food and Veterinary

From the table above, we have a right to conclude that the data about breed structure of sheep in RM are not accurate and do not suit the actual situation on the terrain. Above all, the number of 75.000 purebred Merinolandschaf sheep is completely incorrect which could question the realization of this Study. We believe that the number of Cross-breeds with Merinolandschaf in Macedonia is not less than 50–60% of the total number of sheep in the country, taking into account its use and breeding in the country for more than 30 years. It is the same situation with the

number of Sharmountain and Ovce Pole, which is far lower than the number in the Table.

Given that this figure is specified by the authorized veterinary services across the country, we, as a profession do not stand behind it and also think that it should undergo certain adjustments, for each breed separately.

The following table (Table 16) shows the breed structure of sheep in EPR by municipalities.

Table 16

Breed structure of sheep by municipalities in East Planning Region in 2010/2011

Ordinal number	Municipality	Breed										
		O.Pole sheep	Shar M. sheep	Other	Cross-breeds Mer. land.	Mer. land.	Cross-breeds Awassi	Awassi	Karak.	EF sheep	Cross-breeds EF	Pleven blackh. Sheep
1.	Berovo	20.410	/	/	/	/	/	/	/	/	/	/
2.	Vinica	20	/	/	10.073	/	729	/	/	/	/	/
3.	Delcevo	20	/	1	3	/	7.212	/	/	/	/	/
4.	Zrnovci	/	/	/	918	/	/	/	/	/	/	/
5.	Karbinci	5.857	/	4.949	2.978	/	311	7	/	/	/	/
6.	Kocani	2.543	/	/	1.989	/	491	/	/	/	/	/
7.	M. Kamenica	/	/	3.772	/	/	/	/	/	/	/	/
8.	Pehcevo	8.945	2	401	/	/	5	/	/	/	/	/
9.	Probistip	/	/	15.287	1	615	1	34	/	/	/	/
10.	Cesinovo–Oblesevo	5026	1	941	1222	/	446	/	/	/	/	8
11.	Stip	11.141	/	8.649	12.399	13	248	4	/	18	/	/
Total		53.962	3	34.000	29.583	628	9.443	45	/	18	/	8

Explanation of the abbreviations: O.Pole sheep. – Ovce Pole sheep, Shar M. sheep. – Sharmountain sheep, Other. – Other sorts including the sheep which do not belong to any of the abovementioned breeds in RM, Cross-breeds Mer. land. – Cross-breeds Merinolandschaf, Mer. land. – Merinolandschaf, Cross-breeds Awassi – Cross-breeds Awassi, Awassi. – Awassi, Karak. – Karakachanian sheep, EF sheep – East Friesian sheep, Cross-breeds EF – Cross-breeds with East Friesian sheep, Pleven blackh. sheep – Pleven blackhead sheep

According to Table 16, the most common sheep breed in the EPR is Ovce Pole type of pramenka (53.962), followed by sheep defined as Other population (34.000), Cross-breeds with Merinolandschaf (29.583), Cross-breeds with breed Awassi represented by 9.443 heads, and 628 Merinolandschaf sheep. Other breeds and populations are represented in insignificant numbers.

The same table (Table 16) shows that in the EPR, the city with largest number Ovce Pole sheep is Berovo (20.410) Cross-breeds with breed Merinolandschaf are mostly found in Stip (12.399) Cross-breeds with breed Awassi in Delcevo (7.212), while sheep from other populations are most common in Probistip with 15.287 heads. Other populations such as Sharmountain sheep, Kara-

kachanian sheep, Merinolandschaf, Awassi, East Friesian sheep, Cross-breeds with East Friesian sheep and Pleven blackhead sheep could be found in all municipalities but in insignificant percentage.

In accordance with the numerous condition of the goats in the Republic of Macedonia, confirmed on 1.10. 2011 (79.664) by the Agency for Food and Veterinary, the most common goat breed in the country is domestic Balkan goat (38.378) and the second is the population of goats of undefined breed (other) with total of 21.772 heads, followed by Cross-breeds with breed Alpine (6.330), Saanen goat (6.256), Alpine breed (4.193) and Cross-breeds with Saanen breed (2.735). The number of the goats by breed in R. Macedonia is shown in Table 17.

Table 17

Breed structure of goats in RM in 2010/2011

Ordinal number	Breed	Numerical condition
1.	Domestic Balkan goat	38.378
2.	Other	21.772
3.	Cross-breeds with Alpine	6.330
4.	Saanen	6.256
5.	Alpine	4.193
6.	Cross-breeds with Saanen	2.735
TOTAL		79.664

Regarding the presented racial structure of goats, it could be mentioned that it is quite correct, and as such can be taken into consideration when making future breeding programs in this area.

The following table (Table 18) shows the breed structure of goats in the EPR, according to the data from Agency for Food and Veterinary.

Table 18

Breed structure of goats by municipalities in East Planning Region in 2010/2011

Ordinal number	Municipality	Breed					
		Alipne	Saanen	Domes.	Cross-breeds Alpine	Cross-breeds Saanen	Other
1.		13	/	13	/	/	2.140
2.	Vinica	/	/	3.858	7	/	/
3.	Delcevo	/	/	2.473	/	/	/
4.	Zrnovci	/	/	620	/	/	/
5.	Karbinci	155	7	126	94	247	1789
6.	Kocani	77	/	1.342	336	15	368
7.	M. Kamenica	/	/	/	/	/	1.926
8.	Pehcevo	18	/	19	/	/	232
9.	Probistip	/	/	/	/	/	1.805
10.	Cesinovo–Oblesevo	/	/	200	89	15	343
11.	Stip	26	35	14	75	154	1.092
TOTAL		289	42	8665	601	431	9695

Explanation of the abbreviations: Domes.–domestic Balkan goat

According to Table 18, the most represented goat breed in EPR is the one with an undefined racial status (other) with 9.695 heads and domestic Balkan goat with 8.665 heads. The remaining populations such as Cross-breeds Alpine (601), Cross-breeds Saanen (431), Alpine (289) and Saanen (42),

which are considered as more productive, are not so represented (below 1000 heads) or 5,02% of the total number of goats in EPR. This statistics indicates that there is still a lot to be done in the field of refinement, i.e. genetic improvement of goat population in the EPR.

1.5. PRODUCTION TRAITS OF SHEEP AND GOATS IN THE REPUBLIC OF MACEDONIA

The production abilities of most domestic sheep and goat populations are very small. Numerous attempts to improve the domestic "pramenka" sheep, gave quite modest results, mainly in the farms of that time. According to some literature data, the attempt for rapid changes in racial composition by mass "merinizacija" in the fifties, was not so successful, but gave a partial result.

The crossbreeding of domestic sheep populations with few merino breeds (arles merino sheep, Rambouillet merino, merino "zlatoushki" etc.). affected the weight gain of sheep, but did not resulted with increase in production and better quality of wool as well as the milk production .

The following table (Table 19) shows the production traits of sheep breeds prevalent on the territory of the Republic of Macedonia.

Table 19

Production traits of sheep breeds prevalent in Republic of Macedonia

Ordinal number	Breed	Live weight, adult heads (kg)	Lactation (liters)	Period of lactation (days)	Wool crop (kg)	Twinning (%)	Weight on birth (kg)
1.	Ovcepolian sheep	♂ 45 (34–35) ♀ 36 (25–48)	72.49 (38.47–128)	191 (144–214)	♂ 1.75 ♀ 1.22	3–5	♂ 3.0 ♀ 2.9
2.	Sharmountain sheep	♂ 44.2 ♀ 32.3	92.60 (61–120)	199	♂ 1.6 ♀ 1.3	3–5	♂ 3.0 ♀ 3.0
3.	Karakachanian sheep	♂ 44 ♀ 33	24–26	150–160	♂ 1.5 ♀ 1.1	3–5	/
4.	Merinolandschaf	♂ 90–130 ♀ 60–75	150–200	180	♂ 6–8 ♀ 4.5	20–50	/
5.	Cross-breeds Merinolandschaf	♂ 90–120 ♀ 55–75	80–150	180	♂ 3–6 ♀ 2.5–4	20–50	/
6.	Awassi	♂ 110 ♀ 55–65	300	200–300	♂/♀ 2.1	6–10	♂ 3.0–3.5 ♀ 3.0–3.2
7.	Cross-breeds Awassi	♂ 70 ♀ 50–60	100–180	200–250	♂/♀ 2.0–2.2	6–10	♂ 3.0–3.5 ♀ 3.0–3.2
8.	East Friesian sheep	♂ 90–100 ♀ 60–75	250–350	300	♂ 4–6 ♀ 4–4.5	180–250	/
9.	Cross-breeds East Friesian	♂ 90–100 ♀ 60–75	100–200	200–250	♂ 4–6 ♀ 4–4.5	180–250	/
10.	Pleven blackhead sheep	♂ 46–64 ♀ 65–70	150–194	176–190		30–60	♂ 4.37–4.78 ♀ 4.30–4.75
11.	Other	/	/	/	/	/	/

Source: CBPAB (2011–2020)

Table 20 shows the total production of sheep milk and wool in RM in the period of 2006–2010, according to data from the Statistical Office of RM (Statistical Yearbook 2006–

2010). The same table also shows the average milk production per sheep, on the national level.

Table 20

Sheep milk and wool production in RM during 2006–2010

Ordinal number	Year	Sheep milk/tons	Milk/sheep	Wool/ tons	Wool/ sheep
1.	2006	56.582	64	2.106	2
2.	2007	35.473	66	1.113	1,7
3.	2008	38.296	68	1.018	1,6
4.	2009	32.935	69	951	1
5.	2010	32.157	60	1.024	2

Source: Statistical Office of the Republic of Macedonia (Statistical Yearbook (2006–2010))

According to the data in Table 20, the average production of milk by milking sheep from all breeds that prevail in the Republic of Macedonia ranges from 60 liters in 2010 to 69 liters in 2009. According to the same table, the average amount of wool per sheep is about 2 kg. If we analyze the total amount of sheep milk in the country, we come to a conclusion that since 2006, there is a significant decline in production in 2007 (about 21.109 tons of

milk), and in 2008 there was a slight increase of 2.823 tons, followed by a continuous decline (Chart 9). The reason for this is the continual decline in the number of sheep which is due to the indifference of people, especially young people to start business in this sector.

Total production of sheep milk by region in the Republic for the period 2006–2010, as shown in the following table (Table 21).

Table 21

Total production of sheep milk by regions in RM in a period of 2006–2010 (tons)

Ordinal number	Region	Year									
		2006	By sheep	2007	By sheep	2008	By sheep	2009	By sheep	2010	By sheep
1.	Eastern	/	/	6.669	73	5.253	69	5.110	70	6.782	58
2.	Vardar			3.299	56	3.054	70	3.136	67	3.546	36
3.	Southwestern			3.483	60	4.839	58	3.452	54	3.517	62
4.	Southeastern			5.359	92	11.105	85	4.813	78	3.228	62
5.	Pelagonia			8.876	61	4.303	63	6.356	47	4.256	45
6.	Polog			3.623	81	2.555	93	7.081	167	4.395	115
7.	Northeastern			2.535	63	5.356	57	1.088	52	1.621	47
8.	Skopje			1.628	44	1.830	46	1.900	56	4.813	107

Source: Statistical Office of the Republic of Macedonia (Statistical Yearbook (2006–2010))

According to the previous table (Table 21), the largest production of sheep milk during 2010 is noted in the Eastern region (6.782 tons of milk), and lowest in Northeastern (1.621 tons). This once again confirms the importance of sheep breeding in the East planning region, and therefore the obligation to work constantly on its promotion in all aspects (both in terms of numerical condition and in terms of production traits). In terms of indi-

vidual lactation, the highest average per sheep in 2010 is noted in Polog region (115 liters) and the smallest in the Vardar (36 liters). The average lactation per sheep in the East planning region for 2010 was 58 liters. This lactation rate is close to the Macedonian average, but far from what could be considered a solid annual milk production per sheep. However, as a team and professional public, we have a note about the average individual

lactation in the Polog region for 2009 (167 l.) and for 2010 (115 l.). In other words, if the average commercial lactation per sheep stays on this level, then the average production of cheese per head-sheep would be around 48 kg, i.e. 3.5 cans of cheese, which is impossible. The maximum production of cheese per sheep in the Republic of Macedonia ranges from 1–2 cans or 14–28 kg of cheese per sheep. Despite that fact that the source of this

data is from Statistical Office and it is official, we believe that in the interest of the correct presentation of the results, it should be corrected.

The total production of goat milk in the Republic for the period 2006–2010, according to data from the Statistical Office (Statistical Yearbook 2006–2010) is presented in Table 22.

Table 22

Goat milk production in RM for the period 2006–2010

Ordinal number	Year	Goat milk/tons	Milk/goat
1.	2006	/	/
2.	2007	28.989	314
3.	2008	31.555	314
4.	2009	19.386	284
5.	2010	15.074	266

Source: Statistical Office of the Republic of Macedonia

Analyzing the total amount of goat milk in the country, starting from 2007, in 2008 there was a certain increase in production (about 2.566 tons of milk), and in 2009 and 2010 occurred continuous decline for 12.169 or 4.312 tons (Graph 9). This decline in the production of goat milk at the national level is in accordance with the constant decline of the goats'

number in 2009 (82.760), 2010 (73.888) and 2011 (67.387 heads). The reasons for the decline in the number of goats are almost identical with those of sheep.

The total production of goat milk by region in RM for the period 2006–2010 is shown in the following table (Tab. 23).

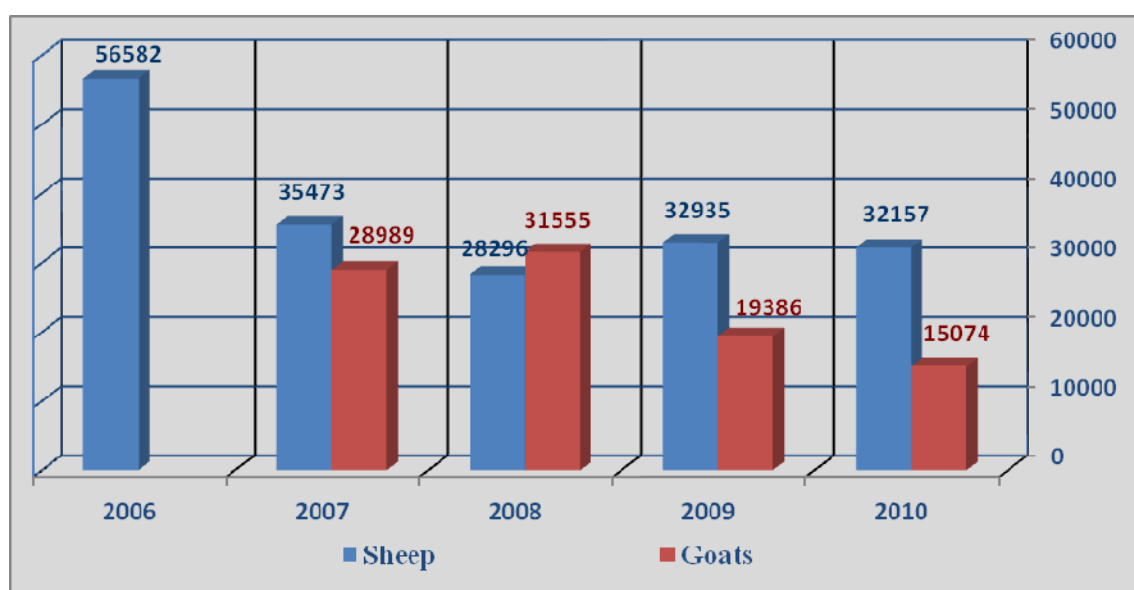


Chart 9. Sheep and goat milk production in RM for the period 2006–2010

Table 23

Total production of goat milk by regions in RM from 2006 to 2010 (tons)

Ordinal number	Region	Year									
		2006	By goat	2007	By goat	2008	By goat	2009	By goat	2010	By goat
1.	Eastern			3.270	301	3.666	298	2.172	232	4.598	232
2.	Vardar			4.494	448	5.986	567	2.778	482	2.766	463
3.	Southwestern			6.138	194	3.376	194	4.843	294	541	166
4.	Southeastern			4.613	345	6.777	247	4.147	259	1.953	221
5.	Pelagonia			1.938	370	2.634	517	739	164	534	134
6.	Polog			2.046	481	2.086	334	677	289	713	331
7.	Northeastern			3.651	309	5.455	299	2.237	294	2.622	320
8.	Skopje			2.840	563	1.576	469	1.793	289	1.346	307

Source: Statistical Office of the Republic of Macedonia

The highest production of goat milk during 2010 is also noted in the Eastern region (4.598 tons of milk), and lowest in the Pelagonia region (534 tons). That means that this region is a leader in this animal-breeding branch, as well as in sheep breeding. This is also confirmed in terms of number of dairy goats in 2010 which prevail in this region (19.842 heads). According to Table 13, the total number of goats in the region that year amounted 21.449 heads. This fact also gives

us the right to start with the preparation of such a study and of course with its final realization.

The same as sheep, here we also have a note about the average lactation per goat in some regions (Vardar, Pelagonia, Southwestern, Polog etc.) for some years. In fact, anywhere where the average commercial lactation per goat is over 400 liters should be corrected because it does not correspond to actual conditions on the practice.

1.6. EXPORT-ORIENTED PRODUCTS IN SHEEP AND GOAT BREEDING AND REVENUES FROM THE SAME

The only strategic export product in the field of animal-breeding in the Republic of Macedonia is lamb. Dairy products (cashkwall and cheese) are exported in very small quantities, due to strict criteria and the tremendous competition in the european and world market. The only dairy in RM with a right to export to EU countries is Bitola dairy (IMB). The technology of lamb production in our country is traditional, which means mating of the sheep once a year (August–September), their lambing in January–February, weaning of lambs in March–April and their sales during the Easter holidays and Labor Day. The exception is the production of lambs for the catholic Christmas (January), when the sheep are treated with hormonal treatment (proges-

teron treatment + PMSG) in late April or the first half of May, so they are lambing in October, but lamb is ready for sale in December. This lamb almost 100% is placed on the Italian market and almost always reaches 30% higher price comparing to that in the months of April and May. But the number of sheep lambing this time in order to have Christmas lamb is relatively small, about 2–5% of the total number of sheep in the country. The average weight of lambs that are slaughtered in both seasons (Christmas and Easter) is 15–18 kg and the average slaughter weight ranges from 7,5 to 9 kg. The production of lamb meat per years on a national level is shown in Table 24.

Table 24

Production of lamb in RM from 1960 to 2011

Year	Lamb (tons)	Year	Lamb (tons)
1960	7.293	2003	5.895
1970	8.267	2004	7030
1980	9.464	2005	6857
1990	14.377	2006	7198
1995	9.976	2007	6495
2000	4.919	2008	5204
2001	5.789	2009	5225
2002	4.637	2010	4786

Source: Statistical Office of the Republic of Macedonia

According to the previous table (Table 24), in the period 1960–1990, the amount of sheep and lamb meat produced continuously increased, and after 1990 that production has fallen sharply, especially after 2000 when the annual production of sheep and lamb in the country was 4919 tons. Between 2003–2010 the production was constantly moving up and down, but always stays between 5000–7000 tons per year, while in 2010 it fell again to

4786 tons. The reasons for this have already been mentioned when explaining the variation of the number of the sheep.

Almost every year, about 50–70% of the total lamb meat production is regularly exported, while the rest is sold on the domestic market. Total export of lamb in the period 2007–2011 by country, with the realized inflow of foreign funds by year is shown in the following table (Table 25).

Table 25

Export of lamb by states in the period 2007–2011

Ordinal number	State	Year									
		2007		2008		2009		2010		2011	
		tons	€ MIL.	tons	€ MIL.	tons	€ MIL.	tons	€ MIL.	tons	€ MIL.
1.	Italy	1374,4	6,960	1463,7	8,503	1434,9	7,401	1440,4	7,996	1848,2	10,001
2.	Greece	1152,8	5,063	888,03	3,696	988,87	4,464	907,41	4,374	723,33	3,621
3.	Croatia	260,17	1,212	178,39	0,873	227	1,08	306,51	1,541	484	2,481
4.	Serbia	/	/	81,97	0,33	49,65	0,227	14,65	0,074	23,33	0,12
5.	BIH	/	/	/	/	5,323	0,024	/	/	/	/
TOTAL		2787,37	13,235	2612,09	13,402	2705,74	13,196	2668,97	13,985	3078,86	16,223

Source: Statistical Office of the Republic of Macedonia

According to data shown in Table 25, in the abovementioned period the largest importer of lamb from the Republic of Macedonia was Italy, followed by Greece and Croatia, while very small and insignificant amounts in

this period have imported Serbia and Bosnia and Herzegovina.

Table 26 shows the total exports of lamb by states and the realized foreign exchange inflow in five-year period (2007–2011).

Table 26

Total lamb exported by states in the period 2007–2011

Ordinal number	Importing country	Exported meat (tons)	Realized inflow in foreign currency (mil. €)	Participation in total export (%)
1.	Italy	7561,6	40,861	54,58
2.	Greece	4660,4	21,218	33,64
3.	Croatia	1456,07	7,187	10,52
4.	Serbia	169,6	0,751	1,22
5.	BiH	5,323	0,024	0,04
TOTAL		13853	70,041	100

Source: Statistical Office of the Republic of Macedonia

According to the data in Table 26, total lamb exported in the abovementioned five-year period (2007–2011) was 13853 tons, with total foreign currency inflow of 70.041.000 euro (Chart 10). According to the foreign currency inflow realized, the average price of a slaughtered lamb, achieved in these markets amounted 5,06 euro (310 denars). On the other hand, the purchase price of the lamb in the country, depending on supply and demand still ranges from 2–2.5 euro per 1 kg live weight. Besides lamb, on the main markets (Italy and Greece) are also exported certain

amounts of kid's meat which is increasing continuously every year.

In terms of dairy products from sheep and goat milk export from the Republic of Macedonia, for now only Dairy Bitola exports in the EU countries, USA and third countries, Mlekara Zdravje–Radovo only in third countries such as Serbia, and another one to two dairies that also export small quantities in third countries. Therefore, there is still a lot to be done on increasing export of end dairy products.

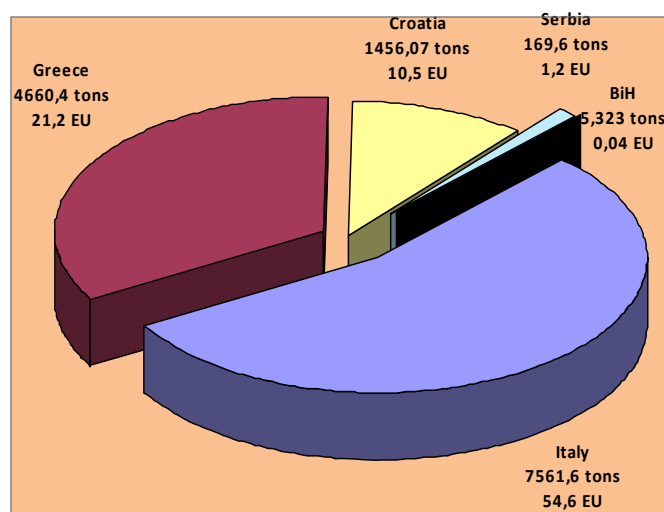


Chart 10. Exported lamb and realized foreign currency inflow in the period 2007–2011

According to the previous experiences, there is a huge interest for exporting organic dairy products especially from goat milk, but in order to accomplish that we should be working on continuous education of farmers on one

side, while on the other side, the dairymen themselves must have a line for processing organic dairy products from sheep or goat milk. This is quite popular in developed European countries (England, Germany, the Neth-

erlands), where a lot of farms are organic, thus producing organic products (milk, meat

and products thereof), and are selling them as such (Figure 2).



Figure 2. Organic goat farm, Leeuwarden, The Netherlands
(Ph.D. Nikola Pacinovski, 2008)

1.7. DOCUMENTS AND LEGAL ACTS REGARDING THE DEVELOPMENT OF SHEEP AND GOAT BREEDING IN THE REPUBLIC OF MACEDONIA

Important documents that are analyzed and elaborated in detail for the purposes of this Study and which directly affect the development of these two animal husbandry sectors are:

- National Strategy for Agriculture and Rural Development for the period 2007–2013;
- Common Basic Program for Animal Breeding (CBPAB);
- Law on Protection and Animal Welfare (Official Gazette of RM no. 113/07);

- Law on Quality of Agricultural Products (Official Gazette of RM no. 140/10);
- Law on Organic Agricultural Production (Official Gazette of RM no. 146/09);
- Program for Protection of biological diversity in animal husbandry (Official Gazette of RM no. 144/10);
- Programs for Financial Support of Agriculture in RM (1995–2011);
- IPARD Program 2007–2013.

1.7.1. NATIONAL STRATEGY FOR AGRICULTURE AND RURAL DEVELOPMENT FOR THE PERIOD 2007–2013

In the National Strategy for Agriculture and Rural Development (2007–2013) significant priority is given to the development of

sheep and goat breeding in the Republic of Macedonia. Referring to the SWOT analysis

for these two branches, the strategy stresses the following facts as strengths:

- Favourable environmental and ecological conditions for production,
- Availability of large areas for grazing,
- Tradition in sheep and goat breeding,
- Sufficient number of slaughterhouses for lambs for export to EU countries,
- Production of several traditional dairy products,
- The quality of lambs and cheeses are with recognized quality,
- Excellent adaptation of local breeds to existing conditions of the external environment,

As weaknesses of these two branches in the strategy are listed the following:

- Small farms and flocks in the state,
- The traditional export markets for lamb are suffering from disorganized purchase, which requires signing contracts with farmers with reference to breed lambs with uniform quality, the lamb carcasses are still not classified according to EU regulations (SEUROP system) despite recommendations of the Law on Quality of Agricultural Products (Official Gazette of RM no. 140/10)
- Weak vertical integration, weak contracted farming and involuntary agreements between farmers and dairies. There is no organization for joint marketing of dairy products and most farmers sell separately. There is a lack of labeling and branding of cheese in certain regions,
- In the state there is only one dairy licensed to export to EU, and two processing facilities for export to third countries (no EU members),
- Low productivity of local breeds and populations, seasonal variation of production (milk and meat), low quality of the milk. Highly productive animal husbandry is poorly fed, low protein and energy input. No serious work in proliferation by many farmers (production courses milk–meat, meat–wool). There is a lack of pattern quality of raw milk and quality control of raw milk,
- The number of people breeding sheep drastically reduces, due to aging and lack of people for a replacement. Educational programs on new and existing farmers are not offered,
- Lack of control of the production. The value of the breeds is not estimated (some

data on breeding and productivity exist, but not a final analysis of the breeding value), in order to form a pattern for breeding real high-quality animals,

- There is no national coordinating body that would link industry and government, and organize market and production. Associations of farmers are still weak and poorly organized. There is no real association in the industry of small ruminants. It is assumed that only part of farmers are associated, which is 20–25% of sheep in the country.

As opportunities in the sheep and goat breeding are listed:

- Adding value to meat and dairy products through processing and improving the quality and branding,
- Launching National programs for promotion of sheep and goat products on domestic and especially international markets,

As risks for these two farm sectors are listed:

- There is a threat Macedonian lamb to be lost and to weaken its quality, as a result of using different breeds. Problems arise about the production of uniform slaughtered lamb with the required quality,
- Problems with animals' health (brucellosis)
- Without support scheme, sheep and goats breeding could have consequences.

The strategy as key factors that hinder the development of agriculture in the Republic of Macedonia, shall state the following:

On a rural level:

1. Low living standard in terms of physical and social infrastructure (migration, age, low education, unemployment of the population in the rural areas)
2. Lack of alternative employment (outside the farm) and opportunities for generating income (heavy dependence on agriculture as the sole source of income, low salaries and poverty),

On a production and processing level:

1. Small farms and their division on parcels (resulting in high costs of unit and ineffectiveness of the production),
2. Old-fashioned production and technologies of breeding (resulting in low harvest and product quality),
3. Poor vertical integration (associations of farmers/cooperatives) resulting in weak po-

litical influence, poor power to contract or purchase (buying inputs and selling output),

4. Poor vertical integration between farmers and processors (resulting in unorganized production that leads to excessive supply and major differences/changes in the price, disparity between the quantity and quality),

5. Low level of education /training (resulting in a conservative attitude towards change/innovations),

6. Weak support services, such as market information, credits, research /advisory services, support policies (resulting in a weak market orientation, lack of farm investment, low rate of innovation, lack of medium term planning of production and organization),

7. Lack of product quality,

8. Small scale of processing technologies (resulting in lack of economies of scale),

9. Outdated processing technologies (resulting in low productivity, high costs, products with lower quality)

10. Low level of approving standards for quality and food safety (HACCP) and insufficient attention on environmental issues (resulting in a few industries with possession of license for export in the EU countries).

Generally, basic directions for development of industry of sheep and goats in the strategy are increasing the number of sheep and goats, and improving the racial structure. In sheep breeding, the policy supports all farms to maintain and increase the number of sheep, as well as breeding centers for some breeds (Awassi, Merinolandschaf and Cross-breeds Merinolandschaf). In goat breeding, the support is also directed to all farms for maintaining and increasing the number of goats, as well as the support centers for breeding (Alpine).

1.7.2. COMMON BASIC PROGRAM FOR ANIMAL-BREEDING (CBPAB)

According to its purpose, the Joint Basic Program for livestock (CBPAB) is an integral program that covers all kinds of domestic animals, so a part of it is also the Common Basic Program for Sheep Breeding (CBPSB) and Common Basic Program for Goat Breeding (CBPGB). Both programs generally predict the basis for preparation of individual breeding programs (in accordance with Article 18 and 19 of the Law on Animal husbandry – Official Gazette of RM no. 7/08) for the particular breeds in the Republic of Macedonia. These programs should enable further development and improvement of sheep and goat breeding in the Republic of Macedonia.

Through the implementation of such breeding programs in developed countries, it is provided appropriate control, evaluation, ranking and selection of breeding heads in certain sheep and goat breeds, which results with a significant improvement of production traits. All this is accompanied by intensive application of modern software packages and models for determining the breeding value of the animals. The methods of molecular biology and genetic engineering techniques are

additionally used in the characterization of the genome and modern methods in reproduction of sheep that also have a significant contributions in the development and improvement of sheep and goat breeding.

1.7.2.1. Common basic program for sheep breeding (CBPSB)

Common breeding program for sheep breeding represents a general framework that defines the general goals of special breeding programs, i.e. guidelines, the ways and methods to increase the genetic potential of the sheep population in RM.

According to Article 16 of the Law on Animal husbandry, the Joint Basic Program for Sheep Breeding should provide the basis for the realization of special breeding programs, which would preserve the basic common framework of a national interest. Considering the facts mentioned, CBPSB provides a broader framework that will define the general objectives, that would be expressed by:

- Defining the breeding objectives in sheep breeding;
- Identification of routes for breeding certain breeds of sheep;
- Usage of appropriate methods and ways of breeding;
- Form of publication and availability of the obtained results;
- Identification of the resources necessary for continual implementation of the program.

In sheep breeding, as the main direction for improving the sector is indicated:

- Improvement and advancement of genetic capacity of the heads,
- Improving the farming practice and
- Education and organization of farmers,

The milk production at all ruminants is a complex physiological process influenced by many internal and external factors. The most important among them are:

- Breed,
- Age and lactation (consecutive)
- Live weight and body size,
- Type of lambing,
- Farming Systems and
- Year.

Based on the achieved production data, for a longer period of time, it could be noted an increase in the average lactation per milking sheep in the Republic of Macedonia. It could be said that the increase of the lactation is partly due to the planned improvement, and the self initiative activities of farmers too.

The total production of sheep meat is mainly conditioned by number of the heads, but the production is also influenced by numerous genetic and paragenetic factors. Despite the slaughtering age, which has a direct impact on meat production from sheep, managing the process of breeding sheep also directly determines the production of meat. The application of different methods in the control of reproduction of sheep allows application of multiple systems for producing lambs, depending on the intensity of production. The main purpose of the application of these methods is the increased production of lamb meat.

CBPSB should provide a framework where the individual breeding programs for sheep would be performed in the next 10 years, with the main goal to improve the genetic capacity of the heads. The envisaged framework should include elements which would increase productivity, in other words, the production, reproductive and functional traits of the sheep would be improved.

As other factors affecting the successful implementation of CBPSB is the formation of a National Breeding Pyramid (nucleus, reproductive and commercial farms).

The highest level is the nucleus which implements the improvement of the population. Spreading the results from the improvement in the nucleus is carried out in reproduction farms, while the application of the results is carried out in commercial farms, as a lowest level.

Breeding pyramid of the sheep population in the Republic of Macedonia, according to its size and structure should ensure realization of: maximal annual genetic improvement of the sheep population, providing the required volume of production and appropriate way of dispersion of the genetic improvement in the rest of the population. The optimal size of nucleus, is considered when it is located 10 to 20% of the population that should be improved. If in the nucleus is applied artificial insemination (A/I), the annual genetic progress is 50% higher in relation to the application of natural mating. The size of the nucleus, the intensity of selection as well as the expected effect of selection, among other factors, are conditioned by the size of the population.

Guidelines for selection and improvement of the sheep. Basic production directions that are advocated in CBPSB are meat-wool and milk-meat. However as the main production direction, and at the same time the main selection direction that is practiced in the Republic of Macedonia is the production direction milk-meat.

In dairy sheep types, CBPSB approves and provides the following basic directions during the selection and improvement of sheep:

Selection for improving production characteristics,

Production direction	Trait
Milk	Total lactation, Total quantity of fats and proteins, average percentage of fat and and proteins.
Meat	Fertility, growth, body shape, offspring weight, weight when 60 days old, conversion.

Selection for improving functional traits

Breeding goal	Trait
Reproduction	Conception, number of lambs per inseminated and lambd sheep, number of weaned lambs, % of lambing, % weaning, problems with fertility or partus, live weight of the sheep when weaning the lamb.
Milk production efficiency	Lactation, live weight, age and lactation (in that order), type of lambing, length of lactation.
Udder and health condition of udder	Number of somatic cells, Mastitis, morphology of udder (udder cavity, basal size of the udder, size, hight, length, diameter and position of teats, position and shape of udder).
Health condition and adaptability to local conditions	Longevity, immunity, parasite tolerance, posture of legs and condition of the hoofs

Breeding goals are often influenced by many factors and should always take into account the needs of: manufacturers, industry and consumers. Strategies and methods, as well as the systems applied in the breeding programs in sheep breeding sector are usually determined by the direction of production and overall development of the sector. Breed is the basic unit of each particular breeding program, and the largest genetic progress in the population would be achieved if the selection is conducted on the entire population.

Due to several reasons (administrative, economic and developmental) in developed countries the concept according to which a performer of national breeding programs is the state has been abandoned a long time ago. In the future, the Republic of Macedonia is expected to increase the number and also to strengthen the capacity of recognized societies (associations) of sheep breeders, that should be the basic carriers of promoting the sector and implementation of breeding programs for the represented sheep breeds. The recognized associations of sheep breeders must be registered and approved by the Ministry, in accordance with the Law on Animal husbandry.

Milk and lamb production are the main goals in sheep breeding in the Republic of Macedonia. Hence CBPSB aims to offer solutions for improving the manufacturing sector.

In milk production, the primary goal of the breeding program is increasing the milk production, while as a secondary objective implies increasing the production of easy lamb (within the same production direction). The cheese, although much of it produced traditionally, represents the main source of income, and the economic profit of the sheep-breeding production depends directly on it. Given that the correlation between the lactation and percentage of fat and protein is low to negative (phenotypic and genotypic) results that the selection for these traits would be directed towards increasing the lactation and retaining the existing % level of fat and proteins. On the other hand, if the selection is directed towards increasing the total amount of fat in lactation period, then the overall lactation would be increased at the same time. Hence, for breeding purpose milk, the main subject of the selection should be the total lactation and the total amount of fat.

The production of lamb meat is equally important as the production of cheese, but it is

characterized by limited opportunities for placing on the markets. In meat production direction, the emphasis is put on producing lamb for a specific market. Increasing the production of lamb could be achieved by increasing the fertility of sheep as well as the of growth of lambs.

Breeding patterns in sheep-breeding.

Breeding schemes in sheep breeding are conditioned by several factors (the system of production, the direction of production and the interest of farmers). Although global trends and experience have shown great interest in breeding pure breed, often it could be observed Cross-breeding as well as combination of both methods of breeding in certain breeds (pure racial breeding and Cross-breeding). Depending on the development of the sector (market demand, parity of interprices of the milk, meat and food and the degree of professional competence and interest of the farmers) it has been planned using different strategies for Cross-breeding that could be characterized by various direction of realization but with different volume and intensity.

Offering a broad framework in defining the systems of breeding, CBPSB provides pure racial breeding, if certain associations of sheep breeders show interest in indigenous sheep populations. Besides the indigenous sheep populations, CBPSB also provides an opportunity for pure racial breeding of breeds with exceptional milk and meat production. In fact, the interest in breeding breeds with exceptional milk and meat production and preparation of special breeding programs for these breeds is quite significant. It is important because the appropriate breeding programs would help in maintaining and improving the breeds with exceptional production that would serve as land reclamators of indigenous sheep populations. Given the fact that the lactation of the domestic sheep population is quite low, CBPSB predicts Cross-breeding of the domestic sheep population with breeds of sheep with exceptional milk production. The Cross-breeding would fasten the process of creating a dairy sheep population.

Regarding dairy breeds, the program proposes, i.e. is not forcing any of several dairy sheep breeds in the world: East-Frie-

sian, Awassi, Sardinian, Chios, Lacaune, Plevan Blackhead and British dairy sheep.

At the production direction meat-wool, breeding program considers two breeds: Merinolandschaf and Ile de France sheep.

CBPSB considers application of industrial and meliorative Cross-breeding designed according to the sector's needs, which in turn will result in maximal securing and use of heterosis effect, and also maintaining the genetic predisposition of the domestic population (solid constitution and resistance). Applying the methods of intersection, it is projected obtaining genotypes with various degrees of participation of the breed improver (meliorator). The level of participation of the breed meliorator in the genome of autochthonous sheep population would be determined by the interest of farmers and associations of the breeders. The meliorator breeds should come from breed sheep population and the selection should be directed towards the superior product traits that are characteristic for the breed improver.

Although the Cross-breeding by definition means an increase in productivity (improving the quality and the quantity of the product), while cross-breeding, briefly, attention should especially be paid to:

- the emergence of hybrid vigor, characteristic for the offspring, resulting in increased vitality, reproductive capacity, growth, immunity, efficiency in food consumption, in one word represents an opportunity for increased productivity;
- correct selection of quality breeding heads (male and female) while Cross-breeding is equally important as the correct choice of the appropriate breeds;

Neither method used for improvement in modern sheep breeding can not and is not a substitute for poor management systems on the farm and the inadequate nutrition.

For realization of the planned activities, a minimal number of recommended breeding purposes, traits that should be subject to selection, as well as principles of breeding, CBPSB recommends the following frame:

Breed	Breeding goal	Trait	Principles of breeding
Ovcepolian / Sharmountain sheep	Milk	Total lactation, total fats	Purebred breeding Improvement with dairy breeds
	Meat	Fertility, growth, offspring weight	Purebred breeding Refinement with breeds for meat and meat-wool
	Preserving the biodiversity		Purebred breeding
Karakachanian	Preserving the biodiversity		Purebred breeding
Dairy breeds	Milk	Total lactation, total quantities of fat	Purebred breeding
Breeds for production of meat and meat-wool	Meat	Fertility, growth, offspring weight	Purebred breeding

Observing the contemporary trends in sheep breeding, CBPSB plans implementation of modern DNA methods in various levels of implementation of special breeding programs. The implementation of these methods would give a contribution towards the realization of the breeding goals set that would result in the creation of genotypes of sheep, holders of desired traits.

Farm register and databases. The system of farm register is the basis of each particular breeding program. Depending on the farmer's needs and the breeding program's objectives, farm register and database can be a simple or detailed system of data accumulation. Regardless of the amount of data accumulation and the complexity of the system, each good system provides a precise and simple way of collecting data, regardless of the fact if data is recorded in books or in electronic form (specifically designed software packages).

Import of genetic material, way of use and comparative testing. According to CBPSB, the import of genetic material is necessary for economic, organizational and selection reasons connected to improving of the indigenous population of sheep, and for forming the nucleus flocks of breeds with exceptional milk and meat production.

Pursuant to Law on animal husbandry, the import or export of breeding material should not be banned and restricted from zootechnical reasons. Market liberalization means opening the market while allowing liberal attitude towards import and manipulation

of live heads, semen and embryos. But the import of breeding heads, semen and embryos, according to the Law on animal husbandry should be under strict control and special precautions measures (monitoring of imported breeding heads as well as monitoring of certain traits of their offspring).

Expected effects from the improvement of the sheep' traits. Through implementation of the approved breeding programs, in the future, first of all it is expected increase of the milk production and the individual lactation per sheep in the RM. Improvement of the quality of the milk and meat is also expected.

Interested parties within CBPSB. Implementation of CBPSB is primarily, according to the Law on Animal husbandry an obligation of the state in which it is expected the direct realisers of certain special breeding programs within CBPSB to implement all biotechnological, biological methods and measures projected within the specific breeding programs.

The implementation of the activities for genetic improvement basically means the state to establish active participation in the monitoring of direct realization of the whole breeding program, which is especially important for supporting the breeding programs for endangered indigenous genotypes and the like.

Organizing CBPSB implementation. The law envisages the coordination of the state with the above mentioned factors in the implementation of CBPSB to be realized through the Council for Animal husbandry

within the MAFWE through confirmation of the breeding programs. The time frame when CBPSB will be prepared as part of CBPAB gives space for adoption and implementation of proposed breeding programs and should also predicts i.e. accept the transfer of legitimacy of the adopted breeding programs out of these time limits, of course if the expert supervisors of breeding program envisaged by the Law on animal husbandry, note that it is ongoing and is realized successfully. The professional supervision will pay attention to the level of confidentiality of certain information within the realization of the breeding program.

Breeding programs for particular genotypes of sheep by a recognized organization of breeders. Pursuant to the Law on Animal husbandry, the breeding programs in sheep breeding are prepared within a period of five years, so for a specific sheepbreed there may be one or more breeding programs. According to the activities defined by CBPSB, the breeding programs should include:

- Description of population,
- breeding goals,
- size of population
- breeding methods,
- programs in selection,
- developmental, researching and professional tasks for the purpose of increasing the efficiency of program implementation,
- measures for promotion of animal breeding and ensuring the dissemination of genetic progress that will impact on improving the quality of the products of animal origin,
- annual programs for the use of certain male breeding heads and manner of publication of the results obtained and
- zootechnical standards (criteria for trade with breeding material, conditions, procedure and manner of keeping registers, the contents of zootechnical documents, the criteria for acceptance of animals for breeding, methods for monitoring and evaluating the characteristics of the genetic value and the criteria for recognition of breeders' organizations).

The minister approves special breeding programs in sheep breeding, after making a demand and getting an opinion from the Council for animal husbandry. The specific breeding program should:

- enable the improvement of sheep breeding,

- provide control of productivity and other traits of the population,

- provide a large enough population for realization of the program itself,

- apply appropriate methods for checking the origin of heads,

- heads that will be part of the program are properly labeled so we can determine their origin,

- ensure professional, technical and organizational preconditions for the implementation of the breeding program,

- have a proper professional team for implementation of the breeding program that will provide professional care of the whole breeding documentation prescribed

- provide genetic reserves and ensure genetic variability and biodiversity,

- provide the conditions to prevent inbreeding, unless otherwise projected and

- provide a system of internal control for the key issues in performing the breeding program and program selection.

Breeding programs approved according to CBPSB should meet all additional criteria projected according to the Law on the livestock.

According to the abovementioned, the obligation of the newly formed sheep farms for the breed Merinolandschaf will be preparing a breeding program for the breed Merinolandschaf, as it could be recorded in the registry of the Ministry of Agriculture, Forestry and Water Management as a recognized organization of breed Merinolandschaf breeders (new term for reprocenter, pursuant to Law on livestock).

1.7.2.2. Common basic program for goat breeding (CBPGB)

Similar to sheep breeding, goat breeding also as the main direction for improving the sector indicates the improvement and advancement of genetic capacity of the heads, improving farming practice, education and organization of farmers.

Factors for improving the milk production are the same as in sheep breeding:

- Breed,
- Age and lactation (in that order)
- Live weight and body size,
- Type of kidding,
- Breeding system and
- Year

CBPGB should provide a framework in which individual breeding programs in the next 10 years would be performed, and the main goal would be improving the genetic capacity of the heads, while the projected framework should include elements which would increase the productivity, that will improve productive, reproductive and functional traits of the goats.

The basic functions of CBPGB are increasing productivity and the volume of production, product quality, efficiency in working, maintenance of genetic diversity, supporting conservation programs, taking care of the animal welfare and successful dissemination of genetic progress in the rest of the population.

National breeding pyramid. The breeding program for goats also predicts the existence of three levels: nucleus farms reproductive and commercial farms. The improving of the population is carried out in the nucleus, while the popularization of the results of the nucleus is carried out in the reproductive farms. The application of the results is performed in commercial farms, as a lowest level.

Selection for improving production traits

Production goal	Trait
Milk	Total lactation, total quantity of fat and proteins, average percentage of fat and proteins.

Selection for improving functional traits

Breeding goal	Trait
Reproduction	Conception, number of kids per inseminated and lambed goat, number of weaned kids, % of kidding, % weaning, problems with fertility or kidding
Milk production efficiency	Lactation, live weight, age and lactation (in that order), type of kidding, length of lactation.
Udder and health condition of udder	Number of somatic cells, mastitis, morphology of udder (udder cavity, basal size of the udder, size, height, length, diameter and position of teats, position and shape of udder).
Health condition and adaptability to local conditions	Longevity, immunity, parasite tolerance, posture of legs and condition of the hoofs

The implementation of these directions will allow improvement of the goat population and could be expected fulfillment of the general goals of CBPGB. Through methodological division there is a possibility of using customized models for their genetic evaluation, and the possibility of using different selection procedure in terms of the tests that were

Breeding pyramid of the goat population in the RM, according to its size and structure, should ensure performing maximal annual genetic improvement of goat population, providing the required volume of production and appropriate manner of spreading genetic improvement in the rest of the population. The optimal size of the nucleus is considered when in the nucleus are located 10 to 20% of the population that should be improved. If A/I is applied in the nucleus, the annual genetic progress is 50% higher in relation to the application of natural mating. The size of the nucleus, the intensity of selection as well as the expected effect from the selection, among other factors, they are conditioned by the size of the population.

Directions of selection and improvement of goats. As an internationally generally recommended selection directions of small ruminants, CBPGB accepts and projects the following basic directions in the selection and improvement:

used, managing the overhaul of the flock, accuracy of selection and different level of selection intensity.

Basic breeding goals – objects of selection. Development of goat breeding as well as the overall selection and breeding of goats should comply with established breeding ob-

jectives for individual breeds of goats. Hence, the minimum number of recommended breeding goals, or traits that should be subject to selection by CBPGB are:

Production direction	Trait
Milk	Total lactation, total quantities of proteins and fat in the milk

The production of goat milk is the main goal in goat breeding in the Republic of Macedonia, hence CBPGB aims to offer solutions for improving the production in the sector.

The primary objective of the breeding program is increasing the production of goat milk. In some countries (Canada) promoting population is directed towards increasing the lactation per goat, paying no attention to the composition of milk. However, the selection oriented only towards increasing the lactation result in reduction of the concentration of fat and proteins in the milk. The selection in dairy goat-breeding in most European countries, especially in France, is oriented towards increasement of lactation, while paying attention to proteins and fat, where selection criteria include the total amounts of fat and proteins as well as the content of fat and proteins in the milk. Positive genetic correlations between the lactation and the total amounts of fat and proteins have been observed at goat population, while negative correlations were observed between the total lactation and the percentage of fat and proteins.

Noting the directions where the dairy goat-breeding ranges worldwide, CBPGB projects two possible directions of improving the genetic potential of the goats in the Republic of Macedonia. If farmers decide to start producing fresh goat milk which would be sold to processing facilities with the ultimate objective— selling consumption milk, the breeding programs should aim at increasing the lactation, keeping the percentage of fat and proteins on the required level (defined by pur-

chasing center). On the other hand, if farmers are oriented towards cheese production, attention should be paid to the concentration of fat and proteins (%) without reducing the total amount of fat and proteins in milk. The cheese, although much of it is produced traditionally, represents the main source of income and the economic viability of the goat production depends directly on it.

Breeding scheme and goat genotypes.

Although global trends and experiences point increased interest in purebred breeding, often it could be seen Cross-breeding as well as combination of both methods of breeding certain breeds (purebred breeding and Cross-breeding).

Presenting a broad framework in defining the breeding systems, CBPGB provides pure racial breeding of domestic goat population, if certain associations of breeders of goats show interest. CBPGB gives opportunity for purebred breeding of breeds with exceptional milk production (Alpine and Saanen). In fact, the interest in breeding of breeds with exceptional milk production and preparation of special breeding programs for these breeds is quite significant. The appropriate breeding programs would maintain and improve the breeds with exceptional milk production which should serve as meliorators of domestic goat population. Given that fact that the lactation of domestic goat population is quite low, CBPGB aims towards crossbreeding of domestic population of goats with breeds of goats with exceptional milk production. The Cross-breeding would fasten the process of creating a dairy goat population.

Predicting the breeds Alpine and Saanen as dairy breeds for purebred breeding or crossbreeding with domestic population is due to the positive experience with them in the past 20 years and more.

Starting from the recommended breeding goals and the traits that should be subject to selection and principles of breeding, CBPGB recommends the following framework:

Breed	Production direction	Trait	Principles of breeding
Domestic goat population	Milk	Total lactation, total quantity of proteins and fat	Purebred breeding Refinement with dairy breeds
Dairy goat breeds	Milk	Total lactation, total quantity of proteins and fat	Purebred breeding

Observing the contemporary trends in goat breeding, CBPGB provides implementation of modern DNA methods on different levels of implementation of special breeding programs.

Farm registry and databases. The system of farm registry is almost identical to the breeding program for sheep.

Dissemination of genetic progress. In structuring the special breeding programs, among other basic elements necessary for the program itself, the following two aspects are relevant:

- how to make a determination of genetically superior animal (the aspect of genetic improvement)
- dissemination of the genes of superior animals in the population of production heads (the aspect of dissemination of genetic progress).

The reproductive use of the selected animals should provide appropriate dissemination of genetic progress on the goat population in the Republic of Macedonia which would be conditioned by the degree of interest shown by farmers to be an integral part, to participate actively in special breeding programs.

One measure that provides a greater extent of dissemination of genetic progress is the application of A/I at goats. The massive application of A/I despite the spread of genetic progress would provide: a system of assessment between the flocks, increased intensity of the potential usage of superior individuals, optimization of the selection priorities and migration of wanted genes (carriers of alleles for certain production traits) and distribution of genes (genotypes), characterized by increased immunity.

Import of genetic material, manner of usage and comparative testing. According to CBPGB, the import of genetic material is necessary for economic, organizational and selective reasons connected to the improvement of local goat population as well as for forming the nucleus flocks of breeds with exceptional milk production.

Pursuant to the Law on animal husbandry, from zootechnical reasons it should not be banned and restricted the import or ex-

port of breeding material. Market liberalization means opening the market that allows liberal attitude towards import and manipulation of live heads, their embryos and semen. But the import of breeding animals, semen and embryos, under the Law on livestock should be under strict control and special precaution measures (monitoring of imported breeding heads and monitoring of certain traits at their offspring).

Expected effects from improvement of the characteristics of goats. The expected effects from the improvement of goats can be expected from the implementation of special breeding programs. Firstly, it is expected improvement of the lactation per head and thus the total lactation, i.e. improving the milk quality.

Stakeholders and implementing CBPGB. The implementation of CBPGB pursuant to Law on Animal husbandry is a responsibility of the state where it is expected direct realisers of certain special breeding programs within CBPGB to implement all biotechnological, biological methods and measures that are projected in specific breeding programs.

The implementation of activities for genetic improvement, basically means the state to establish active participation in the monitoring of direct realization of the breeding program as a whole, particularly important in supporting the breeding programs for endangered indigenous genotypes and the like.

Organizing the implementation of CBPGB. The law envisages the coordination of the state with the abovementioned factors in the implementation of CBPGB to be realized through the Council for Animal husbandry within the MAFWE through confirmation of the breeding programs. The time frame when CBPGB will be prepared as part of CBPAB gives space for adoption and implementation of proposed breeding programs and should also predicts i.e. accept the transfer of legitimacy of the adopted breeding programs out of these time limits, of course if the expert supervisors of breeding program envisaged by the Law on livestock, note that it is ongoing and is realized successfully. The professional supervision will pay attention to the level of

confidentiality of certain information within the realization of the breeding program.

Like in the sheep farms, breeding program would also be developed here for Saanen breed (for the Alpine breed it is already made, on the national level), so this farm could be registered in the registry of the Ministry of Agriculture, Forestry and Water Economy as a recognized organization of breeders for breeds Alpine and Saanen. After

completion of the breeding programs, the obligation of the farms would be only to submit a formal request and a statement to MAFWE that the recommendations of the breeding programs for the abovementioned breeds would be respected. Thus, the procedure for registration of these farms in the registry of recognized organizations of breeders at the MAFWE is completed.

1.7.3. LAW ON PROTECTION AND WELFARE OF THE ANIMALS

The Law prescribes minimum requirements for the protection and welfare of certain animals, including sheep and goats regarding its breeding, keeping, care and housing, protection of animals while farm holding, protecting and welfare of the animals during transport, slaughter or killing.

By this Law, the animal owners and /or keepers shall:

1. Take appropriate measures to ensure the welfare of animals under their care and they should not cause any pain, suffering or injury to them;

2. Provide conditions under which animals are bred or kept under the provisions of this Law and determined experience and scientific knowledge;

3. As owners or people who care for animals they should be properly, theoretically and practically prepared and have knowledge of:

- To identify whether the animals are in good health condition or not,

- Identify significant changes in the behavior,

- Assess whether the environment is adequate for the health and welfare of the animals.

4. Provide adequate veterinary medical care for animals.

This Law must be taken into consideration when working on newlyformed repro-centers for sheep and goats in EPR.

1.7.4. LAW ON THE QUALITY OF AGRICULTURAL PRODUCTS

This Law regulates the markets of agricultural products, quality standards, classification, labeling of the quality and information system for cereals and rice, animal food, fresh fruits and vegetables, eggs and poultry, beef, pork, sheep and goat meat, milk and dairy products, bee products, protection of agricultural and food products with a geographical name and label of guaranteed traditional specialty, control and supervision over the implementation of the provisions of this Law.

What is important at this Law that is connected to this Study is the part that refers to the categorization of sheep and goat carcasses, and classification of these carcasses.

Under Article 104 of the Law on Quality of Agricultural Products (Official Gazette of RM

no. 140/10), sheep and goats for slaughter by 3ge are divided into two categories:

- Lambs /kids (sheep / goats) to 12 months

- Sheep /goats over 12 months

According to the same article, the category lambs is divided into two subcategories:

- Light lambs – dairy lambs or fat lambs of both sexes not older than five months, and

- Heavy lambs (fat lambs) at the age of 5–12 months.

According to Article 105 of the same Law, carcasses classified according conformation, degree of coverage of the body with fat and body weight (at light lambs) are put on the market.

According to the conformation, sheep carcasses are classified in six classes: S, E, U, R, O and P (SEUROP system).

In terms of coverage with fat tunica, sheep carcasses are classified into five classes: 1, 2, 3, 4 and 5.

Regarding the weight (at light lambs), the carcasses is classified into:

- Class I – carcasses of light lambs (dairy lambs), refers primarily to processed carcass to 13 kg (after bleeding, removal of internal organs – evisceration and skin removal). Carcasses of light lambs, according to the weight are further divided into three classes A, B and C.

- Class II – carcasses of fatten lambs. It involves primarily processed carcass over 13 kg (after bleeding, evisceration and skin removal) and

- Class III – sheep carcasses. It involves primarily processed carcass in the same way as in the second subcategory lambs (fatten lambs) without head.

Generally this Law may not directly affect the operation of repro-centers, but is especially important for those farms (reproductive and commercial) which will use reproductive material (rams and bucks) from the same and

will produce lambs and kids for the meat market.

The second part of this Law that is also important for this Study is the part that refers to the arrangement of the milk market. The recommendations of this Law about the quality of raw milk and consuming milk are important for the operation of these repro-centers, given that the two will produce milk (sheep and goats).

According to Article 125 of this Law, the requirements for quality raw milk are envisaged in a separate regulation (Rulebook on requirements for the quality of raw milk, quality standards of consuming milk, dairy products and the use of their names, the quality of the activity of starter cultures, the rennets and other specific materials and manner of their use, the manner of additional milk and dairy products labeling as well as the permitted deviation of weight in relation to the declared, Official Gazette of RM, no. 96/11). This Rulebook is specific in terms of raw milk quality (chemical and microbiological composition), so in terms of that it is very important and must be taken into account in the operations of both repro-centers, in order to produce milk according to the required standards.

1.7.5. LAW ON ORGANIC AGRICULTURAL PRODUCTION

This Law regulates the manufacture, processing, finishing, storage, transportation, distribution, advertising, sale, labeling and control of organic products where the methods of organic production have been applied. During its operation, the repro-centers can work according to the recommendations of the Law, of course if they accept the rules and procedures for organic animal husbandry production. The rules and procedures for breeding and housing conditions, the rules for reproducing, rules for animal husbandry feeding, the rules for veterinary treatment, the rules for transport, etc., are elaborated in details.

Bearing in mind that it is about farms–repro-centers that will have a quality and high quality animals, it is almost impossible here to be applied to these recommendations and rules, but we think this is a good opportunity to be an alternative in some future time. At first, repro-centers will certainly conventionally, how could thin order to achieve maximal productive results, in other words, to ensure maximal utilization of the genetic capacity of animals. Anyway, the Law is very important for numerous commercial sheep and goat farms in EPR, which can start a procedure for conversion into organic products for which exists a great interest abroad.

1.7.6. LIVESTOCK BIODIVERSITY PROTECTION PROGRAMME

By signing the Convention for the Protection of Biological Diversity (CBD – Convention

biodiversity), in 1997 and 1998 the Republic of Macedonia as a country is obliged to identify,

monitor and maintain biological diversity within its boundaries, while data obtained from the monitoring to share with other states and nations. This is because the protection and preservation of biological diversity in agriculture, and thus in animal husbandry is the responsibility of each State that is considered a responsible member of the international community. In addition to this are also the recommendations of FAO, as the carrier and coordinator of the global operations for the protection of animal genetic resources. Officially, this issue in the Republic of Macedonia is covered and treated in the strategy and action plan for protection of biological diversity of the Republic of Macedonia since 2004, The Law on Animal husbandry (Official Gazette of RM no. 7/08, Article 52, 53, 54 and 55), the Program for protection of biological diversity in animal husbandry (2011–2017), and several legal acts (Rulebooks):

- Rulebook on protection (conservation), conservation of biological diversity of animal genetic resources at domestic animals;
- Rulebook on the manner of execution and monitoring of biological diversity in the animal husbandry;
- Rulebook on the manner of breeding and trade of indigenous breeds and /or lines, form and content of the request for recognition of new indigenous breeds and /or lines and form, content and manner of keeping the registry;
- Rulebook on the extent of genetic reserves, and the method and procedure for provision and maintenance of reserves;
- Rulebook on detailed conditions for performing certain public service protection of the biological diversity of animal husbandry, the manner of performance and monitoring of biological diversity in breeding and conservation of genetic variability and genetic reserves of animal husbandry.

The general goal of the Programme for protection of biological diversity in animal husbandry is to determine the national guidelines (priorities) in this area, in accordance with the internationally accepted four priority areas established in the framework of the Global Plan of Action adopted at the first International Technical Conference on Animal Genetic Resources held in 2007 in Interlaken, Switzerland, and the Law on Animal hus-

bandry of the Republic of Macedonia (Official Gazette of RM no. 7/08).

Considering the abovementioned system solutions (laws, strategies, programs), the priorities related to the protection and utilization of genetic resources of animal husbandry are:

- Establishing a system for characterization and inventory of all types and all breeds /lines/strains of domestic animals individually;
- Establishment of a monitoring system for all types and all breeds/lines/strains of domestic animals individually;
- Establishing a system of sustainable use and development of genetic resources of animal husbandry;
- Establishing a system of conservation, gene banks, in situ and ex situ conservation;
- Establishing a system of support measures for the protection of genetic resources of animal husbandry in ex situ or in vivo forms of conservation within national parks, agricultural industries, educational or research centers;
- Institutional strengthening, research and monitoring, education, legislation and
- Raising public awareness of all the areas listed.

Because of the fact that the Article 18 of Law on Animal husbandry prescribes for each specie or breed of animal husbandry to be prepared a special breeding program for applicative purposes, the goals for the protection on the level of each particular specie /breed /line /strain, especially for each indigenous specie /breed /line /strain must be part of the objectives of accepted and approved a special breeding program that every breeder, or a recognized organization of breeders had prepared for indigenous or other specie /breed /line /sort that is bred.

In sheep and goat breeding, indigenous breeds or types of sheep and goats that are envisaged in the Law on Animal husbandry and thus in the Programme for protection of biological diversity in animal husbandry are: Ovcepolian sheep, Sharmountain sheep and the Karakachanian sheep in the field of sheep–breeding, and the domestic Balkan goat in goat breeding.

Although in this Study, as proposed breeds for the formation of repro-centers are mentioned highly productive breeds (Merinolandschaf in sheep–breeding) and (Alpine

and Saanen in goat breeding), which will be offered to sheep and goat breeders (from the EPR and the entire state) as meliorators of their flocks, it is necessary to mention the importance of indigenous breeds of sheep and goats, in terms of protecting them from extinction. Currently, in the state of high risk of extinction is only Karakachanian sheep, while the rest are in stable condition.

Although the breeding of highly productive breeds is always an advantage in terms of the indigenous more primitive and low produc-

tive breeds, we should mention the fact that the next year or no later than 2013 would be launched additional financial support /head for those owners who raise some of indigenous breeds and types of sheep and goats. Additional financial support will be projected in the Programme for Rural Development (100% of the national budget of RM) and in Agroecological programme that uses funds from IPA funds (75% of the EU budget, 25% of national budget).

1.7.7. SUPPORT MEASURES FOR SHEEP AND GOAT BREEDING IN THE PERIOD OF 1995–2011

The subsidizing as a financial support in the agriculture is a measure which was first applied in the European Union countries. It is used to neutralize the risks that are constantly present in this industry. According to this tendency in EU countries, after the independence of the Republic of Macedonia subsidies in ag-

riculture, and thus in animal husbandry production continually increased.

The following tables (Table 27 and Table 28), show the measures that financially support the sheep and goat breeding in the period 1995–2011, by the programs for financial support in agriculture (Chart 11).

Table 27

Stimulating measures in the sheep–breeding projected in the Programs for financial support in the agriculture (period 1995–2011)

Ordinal number	Name of the measure	Amount of the support (den.)	Total projected finances (den.)
Financial support in 1995			
1.	Subsidize for purchasing breeding rams, trested on spermatogenesis from the breed Merinolandschaf (original) intended for A/I	3.000,00	1.300.000,00
2.	Participation for tattooing in sheep and goat breeding in individual sector	/	6.000.000,00
	Total		7.300.000,00
Financial support in 1996			
1.	Subsidize for purchasing breeding rams, trested on spermatogenesis from the breed Merinolandschaf (original) intended for A/I	4.000,00	600.000,00
2.	Subsidize for lambs made by A/I from sheep inseminated by rams from the breed Merinolandschaf (50.000 lambs)	50,00	2.500.000,00
.	Subsidize for procurement of 10 breeding rams from the breed Merinolandschaf (to import)	150.000,00	2.500.000,00
	Total		5.600.000,00

Financial support in 1997

1.

Total

Financial support in 1998

1.	Financial support for bred, labeled, and sold male breeding heads from the breed Merinolandschaf – originals	(30% of the market value)	1.000.000,00
2.	Financial support for bred female breeding heads for extended reproduction from the breed Merinolandschaf crossbreeds	(30% of the market value)	17.000.000,00
3.	Financial support for bred, labeled and male breeding heads from the breed Merinolandschaf (reproducers) for sale	(70% of the market value)	4.000.000,00
Total			22.000.000,00

Financial support in 1999

1.	Financial support for bred or purchased female breeding heads (weaned lambs) for replacement (labeled and recorded)	650 den./head	39.000.000,00
.	Financial support for releasing from the surplus agricultural products – lamb for export on the Near East markets		30.000.000,00
3.	Financial support for bred or sold male breeding heads from the breed Merinolandschaf – originals (labeled and recorded)	4.000,00/head	400.000,00
.	Financial support for bred and sold, labeled male breeding heads (crossbreeds) from the breeds Merinolandschaf and Awassi	(70% of the market value)	1.000.000,00
.	Demonstrative tests for using appropriate identification and control of the production traits at fine sheep breeds Merinolandschaf and Awassi	100% of the Project's value	500.000,00
6.	Demonstrative tests for starting early weaning of the lambs	100% of the Project's value	100.000,00
Total			71.000.000,00

Financial support in 2000

1.	Financial support for releasing from the surplus agricultural products – lamb for export	35,00 den/kg meat	25.000.000,00
2.	Financial support for bred female breeding heads (weaned lambs) for enlarging the number of sheep in the flocks	650 den./head	24.500.000,00
3.	Financial support for purchased male breeding heads from the breed Merinolandschaf – originals (labeled)	50% of the market value	400.000,00
4.	Financial support for purchased male breeding heads (crossbreeds) from the breeds Merinolandschaf and Awassi	(70% of the market value)	1.500.000,00
5.	Financial support for forming nucleus of dairy sheep breeds		3.000.000,00
6.	Financial support for transport of the sheep from winter to summer pastures		500.000,00
Total			54.900.000,00

Financial support in 2001			
1.	Financial support for releasing from the surplus agricultural products – lamb for export	35,00 den/kg meat	39.000.000,00
2.	Financial support for purchased male breeding heads from the breed Merinolandschaf –originals (labeled)	(70% of the market value)	1.000.000,00
	Financial support for nucleus of dairy sheep breeds		1.000.000,00
Total			41.000.000,00
Financial support in 2002			
1.	Financial support for releasing from the surplus agricultural products – lamb for export	35,00 den/kg meat	27.500.000,00
2.	Financial support for transport of the sheep		3.000.000,00
3.	Financial support for nucleus of dairy sheep breeds		500.000,00
Total			31.000.000,00
Financial support in 2003			
1.	Financial support for purchased male breeding heads from the breeds Merinolandschaf and Awassi–reproducers	(50% of the market value)	700.000,00
2.	Financial support for nucleus of dairy sheep breeds		500.000,00
3.	Financial support for produced female lambs for maintaining and enlargening of the flock	1.000,00 den./head	30.900.000,00
Total			32.100.000,00
Financial support in 2004			
1.	Financial support for purchased male breeding heads–reproducers		1.500.000,00
2.	Financial support for maintaining and enlargening of the basic sheep flock		100.000.000,00
3.	Financial support for establishing farms of the breed Merinolandschaf		1.000.000,00
Total			102.500.000,00
Financial support in 2005			
1.	Financial support for maintaining and enlargening of the basic sheep flock		110.000.000,00
2.	Financial support for bred and sold male breeding heads from the breed Awassi (originals)		300.000,00
3.	Financial support for establishing farms of the breed Merinolandschaf		1.000.000,00
4.	Financial support for bred and sold male breeding heads from the breeds Wurtemberg and Awassi (reproducers)		2.100.000,00
Total			113.400.000,00
Financial support in 2006			
1.	Financial support for maintaining and enlargening of the basic sheep flock		50.000.000,00
Total			50.000.000,00
Financial support in 2007			

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1.	Financial support for maintaining and enlargening of the basic sheep flock in farms with minimum 50 heads		266.200.000,00
2.	Financial support for purchasing male breeding heads from the breed Awassi (originals)		450.000,00
3.	Financial support for purchasing male breeding heads from the breed Merinolandschaf (reproducers)		800.000,00
Total			267.450.000,00
Financial support in 2008			
1.	Financial support for labeled female lamb for maintaining and enlargening of the basic sheep flock (minimum 50 heads)		220.000.000,00
2.	Financial support for produced sheep milk and sold to the registered companies for milk processing	2 den./litre	40.000.000,00
3.	Financial support for purchasing male breeding heads—originals and reproducers	50% of the purchasing value (15.000 den. per originals and 5.000 den. per reproducers)	1.500.000,00
Total			261.500.000,00
Financial support in 2009			
1.	Financial support for labeled sheep heads	850 den./head, minimum 30 heads from all categories	467.500.000,00
2.	Financial support for purchasing male breeding heads—originals and reproducers	50% of the purchasing value (15.000 den. per originals and 5.000 den. per reproducers)	4.000.000,00
Total			471.500.000,00
Financial support in 2010			
1.	Financial support for labeled sheep heads from all categories	900 den./head, minimum 30 heads from all categories	/
2.	Financial support for purchasing male breeding heads—originals and reproducers	50% of the purchasing value (15.000 den. per originals and 5.000 den. per reproducers)	/
Financial support in 2011			
1.	Direct payments for labeled sheep heads from all categories	950 den./head, Minimum 30 heads from all categories	/
2.	Direct payments for sheep milk produced and sold	3,5 den./litre	/
3.	Direct payments for procuring male breeding heads—originals and reproducers	Maximal amount of 15.000 den/head per originals and 5.000 den./head per reproducers	/

Т а б е л а 28.

*Stimulating measures in the goat-breeding projected in the Program for financial support
in the agriculture (period 1995–2011)*

Ordinal number	Name of the measure	Amount of the support (den.)	Total projected finances (den.)
Financial support in 1995			
1.	Supsidize for purchasing breeding heads for establishing repro-center	50% of the purchasing value	1.000.000,00
		Total	1.000.000,00
Financial support in 1996			
1.	Supsidize for purchasing breeding heads for establishing repro-center (imported)	50% of the purchasing value	3.000.000,00
		Total	3.000.000,00
Financial support in 1997			
1.		Total	
Financial support in 1998			
1.	Financial support for purchasing breeding heads from the breeds Alpine and Saanen (imported) for establishing repro-center	50% of the purchasing value	1.500.000,00
		Total	1.500.000,00
Financial support in 1999			
1.	Demonstrative tests for monitoring the procces of adjustment and control of the production traits of the imported heads from the breed Alpine	100% of the Project's value	300.000,00
		Total	300.000,00
Financial support in 2000			
1.	Financial support for bred and sold male breeding heads (labeled) from the breed Alpine	8.000,00/head	600.000,00
2.	Financial support for monitoring the procces of adjustment and control of the production traits of the nucleus from the breed Alpine		300.000,00
		Total	900.000,00
Financial support in 2001			
1.	Financial support for monitoring the procces of adjustment and control of the production traits of the nucleus from the breed Alpine		200.000,00
2.	Financial support for bred and sold male breeding heads (labeled) from the breed Alpine	8.000,00/head	400.000,00
		Total	6.00.000,00
Financial support in 2002			
3	/	/	0,00
Financial support in 2003			
1.	/	/	0,00
Financial support in 2004			
1.	Financial support for goat flocks–crossbreeds from the breed Alpine (labeled)	/	3.000.000,00

		Total	3.000.000,00
Financial support in 2005			
1.	Financial support for goat flocks—crossbreeds from the breed Alpine with control of the production traits at farms with minimum 50 heads	/	1.500.000,00
2.	Financial support for maintaining and enlargening of the basic goat flock	/	8.000.000,00
		Total	9.500.000,00
Financial support in 2006			
1.	/	/	0,00
Financial support in 2007			
1.	Financial support for maintaining and enlargening of the basic goat flock in farms with minimum 30 heads	/	23.155.000,00
2.	Financial support for purchasing breeding heads from the breed Alpine	/	400.000,00
		Total	23.555.000,00
Financial support in 2008			
1.	Financial support for the basic goat flock	Minimum 30 goat heads from all categories in flock	20.000.000,00
2.	Financial support for produced goat milk and sold to the registered companies for milk processing	2 den./litre	2.000.000,00
3.	Financial support for purchasing breeding goat heads	50% of the purchasing value (no more than 4.500,00 den./head)	400.000,00
		Total	22.400.000,00
Financial support in 2009			
1.	Financial support for labeled goat heads	750 den./head, minimum 10 heads from all categories	57.750.000,00
2.	Financial support for purchasing breeding goat heads	50% of the purchasing value (no more than 4.500,00 den./head)	900.000,00
		Total	58.650.000,00
Financial support in 2010			
1.	Financial support for labeled goat heads	800 den./head, minimum 10 heads from all categories	/
2.	Financial support for purchasing male breeding goat heads	50% of the purchasing value (no more than 4.500,00 den./head)	/
Financial support in 2011			
1.	Direct payments for labeled goat heads	850 den./head, minimum 10 heads from all categories	/
2.	Direct payments for goat milk produced and sold	3,5 den./litre	/
3.	Direct payments for procuring male breeding heads	Maximal amount to 4.500 den/head	/

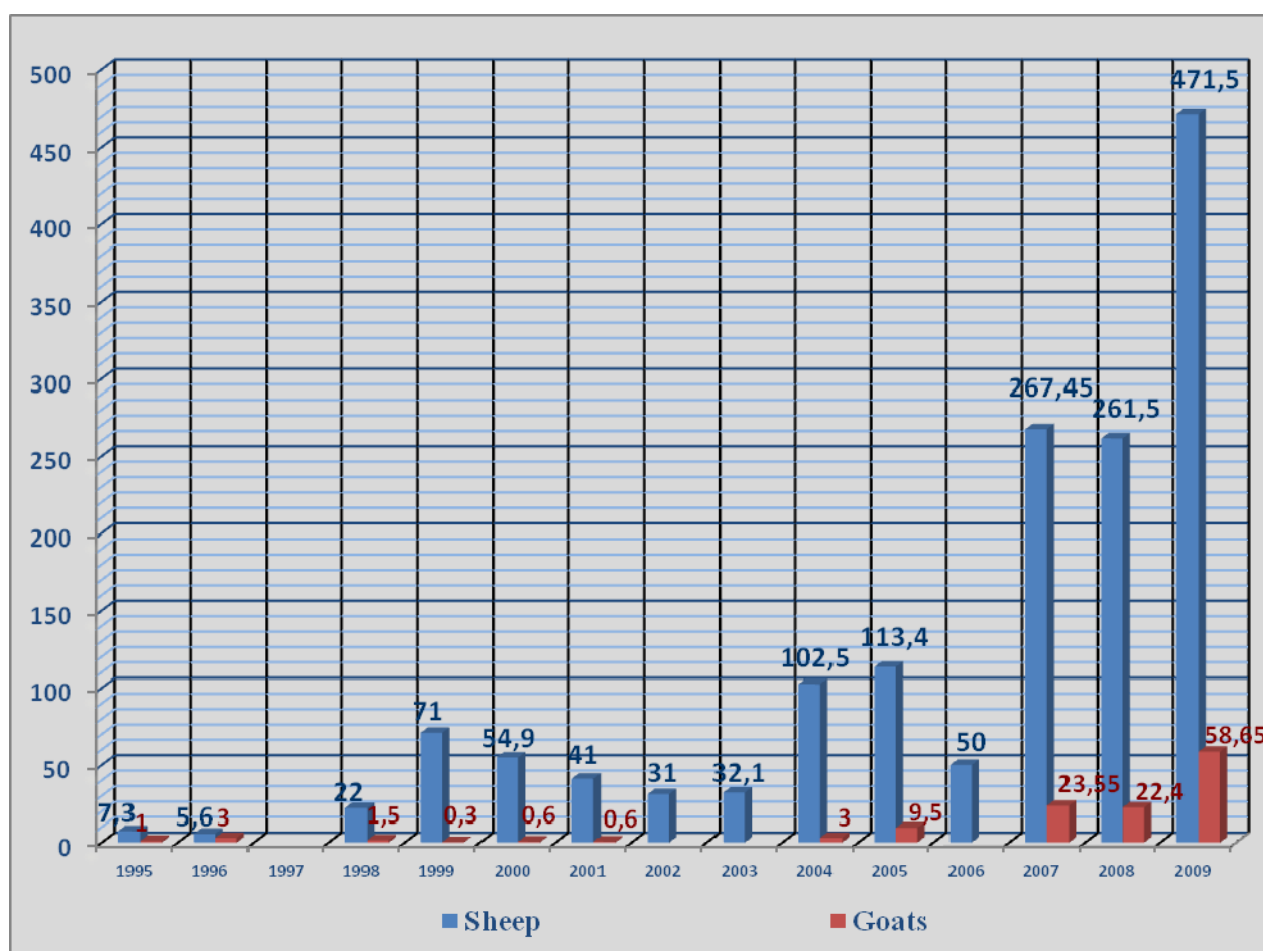


Chart 11. Financial resources from the Programs for encouraging agriculture in RM (1995–2011)

Besides the support that the sheep and goat breeding obtain through the Programs for financial support in agriculture, some financial support this sector gets from the Rural development programs. These branches get the

support from this Programme mostly through purchase of additional equipment and upgrading the existing infrastructure of the farm (annexe, using the renewable energy sources, etc..)

1.7.8. IPARD PROGRAMME 2007–2013

IPARD or Instrument for Pre-Accession Assistance of the European Union aimed for rural development is part of the IPA (Instrument for Pre-Accession Assistance of the European Union) and presents its fifth component. On the other hand, IPA is an assistance to candidate countries for EU membership, such as Republic of Macedonia, in order to support the process of meeting the accession criteria in terms of establishing a functional market economy, customization and implementation of European legislation and the ability to carry out the responsibilities arising from EU membership.

The aim of IPARD is to provide financial assistance for sustainable agriculture and rural development, in terms of preparation of the Common Agricultural Policy (CAP) of EU and the instruments for its implementation. Specifically, implementation and observance of the rules for financing by the European Fund for Agriculture and Rural Development (EARDF) and adjustment of the agricultural sector to the rules and standards of the Joint EU market.

IPARD funds are used after developing and adopting IPARD program for the development of agriculture and rural development

for the programming period 2007–2013. IPARD program contains an overview of the main priority areas for intervention and appropriate measures for funding.

Within the IPARD program there are certain objectives that derive from the principles of IPA. The main priorities of the Programme are:

1. Improving the market efficiency and implementation of EU standards and
2. Development of rural economy.

Specific objective of the first priority is: Improving the technological and market infrastructure of the commercial agricultural industries and food industry that are headed towards higher added value of agricultural and food products, and compliance with EU standards for quality, public health, food security and environmental protection.

Specific purpose of second priority: Improving the quality of life of the rural population, increasing the income and creating new employment opportunities.

Within the first and second specific goal, there are appropriate measures. Two additional measures included within the first specific objective are:

- Investments in agricultural industries for restructuring and upgrading to EU standards and
- Investments in processing and marketing of agricultural products for restructuring and upgrading to EU standards.

The second specific goal includes an appropriate measure: Diversification and development of the economic activities in rural areas.

What might be of interest to the investor of repro-centers, even for some farmers from EPR is measure 101 – Investments in agricultural industries in order to their restructuring and upgrading to EU standards.

The only acceptable measure from it is measure 1014 – Breeding of animals for milk production.

This measure includes two types of investments, such as:

Type of investment 10141: CONSTRUCTION/RENEWAL OF FACILITIES FOR BREEDING MILKING COWS, SHEEP AND GOATS and type of investment 10142: PURCHASE OF EQUIPMENT FOR MILKING, COOLING AND STORING MILK

As acceptable projects of the measure 10141 are listed:

- Renewal of existing facilities for breeding milking animal husbandry (stables), to achieve the standards for animal welfare and sanitary and veterinary standards in accordance with EU standards,
- Renewal of existing buildings for storage and preparation of stock feed and equipment for food preparation,
- Construction of buildings /depots /reservoirs for manure storage and equipment for handling and transport of the fertilizer.

Unacceptable investment activities of this measure are:

- Construction of new facilities for breeding milking animal husbandry
- Expansion of existing facilities for breeding milking animal husbandry in order to increase the flock.

The program specifies acceptable and unacceptable specific costs of this measure.

As acceptable specific costs are mentioned the following:

- procurement of construction materials and construction elements to renovate the existing stables and facilities for breeding milking animals (cows, sheep and goats), including equipment for renovating or providing other enclosed spaces as separate joined rooms for resting / milking / shearing (sheep) / insemination / delivery room etc.
- procurement of equipment for ventilation, maintaining optimal microclimate, water-supply, sewerage network, electrical installations,
- procurement of equipment for feeding system,
- procurement of equipment for watering system,
- procurement of equipment for milking and milking systems,
- procurement of automatic or mobile milking aggregates,
- procurement of equipment for handling and storage of manure
- procurement of elevators for grains and silage,
- procurement of equipment for production of stock feed,
- procurement of equipment for milking and milking systems,

- procurement of items for fencing, including equipment for electric fence with low voltage,

- obligations performed by third persons: construction work and installation of construction elements and materials for construction, installation of ventilation equipment, maintaining optimal microclimate, water-supply etc.

Unacceptable specific costs are the following:

- procurement of animals,
- procurement of agricultural machinery,
- supply of cargo machinery, except for manure.

At the type of investment 10142: PROCUREMENT OF EQUIPMENT FOR MILKING, COOLING AND STORING MILK

Acceptable investment activities are the following:

- Modernizing the system of milking, cooling and storing milk in order to equalize production of raw milk on agriculture with the EU standards for production of raw milk. This project must also anticipate investment activities in the construction of facilities for storing manure and equipment for handling and transport of the fertilizer, according to the standards.

Specific acceptable costs are:

- procurement of equipment for milking and milking systems,

- procurement of automatic or moving milking aggregates,

- procurement of lact-freezers for storage,

- procurement of equipment for cooling the milk,

- procurement of equipment for measuring the quantity of milked milk and equipment for measuring the quality,

- procurement of equipment for cleaning (vapor or water compressors, sterilizers, etc.)

- procurement of equipment for handling and storage of manure, including machinery for cleaning and handling of manure, computer equipment and computer software for the milking equipment.

Unacceptable specific costs for this type of investment (10142) is the procurement of animals.

The possibilities of the IPARD program in this Study could be used, if the existing facilities are reconstructed as well as in providing equipment for farms.

1.8. REPRO-CENTERS IN SHEEP AND GOAT BREEDING IN THE REPUBLIC OF MACEDONIA (PREVIOUS AND CURRENT)

In the Republic of Macedonia operate several repro-centers in the field of sheep and goat breeding. Some of the below mentioned no longer exist.

In **Sheep-breeding** as more important we could mention the following:

1. **Reprocenter for the breed Merinolandschaf – s. Gneotino Bitola.** Established in 1976 within ZIK "Pelagonija" from Bitola, for promoting and forcing the production direction meat-wool. The location of the farm is in the village Gneotino, Bitola. Initially, the first flock of this breed was imported from Germany in 1976. After that, a few times male heads (rams) were imported subsequently from Germany in order to refresh the flock with new purebred heads. For many years this farm produced male heads of breed Merinolandschaf with outstanding quality, which

were distributed throughout the farms not only in Macedonia but also the territory of whole former Yugoslavia, refinement of domestic sheep populations in order to improve certain product properties (especially the growth and quality of lamb). Over the time, the quality of the flock gradually declined due to some organizational flaws at the farm, irregular managing the registry of the farm, which is intolerable for a repro-center of its kind, keeping the sheep with the rest of the flock (domestic population and Cross-breeds), which regularly resulted with uncontrolled mating. Now this farm works as a commercial farm, as it is not registered as a recognized organization of breeders under the new Law on Animal husbandry (Official Gazette of RM no. 7/08), and because of the irregular managing the registry of the farm could not be issued pedigree

about the origin of any male or female head. Today, we can not accurately tell the racial purity of the sheep on this farm, or to verify what is the percentage of blood from Merinolandschaf for reasons we mentioned above. The latest import of Merinolandschaf originals from Germany, for the purposes of this repro-center was made in 1985.

2. Repro-center of Merinolandschaf reproducers – Bogdanci. Established in 1990 within the ZTD "Stocharstvo" from Bogdanci, also for promoting and forcing the production direction meat–wool. The repro-center was formed in order to meet the growing demands by sheep breeders in the Republic of Macedonia for male heads that are from Merinolandschaf breed, and because of the good results are received in the offspring at this Cross-breeding. This farm over the years worked as repro-center which produced male heads crossbreds of the F1 generation from domestic merinized sheep population with purebred rams of breed Merinolandschaf. The rams for this purpose, were purchased from the repro-center in Gneotino, Bitola. The quality of the rams produced in this repro-center was often average and below average, also because of the irregular managing of the registry, inadequate nutrition etc. On this farm, it

was almost impossible to be issued a complete pedigree for any male head produced on the farm. Currently, the farm is working as a commercial farm and it is not registered as a recognized organization of breeders under the Law on Animal husbandry (Official Gazette of RM no. 7/08).

3. Reprocenter for the breed Awassi – vil. Gradiste Kumanovo. Officially registered in 2001 within the TD "Karlo" from Kumanovo. The farm is located in the village Gradiste, Kumanovo. Basic sheep flock on this farm is purchased from a flock in the village Germijan, Bitola, which is actually the only remaining flock from the flock originally imported in 1969 (500 heads) and 1970 (1.500 heads) from Israel. The farm has since produced a number of male heads of this breed, which are distributed to various farms throughout the country and who spread the genotype of this dairy breed. According to the data until 2009, the farm sold 680 male heads, of which 150 are subsidized. No accurate data on how many female heads lived, and thus how many crossbreds were produced. Currently, under the existing Law on Animal husbandry (Official Gazette of RM no. 7/08), the farm is not registered as a recognized organization of breeders (Figure 3).



Figure 3. Repro-center for Awassi sheep breed– s. Gradiste, Kumanovo
(Ph.D.. Nikola Pacinovski, 2008)

In the field of goat breeding, in the Republic of Macedonia also existed several repro-centers, of which the more important as the following:

1. Repro-center for dairy goat breeds (Alpine and Saanen) –vil. Lakavica, Stip. Established in 1989 within the AD "Lakavica" from Stip in order to improve the production

traits of the domestic goat population. Initially, the primary flock of 40 heads, of which 36 female (18 Alpine, 18 Saanen) and 4 male heads (2 Alpine, 2 Saanen), is imported from the repro-center for goats in Gnjilane, Kosovo, and it could be noted that the experiences with the same were outstanding. The repro-center did not succeed due to organizational problems caused by transitional changes in the society after the independence of the state.

2. *Repro-center for goats of Alpine breed – Bogdanci.* Established in 1999 within the ZTD “Stocharstvo” from Bogdanci. The basic flock of around 100 goats for this farm was purchased from their native country France. By passing the Law on Animal husbandry in 2008, the farm operated as repro-center, according to the old Law on Animal husbandry (Official Gazette of RM no. 61/1997). Until 2005 the repro-center was supported by the Program for financial support in the agriculture, with subsidize of 50% from the price of the male breeding heads sold (bucks and male kids). The farm is not yet officially registered as a recognized organization of breeders under the current Law on Animal husbandry (Official Gazette of RM no. 7/08).

The average number of breeding male heads sold annually from this farm is around 40. Currently on the farm there is no regular registry management and plan selection.

3. *Repro-center for goats of Alpine breed – vil. Kozhle, Skopje.* Established in 1997 within the goat farm “Kozhle” from vil. Kozhle, Skopje. The basic flock of 80 goat heads for this farm was purchased from a farm in Sjenica, Southern Serbia, which works as repro-center in this country. The farm starting from 1998, cooperates with the Institute of Animal Science from Skopje. For two years it was supported by direct funding, and the remaining years with 50% subsidize of the cost of breeding male heads sold (bucks and male kids). The farm is officially registered as a recognized organization of breeders pursuant to Law on Animal husbandry (Official Gazette of RM no. 7/08) (Figure 4).

The average number of male heads sold annually for breeding is around 70–80. From 2007–2010 the farm was in oriented to organic production, and from 2011 it works as an organic goat farm whose dairy products (white soft cheese, yellow cheese - cashkawaal, etc.) are sold in major markets in Skopje.



Figure 4. Repro-center for Alpine goats – v. Kozhle, Skopje.
(Ph.D. Nikola Pacinovski, 2008)

1.9. REVIEW OF EXPERIENCES WITH REPRO-FARMS IN THE NEIGHBOURING COUNTRIES AND THE EUROPEAN UNION

Since we belong to the Mediterranean region, sheep and goat breeding in these areas (neighboring countries and the broader region) have always had a priority compared to other animal husbandry sectors (animal-breeding, pig breeding, poultry, etc.). Therefore, the attention of the expert community from these countries have always been directed towards improving the same, both in terms of quantity and productivity.

Republic of Greece: Starting from the Republic of Greece as the oldest member of the European Union from the neighbouring countries, it has initiated reforms in these animal husbandry industries from the very beginning, particularly in relation to genetic improvement, and establishing farms that produce quality and high quality sheep and goat heads. Greece is very closed for import of foreign breeds for genetic improvement of their own. In sheep breeding, one of the most represented breeds is their indigenous sheep breed “karagunika” (Kapagkoynikn). This breed is bred only as a purebred and it produces a solid quantity of milk and meat. The other sheep breeds include the following: Chios, East-Friesian, Lacaune etc. which are bred only as purebred. Regarding the repro-farms, sheep breeders in Greece are organized in associations for many years, and all those under the control of authorized institution and have above-average production properties sell their heads to potential buyers as quality and high-quality repro heads.

In goat breeding, the most common goat breed is the domestic Balkan goat, as indigenous breed. From the remaining breeds could be found: breed “skopeloi” (Skopeloy) Alpine, Saanen and crossbreeds of the Alpine and Saanen. According to FAO statistics, Republic of Greece has the largest number of goats in Europe where from the overall population, the most represented is autochthonous breed of goats. The organization of the selection service in goat breeding is almost identical as in the sheep breeding, through associations that are controlled by the authorized institution.

Generally, the scientific and professional audience in the Republic of Greece thinks that the genetic improvement of indigenous breeds should be performed only by selection within the breed itself, not with crossbreeding with other breeds. This applies to both sheep and goat breeding. Therefore, until now the Republic of Greece has forecasted significant funds for maintenance and improvement of existing indigenous breeds of sheep and goats.

In the Republic of Greece there are several Institutes of Animal Husbandry where indigenous breeds of sheep and goats are bred, which also work as raw farms. These institutes have been visited by significant number of farmers from the Republic of Macedonia, as members of associations.

Republic of Bulgaria: As a member of the European Union, the Republic of Bulgaria also left the establishing of the repro-centers, and thus the control of production traits to the associations or breeders' associations of certain sheep and goat breeds. Of course there is authorized institution which has authority to control the reliability of the results of the production traits control among certain breeds of sheep and goats. Bulgaria has many sheep breeds such as: Pleven Blackhead, which is a Bulgarian indigenous breed and is one of several dairy sheep breeds in the world, then “kamvol merino”, “merinoflajsh”, “svichovska” sheep, Ile de France, Mouton sharole, Lacon (the last three imported from France), Bulgarian synthetic dairy sheep, “cigaja”, “finewool” sheep, Karakachanian sheep, Copper Red Shoumen sheep, Caucasian sheep “Alkanska” sheep and many others. Most repro-farms of almost all sheep breeds are owned by private breeders, organized in associations that are under the control of the production traits (by an authorized institution). There is an example with the Pleven blackhead sheep, of which there is an original flock (repro-center) owned by the Institute for Agriculture and fodder crops from Pleven (Figure 5).



Figure 5. Reprocenter for Pleven blackhead sheep, Pleven, Republic of Bulgaria
(Ph.D. Nikola Pacinovski, 2008)

The farm has a high quality heads of this breed in the country and offers them for sale to farmers not only in the state but also in the wider region. The situation is similar in goat breeding when it comes to establishing and operating repro-centers.

Republic of Serbia: In the Republic of Serbia sheep and goat breeding are also important animal husbandry industries. Although the production of lamb is a priority of sheep breeders, however, in this country are produced significant quantities of certain dairy products from sheep milk (soft white cheese, yellow sheep cheese - cashkawaal, etc.). In Republic of Serbia are bred various indigenous sheep breeds (types of "pramenka") as follows: "sjenichka", "svrlishka", "lipska", "vitoroga", "krivovirska" and Pirot sheep. Important place in the Serbian sheep-breeding also have the breed Merinolandschaf, used for crossbreeding with existing breeds, especially with "pirotska" breed, in order to improve the existing production traits, "cigaja" etc..

The existing repro-centers of certain breeds (Merinolandschaf) are under control of certain research institutions (Institute of Animal husbandry-Zemun), and are mainly owned by legal persons in private ownership.

There is such a repro-center of the breed-Merinolandschaf in Kraguevac, owned by the company "Compass".

From the goat breeds could be found Alpine and Saanen, as well as crossbreeds of these two breeds. From the indigenous breeds the most typical is domestic Balkan goat. Repro-centers in goat breeding work in the same way as those in sheep breeding.

Republic of Albania: Indigenous sheep breeds bred in the Republic of Albania are: "rechka" sheep, "bardoka", "shkodran" and "ruda" sheep. Registering farms repro-centers in the sheep and goat breeding in this neighboring country is similar as in Macedonia. The farms are privately owned and they are controlled by authorized institutions for monitoring and controlling production traits. There is not a particular breed (sheep and goats) that can be selected by its production properties, but they move within the production properties of existing indigenous populations of sheep and goats as in the other Balkan countries.

Other countries in the region and Europe: When it comes to establishment and operation of the repro-centers in sheep and goat breeding, and also in other animal hus-

bandry sectors, the case with Republic of Croatia is quite interesting. Namely, for this purpose, in this country was formed so-called Croatian animal husbandry selection center that is fully funded by the state, for which a lot of finances are invested every year (employs over 200 people). The classification of these people is according to the territorial division of the Republic of Croatia (districts) and in each district there is a city-center where data for farms and animals (by species and breeds) is kept, and hence they are sent to the office in Zagreb. The number of people employed in individual centers in the districts depends on the number of animals to be controlled. The task of these people is to constantly monitor the field and record all types of farms (animal, sheep, goats, poultry, pigs), which possess high quality raw materials, to enter the same in the database and to start controlling the production properties. At the end of each year they prepare a detailed annual report on the production properties of all types and breeds of domestic animals, which is sent to the Ministry of Agriculture. The report is public and all farmers in the country have access to it, so every time they are familiar with the quality of the breeding heads in each farm that is being monitored. All farms that are under control are privately owned, formed with private funds or specific project funding from the EU. When

selling the reproductive heads, this center issues the necessary documents (pedigree) about the quality of the head.

In other developed and highly developed European countries (Germany, Netherlands, Norway, Sweden, France, etc.), there are associations involving hundreds and thousands of farmers who breed certain types and breeds of animals. Given that it is about big states with large number of farms (centers) societies for various animal breeds are formed. Thus, there is an association only for the breed Merino-Rambouillet in France, an association of dairy sheep breed – Lacaune also in France, an association of East-Friesian sheep in the Netherlands, etc. These associations in cooperation with the scientific institutions that control the production properties within their farms, and based on the obtained results, issue pedigree for each animal when selling it. These associations, of course, are strongly supported by the state i.e. of the Ministry of Agriculture, whose programs provide significant funds for that purpose.

We should also mention the fact that veterinary centers in almost all the abovementioned countries function as a kind of repro-centers, owning sperm (from own production or import) of different types and breeds of domestic animals, and sell the same by market price to interested farmers.

1.10. TECHNOLOGICAL SOLUTION FOR THE SHEEP REPRO-CENTER

1.10.1. SELECTION OF BREED AND PRODUCTION DIRECTION

For breed that will be bred in the sheep repro-center is suggested the German breed Merinolandschaf, and on this basis, the technological process on the farm projects organizing production direction meat-milk. The choice of breed Merinolandschaf is as a result of its presence in the Republic of Macedonia for 34 years and the experiences gained over its acclimatization to our conditions as in pure-bred, as well as its crossbreeds with local populations. The necessity of forming this repro-center in the East Planning Region requires as a result of natural resources in this

region and the potentials for development of sheep breeding.

Additional motivation for establishing this repro-center is the growing demand of pure-bred rams of this breed, and because nearly 26 years new heads are not imported from the native country Germany (the last import was realized in 1985). The long-time experience with this breed showed that lambs which are obtained by crossbreeding of domestic sheep populations with Merinolandschaf rams have faster growth and better meat production. On the other hand, by export to EU countries, this

lamb made a famous brand and is quite wanted by the local merchants and distributors. Almost ten years, the lamb for Easter holidays has a stable price (an average of 130 to 150 denars per kg live weight), while for Christmas and New Year holidays the price reaches 180 to 220 denars per kg live weight. Also, the rams of Merinolandschaf breed used in industrial crossbreeding as a terminal breed (with dairy breeds), increase production performance of the lambs for market (offspring live weight, growth, food conversion, faster growing to the final weight of 18 kg etc.). Hence, by maintaining repro-center of breed Merinolandschaf and producing quality male breeding material will be allowed the application of specific program for crossbreeding which ultimate goal would be increasing the potential of meat production at other sheep population. Given that the breed Merinolandschaf bred purebred and in optimal breeding

conditions has an average lactation of 150 kg of milk in lactation, suggests that its use in crossbreeding with domestic sheep populations, along with increasing the meat production potential will also increase the milk production potential. In this context it is recommended in the (commercial) flocks where will be used Merinolandschaf rams for genetic improvement in the of meat and milk sector, after a certain number of years, to be also used certain highly milking and highly fertile breeds (Awassi, East-Friesian, Chios, Plevan Black-head, etc.). This is because of the fact that Merinolandschaf belongs to a group of combined breeds, so it would be advisable using dairy sheep breeds, for faster improvement of trait-lactation. Within this should also be used the industrial crossbreeding. Using dairy breeds should be monitored because the longer use of any suggested breeds, could cause certain negative effects.

1.10.2. BASIC CHARACTERISTICS OF BREED MERINOLANDSCHAF (WURTTENBERG, GERMAN DOMESTIC MERINO)

German domestic merino (Merinolandschaf) can also be found under the names merino landras or Wurttemberg breed. Named by the province Wurttemberg in Germany, made by crossbreeding domestic "gruboruni" sheep with merino rams from breeds (Rambouillet, Prekoce, Saxon Merino) and fattening breeds (Licester – Lester and Soutdown – Sautdaun).

It is characterized by strong constitution and ability to adapt to mountainous terrains, with great acclimatization on the altitude of 800–1000 m and use of poor pasture (Figure 6). In the province Merinolandschaf participates with 90% in the total sheep number. Since 1950 its name was changed from German refined sheep in German domestic sheep.



Figure 6. Merinolandschaf ram (Wurttemberg)

The breed was created in 1786, by importing Spanish merino that was crossbred with domestic meat sheep. Offspring of such crossbred was crossbred again with merino rams from France, and then among themselves. Initially, this material was not evenly matched, but later due to systematic selection, in 1915 was recognized as a breed. The period of creation of this breed is about 150 years. At first, two lines were created and grown until 1924. From then until today breed Merinolandschaf is bred as purebred.

The breed has strong constitution and well-shaped body. The sheep reach a weight of 60–75 kg while rams from 110–130 kg. Breed is well covered with wool and without pigmentation. It is characterized by annual wool quantity from 4–4,5 kg at sheep and 7–8 kg at rams, with average fineness of 24–26 micrometers. Fertility varies within the limits of 120–150%. According to Kozarovski (1980), at purebred imported flock, using the technology of continuous production with hormones, fertility could reach 210%. The offspring weight ranges from 4–5 kg. At the age of 90–100 days, the lambs reach a weight of 30 kg, with dressing percentage of meat by 55%. The lactation of this breed is quite good and

ranges up to 150 kg, for lactation of 180 days and average fat of 6,82%.

Breed has excellent acclimatization capability, and is widely spread throughout Europe. In the Republic of Macedonia it was first imported in 1976, and after a while, repro-center for this breed was established in ZIK "Pelagonija" – Bitola, which matched the needs of purebred rams of this breed not only in the Republic of Macedonia, but also on the territory of former Yugoslavia. This reprocenter played a historic role in the improvement of sheep in the Republic of Macedonia and elsewhere in former Yugoslavia. When imported in Macedonia, the rams were taken directly on Kajmakchalan (Nidze Mountain) at an altitude of 1600–2000 m. were they adapted immediately after import.

Although it has excellent adaptation ability, in bad conditions it does not give the expected results. According to some authors (Zivkovic et al., 1969), Merinolandschaf bred at an altitude of 360–800 m., at an average annual temperature of 9,7 °C, (4 – 15,5 °C), and average annual rainfall of 700mm was obtained a height of 67,84 cm, live weight of 54 kg, wool production 3,8 kg of wool and fiber fineness of 25,37 microns.

1.10.3. BREEDING SYSTEM

Starting from the available conditions and needs of the breed for the manifestation of its maximum genetic potential for production of breeding material, in the beginning (first year) in the sheep repro-center would be organized intensive system of breeding. This system considers optimum conditions for living, nursing and health care of the sheep, as well as equal and continuous feeding throughout the year, based on quality of the forage and concentrated food. During this initial period it is possible to take the sheep on pasture, when there are optimal weather conditions. The following period, the sheep will get used to the mixed food, i.e. food by hand and pasture, but it will be gradual with no abrupt changes that would affect negatively on their health condition.

As for the reproduction of sheep, because of the expected increased demand, in the first years could be applied hormonal method, i.e. three lambings for two years and

after that the reproduction to be organized as needed. If the demand is not so big, the sheep be lambing once a year, which means their mating in the usual season (August–September) and lambing in January–February.

After weaning of the lambs, sheep would be milked and the lactation would be controlled. Despite the fact that in Germany this breed is no longer milked, so far the experience with this breed showed that our farmers despite the fact that in their flocks they use rams from breed Merinolandschaf they continue to milk those crossbreeds and are satisfied with their milk production.

If in the newly formed repro-center, on the sheep was applied hormonal method which involves technology of lambing throughout the year (three times in two years), the flock on the farm will be divided into two groups, which in will lamb alternatively every four months, and every sheep get an opportunity to lamb at an interval of 8 months.

The order of insemination and lambing is shown in the following scheme:

First Year												
Month	J	F	M	A	M	J	J	A	S	O	N	D
1 group	L			I					L			I
2 group					L			I				

Second Year												
Month	J	F	M	A	M	J	J	A	S	O	N	D
1 group					L			I				
2 group	L			I					L			I

L – lambing, I – insemination

Generally, January, May and September are months in which the sheep will lamb, but depending on conditions, these dates may be adjusted. Lambs will be weaned in the second month, which means the insemination of the sheep should be performed three months post-partum (after lambing).

Induction and synchronization of the estrous will be done by the usual method (progestagen treatment + PMSG).

1.10.4. BREEDING METHOD AND SELECTION GOAL

For realization of the goal, the Merinolandschaf breed flock will be bred purebred and not related. The method allows to maintain the characteristics of the breed for a long time. Also, if quality male and female breeding heads are selected, accompanied with proper care and adequate selection, it allows improvement of the already established performance of the breed. After a certain number of years, in the following stages is projected occasional refreshment of the breed with heads imported from the native breeding area. Given the projected size of the flock, avoiding the increase of the kinship coefficient above permissible limits should be taken into consideration.

However, according to the recommendations of the Common basic program for sheep breeding, the methods of breeding and selection of this breed will be specified in the Breeding program for this breed, which will be prepared by the breeder (a private company, public-private partnerships and so on.). Under the Law on Animal husbandry (Official Gazette of RM no. 7/08) this Program is necessary for registering the farm in the registry of recognized breeders' organizations, that are under control of the Ministry of Agriculture, Forestry and Water Management. In fact, according to the new Law on Animal husbandry, the term Recognized organization of breeders is the new term for farm repro-centers.

1.10.5. FARM REGISTRY

In order to manage the farm's registry, it is necessary to introduce a basic single system of identification, keeping records and monitoring of the production results. According to the Program for labeling domestic animals, by the official veterinary service each breeding head will get ear marks with a unique reference number.

The farms of this type (repro-center) requires precise and decisive evidence of the heads, which involves recording the following data:

- Unique reference number of the head;
- Name (if assigned);

- Sex;
- Date of birth;
- Basic racial and morphological traits;
- Basic information of the head breeder (name and surname, number of farm, address);
- Basic information of the head owner (name and surname, number of farm, address);
- Assessment of the conformation of the body;
- Information for parents and ancestors for 2 generations, and basic product characteristics for each head.

Special attention should be paid on the control of production and reproductive characteristics, which includes constant monitoring of the heads during the year and the basic production parameters such as:

- A live weight of the head at birth, weaning and first mating,
- Date of mating and pregnancy,
- Mating data,
- Duration of pregnancy,
- Date of lambing,
- Total number of born lambs and live-born lambs,
- Sex of newborn lambs,

- Incidence (mortality, abortion)
- Number of bred lambs etc.

All abovementioned parameters should be included in all registers, especially in the registry of lambs, production and control sheet for sheep and production and control sheet for rams. According to Law on livestock, in this type of farms is predicted additional labeling, which is possible if there are financial opportunities (electronic chip, an additional tag, etc.). At the beginning, the farm should also procure appropriate software where all data necessary to implement the selection activities would be processed.

1.10.6. BREEDING VALUE ASSESSMENT

The assessment of breeding value is done in order to determine the real genetic potential of a one head, and the expectations of its use for a particular purpose. The breeding value assessment on this level also will be performed at breeding sheep and rams. The entire procedure of the breeding value assessment will be performed according to the

recommendations of the Common basic program for sheep breeding (CBPSB) as an integral part of the Common basic program for animal breeding (CBPAB). This section will also be elaborated in detail in the Breeding program for Merinolandschaf breed, which should be prepared in the future.

1.10.7. FORMATION, SIZE AND STRUCTURE OF THE BASIC FLOCK

For establishing the reprocenter for breed Merinolandschaf, as mentioned above, would be purchased breeding material from Germany (the native country of the breed), or possibly from another country that has quality breeding material from this breed. All this will be implemented according to veterinary and sanitary conditions for import of sheep and goats prescribed by the Ministry of Agriculture, Forestry and Water Management of the Republic of Macedonia.

At the beginning, 100 sheep and 6 rams originals of this breed would be purchased. A priority will be given to sheep pregnant for a first time. If such a material is unavailable or expensive, offspring from selected parental couples, aged 6 to 8 months would be purchased. When purchasing rams, special attention should be paid if they are tested.

It is planned the farm repro-center to be established for a size of 500 heads from all

categories, of which about 220 milking sheep. The following table (Tab. 29) shows the structure of the flock (for a period of 6 years), from the moment of formation of the farm. As the year of the flock's forming is taken 2013.

According to data shown in Tab. 29, after 6 years, i.e. from 2013–2018, the farm would have 513 heads (with lambs). Given that almost all male and some female lambs will be offered for sale (137 heads), the number of sheep after this period would be 376 sheep heads from all categories, from which 217 milking sheep.

If the basic flock should be increased (increased demand for breeding material), then the flock can increase permanently (to 300 or more milking heads), by leaving the breeding material for replacement. Of course, the living conditions should also be taken into account.

Table 29

Sheep flock structure by years for the period 2013–2018

Year	Category						Total
	Milking sheep	Two-year old ewes	Female weaned lambs	Two-year old rams	Male weaned lambs	Lambs (m. and f)	
2013	100	/	/	/	/	/	106
2014	98	/	40	/	2	56	202
2015	96	37	40	2	2	54	237
2016	133	37	50	2	2	83	315
2017	170	47	75	2	2	95	401
2018	217	65	80	2	2	137	513

1.10.8. REPRODUCTION OF THE SHEEP

As it was mentioned above, during the reproduction of sheep in the first few years could be applied hormonal method, i.e. three lambings for two years due to anticipated increased demand for breeding purebred material of the breed Merinolandschaf, and after that it would be arranged as needed. If the demand is so big, the sheep would lamb once a year, which means their mating in the usual season (August–September) and lambing in the period from January–February. Starting from the given breeding conditions and the intensity of production on the farm, will be used A/I. In addition, special attention will be paid on registering the number of the inseminated

sheep, time of insemination, the number of ram etc. in order to facilitate the registration of lambs at delivery. The offspring for reproduction could be inseminated for a first time when achieving 80% of live weight of their mothers, that need not be the case always. Sheep breed Merinolandschaf can achieve this live weight at age 10–12 months, so that the envisaged technology (off-season lambing) allows their insemination before 18 months of age. Rams will be included in breeding at the age of 8–12 months, or by reaching the 70% of live weight of adult heads. The fertility will be maintained within the breed, and it is 130% (120% –150%).

1.10.9. GROWING LAMBS

The first week after lambing, lambs will be fed only with breast milk. During the second week will consume quality Lucerne hay and concentrate for nourishment, according to their needs of nutriment (optional). If used traditional breeding system (annual lambing), the weaning of lambs could be started when 60–70 days old. If an intensive system of breeding is applied on the farm (three lambings for two years), the weaning of lambs could be started when 50–60 days old. Most of the lambs will be used for replacement of its own flock and for selling as high quality breeding material.

The selection of lambs for breeding will be performed in several stages. The first choice would be when one month old, the second of their weaning that depending on the

technology of breeding can be 60–70 days. The third choice is usually performed before the first pregnancy. After weaning, the lambs left for their own reproduction would be bred partly on pasture and will be fed with hay and concentrates, according to the norms for nourishment of offspring for replacement.

Registration and marking of lambs for breeding will be done according to Rulebook of the Ministry of Agriculture, Forestry and Water Management up to 4 months of age. The first 6 years from the total number of lambs on the farm for reproduction of the flock would be kept almost all female and 2% of the male lambs. All other male lambs and some of the female who are poor quality and do not meet the criteria to remain in the flock will be offered to farmers as breeding material by

market price. When purchasing rams, the farmers should be subsidized, primarily due to

the high price that the rams have, produced on the farm.

1.10.10. NUTRITION OF SHEEP BY CATEGORIES AND PRODUCTION PHASES

For sheep, as for other ruminants, nutrition is one of the main factors that affects the production and milk quality. It directly affects the synthesis and the degree of secretion of almost all the ingredients in the milk (fat, protein, vitamins, minerals, etc.), and also influences on microbiological concentration in milk. In a word, the nourishment affects all aspects of milk's performances.

Nutrition of the sheep in the farm will be based on norms for the sheep' needs in various production stages and categories, as well as specific experiences with the nutrition of this sheep breed in the native breeding region.

In other words, the program for feeding sheep kept in the newly formed repro-center will be based mainly on two basic criteria. One concerns the general and manufacturing traits of the sheep at the farm, and the second on the projected breeding system (management) during the calendar year, or reprocycle.

In the project's plan of the newly established reprocenter for sheep—originals from the breed Merinolandschaf, the production traits along with the history of its creation in Germany is already presented. However, due to greater visibility of the specified nourishment needs that would be calculated in this program, we would like to point out once more that it is about nourishment of breeding heads with meat–milk direction and average weight

of 60–75 kg (female) and 90 to 120 kg (male), fertility of 120–150%, lactation of 150 for lactation period of 6 months, and produced lambs with weight of 30 kg, aged 90–100 days.

Starting from the basic task of repro-center which is associated with producing high quality breeding material, the needs of food projected in the intensive breeding system of or management with sheep. It provides, among other actions, continuous nourishment of the sheep and reprocycle of 240 days.

1.10.10.1. Nutrition and food needs for sheep

Based on the projected concept of work or technological solution for sheep breeding, which is a novelty in the sheep management in our practice and the available information from the literature in this field, total food needs were specified, for sheep with an average weight of 60–70 kg, depending on the physiological condition of the animal for reprocycle of 240 days. Norms for sheep feeding in particular production stages are shown in Tab. 30

Based on the stated norms and the available fodders in the farm, as well as the season, sheep' meal in the abovementioned phases will be composed as shown in Tab. 31.

Table 30

Daily nutriment needs for sheep, in particular production stages

Production stage	Weight (kg)	Oaten units	Digestible protein (g)	Ca (g)	P (g)	Salt (g)
Dry period (35 days)	60	0,87–0,95	70–80	3,0–3,5	2,0–2,5	9–10
	70	0,90–1,00	80–90	3,3–4,0	2,2–2,7	9–10
Pregnancy (first 100 days)	60	1,05–1,25	80–95	3,0–4,0	2,0–2,7	9–12
	70	1,15–1,35	80–100	3,3–4,5	2,2–2,9	9–12
Pregnancy (last 50 days)	60	1,35–1,55	125–140	8,0–9,0	4,0–5,0	11–14
	70	1,45–1,65	135–150	8,5–9,5	4,2–5,2	11–14
Lactation of sheep with 1 lamb (180 days)	60	1,80–2,10	180–210	8,4–9,6	5,2–6,2	12.15
	70	1,90–2,20	190–220	8,8–10,0	5,4–6,4	12.15
Lactation of sheep with 2 lambs (180 days)	60	2,20–2,70	220–270	11,0–12,2	7,0–8,0	15–17
	70	2,30–2,80	230–280	11,4–12,6	7,2–8,2	16–18

Table 31

Food structure for sheep, per days and total

Production stage	Weight kg	Period	Herbage (kg)	Hay (kg)	Concentrate (kg)	Salt (g)
Dry period (35 days)	60	Daily	3	1	0,2	9–10
		For 35 days	105	35	7	332,5
	70	Daily	3	1	0,3	9–10
		For 35 days	105	35	10,5	332,5
Pregnancy (first 100 days)	60	Daily	4	1	0,4	10–12
		For 100 days	400	100	40	1100
	70	Daily	6	1	0,5	10–12
		For 100 days	600	100	50	1100
Pregnancy (last 50 days)	60	Daily	3	1,2	0,4	11–14
		For 50 days	150	60	20	625
	70	Daily	3	1,5	0,4	11–14
		For 50 days	150	75	20	625
Lactation of sheep with 1 lamb (180 days)	60	Daily	5	1,0	0,4	12–15
		For 180 days	900	180	72	2430
	70	Daily	6	1,0	0,4	12–15
		For 180 days	1080	180	72	2430
Lactation of sheep with 2 lambs (180 days)	60	Daily	7	1,2	0,5	15–7
		For 180 days	1260	216	90	2880
	70	Daily	8	1,5	0,5	16–18
		For 180 days	1440	270	90	3060
*Annually per sheep		365 days	1935	390	153	4487,5

*The total food quantity is intended for sheep that weight 70 kg and sheep in lactation with 1 lamb

1.10.10.2. Nutrition and food needs for rams

Rams throughout the year will be separated from the sheep, placed in group or individual boxes and maintained in breeding form. One to two months prior to periods of intense exploitation will begin their preparation in accordance with the norms of rams in exploitation. Correction of the rams' hoofs will be done throughout the year. They will be fed so and will be maintained in breeding condition, and their nutriment needs will be fulfilled depending on the intensity of use. The envisaged technology in the repro-center projects using the rams for breeding twice a year. Thus there will be two periods of their nutrition – resting period and period of intensive use. Based on body weight two categories of rams are considered – rams weighing 110 kg and 120 kg.

Regardless of the mentioned specifics of the rams' nutrition, the needs of food in certain situations, or intensive use in the mating season may be compounded by using animal feeds (eggs, milk, etc.). The nutriment needs of the rams for both periods are shown in Tab. 32.

To fulfill these needs, the rams will consume the following amounts of fodders available (Tab. 33).

1.10.10.3. Nutrition and food needs for offspring for replacement

Nutriment needs for the replacement offspring, i.e. for lambs left for flock replacement, as well as the weaned lambs and ewes are shown in Tab. 34.

To fulfill these nutriment needs, the lambs for breeding should consume the following amounts of fodders shown in Tab. 35.

Table 32

Daily nutriment needs for rams, in particular production stages

Production stage	Weight (kg)	Oaten units	Digestible protein, (g)	Ca (g)	P (g)	Salt (g)
Resting period	110	1,7–2,0	155–185	9,5–10,5	5,5–6,0	10–15
	120	1,8–2,1	165–195	10,0–11,0	5,7–6,2	10–15
Period of intense exploitation	110	2,2–2,5	240–295	11,5–13,0	9,0–10,1	15–20
	120	2,3–2,6	250–305	12,0–13,5	9,5–13,5	15–20

Table 33

Food structure for rams, per days and total

Production stage	Weight (kg)	Period	Herbage (kg)	Hay (kg)	Concentrate (kg)	Salt (g)
Resting period	110	Daily	4	0,5	0,5	10–15
		245	980	122,5	122,5	3062,5
	120	Daily	5	0,5	0,5	10–15
		245	1225	122,5	122,5	3062,5
Period of intense exploitation	110	Daily	7	1,5	0,7	15–20
		120	840	180	84	2100
	120	Daily	7	1,5	0,8	15–20
		120	840	180	96	2100
*Annually per ram			2065	302,5	218,5	5162,5

* The total food quantity is intended for sheep that weight 120 kg

Table 34

Daily nutriment needs for offspring for replacement

Age (months)	Weight (kg)	Oaten units	Digestible protein (g)	Ca (g)	P (g)	Salt (g)
2–3	30	1,2	100	5	2,5	9
3–6	35	1,2	100	6	2,5	9
6–12	45	1,4	140	7	3,5	10
12–18	55	1,6	170	8	4,5	11

Table 35

Food structure for offspring for replacement

Age (months)	Weight (kg)	Period	Herbage (kg)	Hay (kg)	Concentrate (kg)	Salt (gr)	Weight (kg)
2–3 (60–90 days)	30	Daily 30 days	2 60	0,5 15	0,6 18	9 27	0,5 15
3–6 (90–180 days)	35	Daily For 90 days	4 360	0,3 27	0,4 36	6–10 720	/ /
6–12 (180–360 days)	45	Daily For 180 days	4,5 810	0,3 54	0,3 54	6–10 1440	/ /
12–18 (360–540 days)	55	Daily For 180 days	6 1080	0,4 72	0,4 72	6–10 1440	/ /
Total per head			2310	168	180	3627	15

1.10.10.4. Nutrition and food needs for lambs aged up to 60 days

Lambs that are healthy and well developed, at the end of the second week after the birth despite breast milk could also consume certain quantities of concentrate and lucerne

hay. Norms for lambs aged up to 60 days are shown in Tab. 36.

To fulfill these nutriment needs, the lambs for breeding should consume the following amounts of fodders shown in Tab. 37.

Table 36

Daily needs and nutriments for lambs aged up to 60 days

Age (months)	Weight (kg)	Oaten units	Digestible protein (g)	Ca (g)	P (g)	Salt (g)
0–30	10	0,8	90	4	1	7
30–60	20	1,0	95	4,5	2	8

Table 37

Food structure for lambs aged up to 60 days

Age (months)	Period	Herbage (kg)	Hay (kg)	Concentrate (kg)	Salt (g)	Milk (kg)
0–30	Daily	0	0,2	0,3	7	0,5
	30 days	0	6	9	21	15
30–60	Daily	0	0,4	0,5	8	0,5
	30 days	0	12	15	24	15
Total per head		0	18	24	45	30

These calculations include all the lambs produced at the farm annually (male and female), from which at the beginning the majority of female heads will be kept for breeding for the purposes of the repro-center, while the rest (mainly male and part of the female lambs) will be offered for sale to third farms as breeding material.

1.10.10.5. Water needs for sheep

Water makes up over 50% of body weight of adult sheep organism i.e. adult sheep. A large number from the body tissues contain over 70–90% water. Because of that, sheep have significant water needs. Grown sheep during twenty-four hours drink averagely 5 liters water, while the daily water needs of lambs are two times smaller (2 –2,5 liters). As with other domestic animals, sheep also show certain differences in daily water consumption. The daily water consumption is highly affected by climate conditions, the amount and composition of the food consumed, age of the ani-

mals and so on. The water consumption is higher in summer than in winter, when consuming dry food rather than nutrition with mat weeded plants and other sappy plants. When eating food that is water rich, the sheep can survive several weeks without drinking a drop of water.

The sheep satisfy their water needs with fresh drinking water, food rich with water and metabolic water (originated by decomposition of organic substances in the body).

Also, when consuming large amounts of nitrogenous substances (proteins) the water needs significantly increase in order to eliminate the final products the nitrogen transfer through the urine. Consumption and metabolism of 100 gram proteins results with formation of 40–45g metabolic water. However, this requires approximately 800g of water from other sources in the body to eliminate the nitrogen when urinating. Thus the total amount of water needed to eliminate the nitrogen, produced by metabolism of 100g proteins is 800g.

The mineral substances consumed also lead to increased needs for water. Each gram of consumed mineral substances, for excretion from the body requires 40ml of water.

Sheep can consume 12 times greater amount of water in summer than winter. This can partly be explained by the day duration during the summer. Generally we can say that sheep on each kilo dry food consumed, drink 2–3 times greater amount of water. The water is very important and necessary for the successful production of the sheep. Sheep must be constantly provided with sufficient quantities of fresh and drinkable water. They do not drink sufficient amounts of water if it is mouldy with poor quality and has a bad odour. If sheep are forced to drink water with poor quality, a considerable drop in production may occur. Regardless of the breeding, sheep

must constantly have good quality water available (fresh, chemically and microbiologically fine).

1.10.10.6. Balance of food

Based on the stated nutriment needs, a balance of the annual needs of certain feeds in the repro-center per categories of sheep has been prepared. The balance is prepared for the four key types of feeds: herbage – which the sheep provide from pastures throughout the year, hay – which is usually provided from plough areas (for the period: fall, winter, spring), concentrate and salt. The calculation is made for a total of 6 years in the period 2013–2018, for each year separately (Tab. 38).

Table 38

Annual nutriment needs at the sheep repro-center, by categories and years

Catgory	Number	Herbage (tons)	Hay (tons)	Concentrate (tons)	Salt (g)	Milk (kg)
2013						
Breeding sheep	100	193,5	39	15,3	450	/
Rams	6	12,39	1,82	1,31	30	/
Offspring for replacement (ewes and weaned lambs)	/	/	/	/	/	/
Lambs for selling (m. and f.)	/	/	/	/	/	/
Total	106	205,89	40,82	16,61	480	/
2014						
Breeding sheep	98	190	38,22	15	440	/
Rams	6	12,39	1,82	1,31	30	/
Offspring for replacement (ewes and weaned lambs)	42	97	7,06	7,56	150	630
Lambs for selling (m. and f.)	56	0	1,008	1,34	2,52	1680
Total	202	299	48	25,21	623	2310
2015						
Breeding sheep	96	186	37,44	14,68	431	/
Rams	6	12,39	1,82	1,31	30	/
Offspring for replacement (ewes and weaned lambs)	81	187	13,61	14,58	294	1215
Lambs for selling (m. and f.)	54	0	0,97	1,30	2,43	1620
Total	237	385	53,84	31,87	757	2835
2016						
Breeding sheep	133	257	51,87	20,35	597	/

Rams	8	16,52	2,42	1,75	41,3	/
Offspring for replacement (ewes and weaned lambs)	91	210	15,29	16,38	330	1365
Lambs for selling (m. and f.)	83	0	1,49	1,99	3,74	2490
Total	315	484	71,07	40,47	972	3855
2017						
Breeding sheep	170	329	66,3	26,01	763	/
Rams	10	20,65	3,03	2,19	52	/
Offspring for replacement (ewes and weaned lambs)	126	291	21,17	22,68	457	1890
Lambs for selling (m. and f.)	95	0	1,71	2,28	4,28	2850
Total	401	641	92,21	53,16	1276	4740
2018						
Breeding sheep	217	420	85	33,20	974	/
Rams	10	20,65	3,03	2,19	52	/
Offspring for replacement (ewes and weaned lambs)	149	344	25	27	540	2235
Lambs for selling (m. and f.)	137	0	2,47	3,29	6,17	4110
Total	513	785	115,5	65,68	1572	6345

*Total food quantity for breeding sheep is calculated for heads weighting 70 kg and sheep in lactation with 1 lamb

1.10.11. LABOR NEEDS IN THE SHEEP REPRO-CENTER

The sheep farm (repro-center), the first two years (2013 and 2014.) would have minimum two employees. The third year that number would increase for one more, i.e. three, and this number would stay the same 3 years (2015, 2016 and 2017), while in the sixth year (2018.), the number of employees would be increased to four. One of the employees must have a university degree in agricultural sciences or biotechnology. Due to the complexity of the operations, the repro-center must have a quality working staff who can perform all the tasks related to sheep breeding

and selection of sheep, according to the standards and criteria prescribed (in CBPAB) related to breeding quality and high quality breeding sheep. To implement the health protection measures, the repro-center will sign a contract with an authorized veterinary service for implementation of health protection measures. Obligation of the repro-center is to cooperate with relevant scientific and research institutions, so it could follow and apply the latest scientific news in this area (nutrition, selection, etc.).

1.11. TECHNOLOGICAL SOLUTION FOR THE GOAT REPRO-CENTER

1.11.1. SELECTION OF BREED AND PRODUCTION DIRECTION

In the goat repro-center, it is proposed to be raised two breeds: Alpine and Saanen,

breeds that belong to the production direction milk–meat. Experience with these breeds

dates back to last century (the period between the two world wars), when they were imported to these areas for a very first time. They were bred as a purebred, but also as a material for crossbreeding with the domestic Balkan goat. The previous experience is excellent, considering that they excellently adapted, either as a purebreds or crossbreds.

As it was mentioned above, currently in the Republic of Macedonia there is one officially registered repro-center for the Alpine breed (according to Law on Animal husbandry – Recognized organization of breeders of Alpine breed), while for the Saanen breed there is no such repro-center. In the period until 2000, there was a repro-center for these two breeds near the village Lakavica, Stip, but due to organizational reasons it failed. The experience with both breeds in this repro-center was excellent.

Therefore we believe that there is a real need for establishing such repro-center. Firstly, to renew the Alpine breed, but also to offer quality breeding material from Saanen-breed, which almost ten years is not officially represented at the repro-centers in our country.

The production direction that use these two breeds is milk–meat, which means a solid milk production as well as production of quality kid.

By establishing and maintaining repro-center of these two breeds, quality male breeding material would be produced, and the same will be used for improving the existing goat population not only in the EPR, but also in the whole country, through the application of specific program for crossbreeding. The ultimate goal of such a crossbreeding would be increasing the milk production potential at the newly produced crossbreds.

1.11.2. BASIC TRAITS OF THE ALPINE BREED

The Alpina breed originates from the Alpine massif (Switzerland) and is created by applying an organized selection. It is recognized as breed 60 years ago. It is the most widespread goat breed in France with 70% of the total population. During the long-lasting selection, it was created a special type called French Aline (Figure 7). The Alpine belongs to the colored dairy goat breeds with short hair, gold–brownis to reddish color and a distinctive black line along the spine. The legs are black to the knees, and ears are upright. It could be withn or without horns.



Figure 7. Goat from French Alpine breed

The goats of this breed are characterized by a wither height of 70–80 cm while the male goats 75–85 cm. The average live weight of goats is 50 kg and 70 kg for the male goats. The average milk production of adult heads in France (older than 2,5 years) is about 750 kg for lactation period of 240 days, while in Switzerland from 550–650 kg for lactation period of 250 days. The presence of milk fat in the milk is approximately 3.5–3.6% while of proteins it amounts 2.8–2.9%. The pregnancy in native breeding area lasts about 150 days, and fertility is around 180%.

Because of its ability for high milk production and wide adaption range, the Alpine breed is exported to many European and non European countries, where it served for creation of many varieties of dairy goat breeds within its type (in USA–French Alpine breed, in England–British Alpine, etc.). Considering the climate in the Republic of Macedonia, the breed's traits, and previous experiences, it is successfully breed not only as a purebred but also for improving the domestic goat population.

1.11.3. BASIC TRAITS OF SAANEN BREED

The experts have concluded that the most productive goat breeds regarding the milk, which have helped in improving a lot of low productive breeds not only in Europe but also around the world are the Swiss breeds. The most important of them are the Saanen and "Togenburshka" goat. The main center for reproduction of Saanen goat breed is located in the southwestern part of canton Bern in Switzerland. It is an area located below 1000 m altitude, surrounded by high mountains from 1800–2500 m. There are many Alpine pastures and water sources there. Due to the excellent distribution of annual rainfalls, the grass on pastures is green all year long. The climate is relatively mild and suitable for animal husbandry development. However, despite the favorable climatic and nutritious conditions, great part in creating the breed takes the hard selection work with local white goats for a period of almost two centuries. This breed is quite big. The wither height of the goats is 74–85 cm at the male goats in 85–89 cm. Live weight varies between 50–85 kg – goats and 75–100 kg – male goats. The constitution is strong and skeletal system is well developed (Figure 8).

Both sexes are hornless, covered with white hair. Externally, this breed radiates generosity and kindness. This breed is a typical representative of the dairy goat types. The Saanen goat is "ranostasna". The weight at birth of the female goats is 3,5 kg, while of the male goats it is 4,5 kg. In weaning period both female and male goat weigh from 9–10 and 10–12 kg respectively, while at the age of 6–7 months, 18–20 and 20–30 kg. At the age of 1

year, females weigh 30–35 kg, while male 38–40 kg. When good nutrition and good development, breeding period could start in the birth year (6–7 months old). Fertility is high. Out of 100 goats often could be born 180–250 kids.



Figure 8. Goat of breed Saanen

The average daily lactation ranges from 2,5–3,5 l, while at the highly productive to 4,5 liters. The lactation period lasts 8–10 months (240–300 days), with 800–1200 l of milk. The lactation record at goats was noted at this breed, and totals 2,950 liters.

Because of the high racial stability, this breed has been used as an improver of low productive goat breeds in the world. It is quite spread in Central and Western European countries as well as in the U.S.A, Canada, Chile, Morocco, Algeria, Tunisia, Syria, China, Japan.

1.11.4. BREEDING SYSTEM

In the repro-center would be combined barn and pasture breeding system. This system could be successfully applied in mountainous terrains, if the necessary amount of food is provided on the barn, as well as if there are enough pastures for grazing. It enables full utilization of the herbage that the nature offers, and thus contributes to more

cost-effective production. Taking into consideration the conditions in the East Planning Region, it is projected the barn nutritious period to last about 5 months, while the pasture period would be 7 months. The deviations would depend on the length of winter conditions.

1.11.5. BREEDING METHOD AND SELECTION GOAL

For realization of the main repro-center's goal (production of quality breeding material from the Alpine and Saanedn breeds), the farm will apply the method of purebred breeding, unrelated. This method provides opportunities to maintain quality and consistency of the breed traits for a long time. Also, if chosen quality male and female breeding heads, with proper care and use of adequate selection method, the performance of the breed and producing high quality offspring could be improved.

In the further operation of the repro-center has been projected occasional renewal of both breeds with heads purchased by the native breeding areas, as a method of maintaining the racial performances.

The repro-center will use optimal model selection, which consists of selection purpose, determination of control methods, assessment of individual breeding value, as well as a plan for using the breeding heads. Basic objectives of the selection program will be:

- Total milk production (for standard lactation);
- Total amount of fat and protein in the milk;
- Percentage of fat and proteins in the milk.

During exploitation of male goat, would be used individual indexes that will form 4 classes of male goats.

- Class A – for producing reproductive material at the repro-center;
- Class B – production for other farms;
- Class C – reproduction of other farms and
- Class D – superannuated male goats from reproduction.

The plan for utilization of reproductive heads in repro-center the will based on a "best with the best" principle. Projected selection program would result with a maximal improvement of the aggregate breeding value at breeding heads.

As recommended by the Common basic program for goat breeding (CBPGB), the breeding and selection methods of this breed will be specified in the Breeding programs for these two breeds, that will be developed by the breeder itself (a private company, public-private partnership etc.). Under the Law on Animal husbandry (Official Gazette of RM no. 7/08) these programs are necessary for registering the farm in the registry of Recognized organizations of breeders, managed by the Ministry of Agriculture, Forestry and Water Management.

1.11.6. FARM REGISTRY

Farm's registry will be managed through application of present single system of identification, keeping records and monitoring of the production results. According to the Program for labeling domestic animals, each breeding head will get ear marks with a unique reference number. For selection purposes, additional method of labeling will be used, if necessary.

The repro-center will keep precise and decisive evidence of the heads, which involves recording the following data:

- Unique reference number of the head;
- Name (if assigned);
- Sex;

- Date of birth;
- Basic racial and morphological traits;
- Basic information of the head breeder (name and surname, number of farm, address);
- Basic information of the head owner (name and surname, number of farm, address);
- Assessment of the conformation of the body;
- Information for parents and ancestors for 2 generations, and basic product characteristics for each head.

Special attention should be paid on the control of production and reproductive characteristics, which includes constant monitoring

of the heads during the year and the basic production parameters such as:

- A live mass of the head at birth, weaning and first mating,
- Date of mating and pregnancy,
- Duration of pregnancy,
- Date of kidding,
- Total number of born kids and live-born kids,
- Sex of newborn kids
- Incidence (mortality, abortion)
- Number of bred kids etc..

All abovementioned parameters should be included in all registers, especially in the registry of kids, production and control sheet for goat and production and control sheet for male goats.

The introducing of the registers will start immediately after the formation of flock from

both breeds, as well as starting with the control of individual production. The milk production would be controlled using AT or A4 method according to the recommendations of ICARPMA, 1990. During each milk-control, the quality of each goat's milk would be controlled by examining the percentage of most constituents, especially proteins, milk fat and lactose.

Breeding method, home registry and the selection at the repro-center would be done under professional supervision of an authorized institution. Here, as at the sheep repro-center should be purchased software for keeping the records, i.e. creating a database of all data required for implementation of the selection activities.

1.11.7. BREEDING VALUE ASSESSMENT

The assessment of breeding value is done in order to determine the real genetic potential of a one head, and the expectations of its use for selective purpose. The breeding value assessment on this level also will be performed at breeding goats and male goats. The breeding value assessment will be per-

formed according to the recommendations of the Common basic program for goat breeding (CBPGB) as an integral part of the Common basic program for animal breeding (CBPAB). This section will also be elaborated in detail in the Breeding program for the both breeds, (Alpine and Saanen).

1.11.8. FORMATION, SIZE AND STRUCTURE OF THE BASIC FLOCK

Given that in the repro-center would be bred two goat breeds, at the beginning would be purchased 100 goats (50 goats of Alpine breed and 50 goats from Saanen breed), and 6 male goats originals (3 of any breed). A priority will be given to pregnant goats for a first time. If such a material is unavailable or expensive, then it will be purchased offspring aged 6 to 8 months, from selected parental couples. When purchasing male goats, special attention should be paid if they are progeny tested. If such don't exist, it will be insisted to be with high production performance of the pedigree.

The structure of the flock of both breeds in the beginning, i.e. after the purchase, would look like in Tab. 39 and 40.

Table 39

Structure of the flock from Alpine breed

Categories	Number
1. Breeding goats	50
2. Male goats	3
3. Replacement offspring from 3–8 months	/
4. Kids not older than 3 months	/

Table 40

Structure of the flock from Saanen breed

Categories	Number
1. Breeding goats	50
2. Male goats	3
3. Replacement offspring from 3–8 months	/
4. Kids not older than 3 months	/

The purchase of goats from Alpine breed is planned to be realized from the native country France, but also, it could be done from another country (Switzerland). At the worst, the quality heads could be purchased from our neighbouring countries where also could be found a solid breeding material from this breed (Serbia, Croatia). It is the same case with the purchase of goats from Saanen breed. Firstly, it would be insisted to be purchased from the native country Switzerland, but if the purchase is too expensive, these heads could be purchased from neighboring countries. Just like sheep, procurement will be implemented under veterinary–sanitary conditions for imports of sheep and goats provided by the Ministry of Agriculture Forestry and Water Management of Republic of Macedonia.

It is planned, the number of both goat flocks, the Alpine and Saanen to be increased to 370 heads of all categories, of which 130

heads would be dairy goats. Analogous to this, the total number of goats in repro-center would be 700 heads, of which 260 dairy goats.

In the following tables (41 and 42) is presented the structure of the flock (for a period of 6 years), from the moment of farm's establishment. As a starting year was taken 2013. The average fertility of goats from both breeds is estimated to be 1,4. The sex inheritance is estimated at 50:50 (male:female). From the produced female kids, it is expected 70% of them to meet criteria for a renewal of the flock, while the remaining 30% to be offered for sale. This percentage of retention of the female heads shall be applied the first few years, while after that period that percentage would be reversed, i.e. more of the heads would be offered for sale, while only the necessary percentage for reproduction would be retained.

Table 41

Structure of the flock from the Alpine breed by years

Year	Category							Total
	Dairy goats	Two-year old ewes	Female weaned kids	Two-year old bucks	Male weaned kids	Kids (m. and f)	Bucks	
2013	50	/	/	/	/	/	3	53
2014	49	/	24	/	2	43	3	121
2015	48	24	24	2	2	43	3	146
2016	72	24	35	2	2	64	6	205
2017	96	35	47	2	2	85	8	275
2018	131	47	64	2	2	117	10	373

Table 42

Structure of the flock from the Saanen breed by years

Year	Category							Total
	Dairy goats	Two-year old ewes	Female weaned kids	Two-year old bucks	Male weaned kids	Kids (m. and f)	Bucks	
2013	50	/	/	/	/	/	3	53
2014	49	/	24	/	2	43	3	121
2015	48	24	24	2	2	43	3	146
2016	72	24	35	2	2	64	6	205
2017	96	35	47	2	2	85	8	275
2018	131	47	64	2	2	117	10	373

According to data shown in Tab. 41 and Tab. 42, after 6 years, i.e. in 2018, each flock (of both breeds) would have a total of 373 goats of all categories, of which 131 dairy, 47 two-year old ewes, 64 female weaned kids, 2 two-year old rams, 2 male weaned kids, 117 male and female kids and 10 male goats. Thus, the total number of goats in repro-center of both breeds would be 746 heads of all categories, of which 260 dairy heads. Each production year, almost all male and some female goats will be offered for sale.

If there is a need of increasing the basic flock (increased demand for breeding material of any breeds), the number of goats would be increased permanently (to 300 or more dairy heads), by leaving breeding material for replacement. The living conditions would also be taken into account.

Such planned size of the basic population of both breeds, gives opportunities for applying selection interventions, without danger of increasing the kinship coefficient above permissible limits.

1.11.9. REPRODUCTION OF GOATS

Goats will be used for breeding 5–7 years. It is not exception some heads (the dairiest) due to long lactation persistency to be bred 10 or more years. The practice has confirmed this many times. Given the purpose of the farm (production of breeding material) the fertility will be kept within the racial traits. In good breeding conditions, ewes aged 7–8 months can be inseminated, while the age of 12–14 months can give birth. In order to ensure normal growth and development of young goats, so they could good mothers with high lactation, it would be allowed to them to mate when they reach 75–80% live weight of the adult heads. Considering the conditions at the repro-center and starting from the racial characteristics, the ewes could mate when reaching a live weight of at least 35 kg. This

lively table with optimal growing conditions are achieved for a period of 8 months.

Reproduction of goats will be done under the usual breeding system, which means one birth a year. If it is necessary, an intensive hormones method would be used—two births in three years, but only if the demand for breeding material increases. Bearing in mind the purpose of the farm, which is production of high quality breeding material of known origin and from both breeds, during the mating period will be applied artificial insemination (A/I). In a word, each mating must be controlled or recorded. During the reproductive season, it is possible to use additional methods for control of the estrus, which is induction and synchronization of estrus, using an usual method (progesteron treatment + PMSG).

1.11.10. REPRODUCTIVE ADVANTAGE OF BUCKS

The male goats reach their sexual maturity when 5 months old. But they will be used for breeding aged over 8 months. In addition, their maximum exploitation will start after reaching the age of 1,5 – 2 years.

For more rational use of the male goats in the repro-center, the insemination of goats will be done only with the "control mating" or artificial insemination (A/I). When performed "control mating", the goats will be mated with previously chosen male goat, which enables complete recording during mating and increasing of the production in the selected direction. During mating "by hand" in the reproductive season, a male goat is predicted to

inseminate 60 to 100 goats. Special attention during mating will be given to recording the number of inseminated goats, insemination time, and the number (label) of male goat which inseminated the goats, that facilitates the registering of the kids during the kidding. Also, when applying this method of mating, it is projected one male goat for 50–60 goats.

When using A/I with sperm from one male goat could be inseminated 400–600 goats. The native sperm from quality male goats can be used for insemination of goats out of the repro-center, which would improve its economic condition from the additional revenues. It is recommended the intensity of

taking sperm from adult male goats to be up to 3 times a day, and up to 2 times from young ones, with occasional breaks from 1–2 days a week.

The methods for better reproductive use of the goats and synchronization of the estrus, will be used so-called "Flashing" (enhanced

nutrition) and "male goats effect" (presence of male goats near the goats, in order to appear estrus and a desire to jump). The mating of the goats will be once a year in the period from August to September, so the kidding of the goats would be from January to February.

1.11.11. BREEDING OF KIDS

Immediately after the birth, the kids get the colostral milk from their mothers. If it is not possible, the farm will keep a stock of colostral milk. Once it is dry, nursed and the umbilical cord is prevented, every kid will be checked. The kids with any insufficiencies (irregularity of maxilla and mandible, lack of palate, abnormal, hoofs and legs, visible defects of the genitals, etc.) will be removed. The normal kids are labeled with temporary individual number (ear or neck tag), and in the offspring's registry will be registered the date of birth, number of mother, sex, size of brood, birth live weight and the assigned number.

The first days after lambing, goats and kids are kept together, until 10 days old. After that period, only during the night they will be together, and during the day while the goats are on pasture, the kids will be separated. After the 10th day, the kids will be fed with goat milk through buckets with nipples or feeding system. In the same period the kids will be given concentrate and quality hay if they want, more often during the day, to gradually get used to dry food. The kids could drink water after 2 weeks of age. The kids for reproduction would be selected and classified based on the production characteristics of the parents and their morphological characteristics. They will definitely be weaned the age of 3 months, and they will be provided with enough quantity of lucerne hay. After the third month, in addition to hay (pasture) the kids will be provided with about 200–300 g. concentrated food per day.

The control of kids' live weight will be done at the ages of 1, 3 and 6 months to monitor their growth and record them in the mother forms. After 3 months of age, the kids will be separated by sex, and simultaneously, the temporary numbers will be replaced with permanent labels. The kids that diverge in growth and development of standards for the breed, will not be used for reproduction. At this age, special attention will be paid to two undesirable hereditary phenomena: the presence of small additional teats in the region of the udder and if they have or don't have horns. Male kids who come from mothers who have additional teats, will be used for breeding because of portability of the trait on the males. Starting from the statistics that the horn-less goats are less resistant, they mostly give birth to male and lighter kids and the fact that 95% of infertile male and female heads originate from 2 homozygous horn-less parents, it will be taken into account all male kids to have horns. For easier manipulation and advantages of feeding (smaller feeding area), the horns will be removed.

As with sheep' reprocentarot, the first 6 years the total number of goats on the farm obtained, for reproduction of the flock will be kept almost all female and 2% male kids. All other male kids will be offered to farmers in East Planning Region or entire state, for crossbreeding with domestic and low productive breed of goats.

1.11.12. BREEDING OF GOATS IN LACTATION PERIOD

Considering that the aim of the farm is producing purebred heads with high genetic potential for milk production, most attention

will be given to lactating goats. Usually in these farms that operate as reproductive centers for producing quality and high-quality ma-

terial, the offspring is with their mothers longer than the usual period of 60 days. Specifically, the offspring is allowed to be breast-fed about 70–90 days. For this purpose, after this period starts milking of the goats. The farm will apply machine milking 2 times in 24 hours. The length of lactation in repro-center will be at least 8, and the most 10 months. The lactation of goats that gave birth for a first time will equate with the other goats (due to later mating) through its shortening.

The termination of the lactation at the goats will be no later than the month of November when they will be milked once a day (in the morning during 7–10 days), which is later replaced by milking every second day (during 7–10 days) and in the end they will be milked once in 2 or in 3 days. For prevention of mastitis, the period of termination of the lactation will take place over 2–3 weeks. Milking will be terminated when the total daily quantity

of milk will drop to 0.5 kg, and after that in the udder (by the breasts' orifices) is applied medicine for protection of mastitis.

At the same time, the available quantity of water for the goats be reduced, which would be done with the food too, making sure that it does not affect the fetus, because this period coincides with the pregnancy of the goats. During the milking period, will be supervised the daily lactation at each head individually. Type of milk control under the previous recommendations would be performed using AT control, which projects implementation of three consecutive controls of the milk production. The obtained data are important in terms of preparing mating plans, as well as for classification of the heads in groups according to productivity. The classification of the goats will enable nourishment of highly productive heads during the production year, and thus fully exploiting of their genetic capacity.

1.11.13. NUTRITION OF GOATS BY CATEGORIES AND PRODUCTION PHASES

The nutrition of the goats is a major factor for high production and realization of the genetic capacity of animals. Only with proper and quality nutrition is possible to implement effective selection and to continuously improve the production characteristics of goats. When insufficient and irregular nutrition of any aspect, 30–50% of the genetic capacity of goats won't be realized, which directly affects the economic efficiency of the farm. Although the goat is quite modest in nutrition and flexible for various breeding conditions, anyway it must take the optimum amount of food, so it can normally perform all physical and physiological functions. When insufficient nutrition of young goats categories, they lag behind in their development, and as adults are characterized by lower live weight, fertility and lactation. When improper diet, the conversion of food is unfavorable, so for 1 kg of growth is wasted greater quantity of food.

Goat is very sly and energetic food consumer, which prefers browsing than grazing. As noted earlier, the goat has a huge capacity for tolerating different tastes compared to sheep and animal, therefore, it uses many foods in their nutrition. Because of that, the goat is selective consumer and has the ad-

vantage over other types of ruminants in the selection of high quality food. However, goats are disabled when food quality is equal, especially when the quality is bad. In such cases, the animals lose much time in trying to choose foods with better quality, so that total quantity of the consumed food is smaller. The goats eat the leaves first, then thinner stems, and finally the rougher parts.

Goat is good transformer of the ponderous food in milk and meat. As with sheep, for the goats as ruminants, the nutrition is one of the main factors affecting production and quality of milk, and thus the synthesis and the degree of secretion of milk's components fat, proteins, vitamins, minerals and etc.).

It is important the needs of goats in nutrients to be supplied with the consumed food. The nourishing, because of the small amounts of dry food consumed or lower concentration of nutrients leads to lower production than expected. In case of small deviations, they are not so important, because the emptying and restoring the depot in body tissues is a normal process. Thus the diet by level and composition should match the physiological condition of the goats (dried, pregnant and in lactation).

The nutriment needs could be provided with large amount of food that contains less concentration of nutriment or smaller food quantity that has higher nutriment concentration. The goats' nutrition by will is a basic goal of most manufacturing systems. For this purpose it is necessary to ensure free access of the animals to food, so the goats can consume when they want. Yet, when we mention this system of nutrition, we should consider the economic aspect, i.e. the profitability. Because of that we should strive the daily quantity to be planned as much as possible, i.e. standardized, which is certainly a goal of every modern goat farm.

Starting from the basic task of repro-center that is associated with the production of quality and high quality breeding material, needs of food are projected in a combined breeding system of the goats. When planning the food for all categories of goats within the prescribed breeding system in repro-center will be start from the structure of the flock and the number of feeding days (150 stable days and 215 pasture). However, these figures do not represent a strict boundary, because during the stable period the goats will go to a pasture, of course when that weather conditions permit it. The nutrition will be standardized on the basis on the nutriment needs in certain production stages for different categories (kids, offspring for replacement, pregnant goats, dairy goats, breeding male goats).

1.11.13.1. Consumption of dry matter at goats

Most of the food consumption at goats is during the day, while about 80% of the rumination is overnight. The food consumption is affected by the following factors:

- type and quality of food;
- the amount of available food;
- body weight of animals;
- the level of milk production and
- frequency of feeding.

The meals with a high share of forage foods, the consumption is limited by the physical capacity of the digestive organs. For these reasons, the quantity consumed food is limited or determined by the size of the digestive tract, speed of moving of the food through the digestive system and the distance of unit dry food in the digestive tract. The speed at

which food moves into the intestine is higher at goats compared to sheep and animal. The volume of the digestive tract is similar in terms of body weight at goats as well as at sheep. It is confirmed that goat consumes more dry food per unit live weight in relation to sheep, especially when consuming meals rich with cellulose. Selectivity, together with greater speed moving of food (passage) is an important element in achieving a greater quantity of consumed food.

In the following tables (Tab. 43 and 44) is shown the consumption of dry matter at goats, depending on body weight and the milk production.

Table 43

Consumption of dry matter at growing goats

Body weight (kg)	Consumption of dry matter (kg/day)
10	0.45
20	1.10
30	1.30
40	1.40

Table 44

Consumption of dry matter at goats according to the body weight and the lactation

Body weight (kg)	Daily lactation with 3,5% milk fats (lit.)						
	0	1	2	3	4	5	6
Consumption of dry matter, (kg/day)							
50	1,5	1,7	1,9	2,1	2,3	2,4	2,5
60	1,8	2,0	2,2	2,4	2,6	2,8	3,0
70	2,1	2,3	2,5	2,7	2,9	3,1	3,3
80	2,4	2,6	2,8	3,1	3,4	3,7	4,0

Consumption of dry matter increases with the growth of lactation. Thus, for each liter of milk produced, the consumption of dry matter increases by 10–12%. In terms of live body weight, the consumed dry food ranges from 3–5% from the body weight. However, it should be kept in mind that the consumption increases when the goat takes a small amount of food at frequent intervals, especially if given

food the goat likes. It has been specified that the goat has a proportionally greater rumen compared to other ruminants, so the goat can use large amounts of food throughout the day, particularly forage food with stem. Also, it has been proved that the goats digest easily the forage food compared to other ruminants.

1.11.13.2. Nutrients needs at goats

In terms of live body weight, the goats need to consume larger quantities of dry matter, or they should contain greater concentration of nutriment in relation to the needs at other ruminants. That is because the reticulum of goats is smaller in terms of the body size, and also the time of resorption (retention) of food's particles is smaller. When food is similar regarding the digestion, real digestion may be smaller at goats due to shorter retention time of the food in reticulo–rumen. It allows a faster movement of the food's particles and increased consumption, which reflects on the greater consumption of food and lower digestion or lower level of consumption of digestible nutriments compared to other ruminants (Tab. 45).

Table 45

Time of retention in the rumen, speed of digestion at animal, sheep and goats

Type of animal	Retention in the rumen, (h)	Speed of digestion, (% / h)
animal	36	5,2
sheep	34	5,2
goat	28	7,1

1.11.13.3. Energy needs at goats

The goats, as other farmed animals, need energy for living, growth, rising, reproduction, lactation, growth of the hair cover, as well as for daily activity. These bodily functions affect to a great extent the system of consumption of dry matter. There is no other domestic farm animal, which has such great variation in the needs of energy, such as the goat. These large variations are as a result of extreme types, productivity and activity of this type of animals (Tab. 46).

If the goats graze i.e. go to pasture, the daily needs should be increased for 2,0, 2,3, 2,6, and 2,8 MJ ME for animals weighting 50, 60, 70 and 80 kg (consecutively). Energy is measured in joules. One calorie is equivalent to 4,19 joules. Greater energy measure that determines the needs of animals is mega joules (MJ), which corresponds to 1.000.000 joules. Daily energy needs at growing goats, according to live weight and average daily growth are shown in Tab. 47.

Table 46

Daily energy needs at goats according to the body weight and lactation

Body weight (kg)	Daily lactation with 3,5% milk fats (lit.)						
	0	1	2	3	4	5	6
Energy needs, (MJ ME/day)							
50	8,0	13,1	18,2	23,3	28,4	33,5	38,6
60	9,2	14,3	19,4	24,5	29,6	34,7	39,8
70	10,3	15,4	20,5	25,6	30,7	35,8	41,1
80	11,3	16,5	21,6	26,8	31,9	37,1	42,2

MJ ME – mega joules methabolic energy

Table 47

Daily energy needs at growing goats, bred in farms

Body weight (kg)	Body weight growth (g/day)				
	0	50	100	150	200
Energy needs, (MJ ME/day)					
10	3,0	4,5	6,0	7,5	9,0
20	5,0	6,5	8,0	9,5	11,0
30	6,8	8,3	9,8	11,3	12,8
40	8,5	10,0	11,5	13,0	14,5
50	10,0	11,5	13,0	14,5	16,0
60	11,4	12,9	14,4	15,9	17,4

The additional energy spending for activity is 25, 50 and 75% of maintenance needs, at goats kept and bred in fenced area, at relatively poor grazing and extensive pastures. Energy needs for growth are 8,84 Kcal DE/g growth (Kcal DE – kilo calories digestible energy).

For normal reproduction, the goats should be provided with adequate energy consumption, before and during the mating, as well as increased energy consumption during the last 2 months of the pregnancy. The last 2 months of the pregnancy, the energy needs amount to 1,74 Mcal digestible energy, regardless the size of the animal. However, it is very difficult to reach that level, especially at the smaller goats, but practice shows that this amount of energy could be halved at average-sized goats without any consequences.

Energy needs in lactation are determined by kg milk produced and fat 2,5 to 6,0%. For example, for 1 kg milk with 4% milk fat, it takes 1,52 Mcal digestible energy, so it takes 19,9 Kcal for every 0,5% increase in the content of milk fat.

1.11.13.4. Protein needs at goats

The proteins' needs are expressed in the form of raw protein (RP) and digestible raw protein (DRP) for goats with different body mass and various bodily functions. When providing maintenance needs, we should consider the relationship calories/proteins. On 1 Mcal DE (mega calories digestible energy) come 22g DRP. This means that the growth of energy needs, grow and needs protein too. Growth needs at goats amounted to 0,195 g DRP/g growth. For pregnant goats, the proteins' needs are 57g DRP/day in the last 2 months of the pregnancy. This level of protein refers to the big goats or goats that give birth to more kids. For smaller goats who get one kid, it is recommended one half of the previously stated amounts.

- The DRP needs during lactation is 51g DRP/kg milk with 4% milk fat.
- The following tables (Tab. 48 and 49) show the DRP needs, at growing goats (depending on body weight and daily growth) and at goats in lactation (depending on body weight and daily lactation).

For animals that go to pasture i.e. walk, the digestible proteins needs should increase for 25% than the quantity projected for stable-breeding. The needs of digestible raw proteins should also be increased to 57 g/day in the last two months of the pregnancy.

Table 48

Daily needs of digestible raw proteins at stable bred growing goats

Body weight (kg)	Body weight growth (g/day)				
	0	50	100	150	200
	Digestible raw proteins needs (g/day)				
10	35	45	55	65	75
20	46	56	66	76	86
30	50	60	70	80	90
40	53	63	73	83	93
50	61	71	81	91	101
60	69	79	89	99	109

Table 49

Daily needs of digestible raw proteins at stable bred goats regarding the body weight and lactation

Body weight (kg)	Daily lactation (lit.)						
	0	1	2	3	4	5	6
	Digestible raw proteins needs (g/day)						
50	51	106	161	216	271	326	381
60	59	114	169	224	279	334	389
70	66	121	176	231	286	341	396

1.11.13.5. Mineral substances needs at goats

In general, there is little difference in the metabolism of nutrients at goats and other domestic farmed animals.

From makroelements, special attention in the goats' nutrition should be paid to calcium (Ca) and phosphorus (P). These elements are very important for development of bones, synthesis and secretion of milk. At animals with unfinished growth, lack of one or both elements leads to poor growth and deformation of bones (rickets). At adult goats, especially those in lactation, if Ca and P are not taken with the food in sufficient quantities, they are mobilized from the bones in order to ensure the priority functions of the body, such as the synthesis of milk. Usually the body reserves are filled when consumption exceeds the current needs of the organism. The continuous mobilization from the bones can lead to thinning of the bones and loss of strength (osteomalacia) and the emergence of bone fragility. Daily needs of Ca, P and Mg (Magnesium) at goats are shown in Tab. 50.

Table 50
Daily needs of Ca, P u Mg at goats

Body weight (kg)	Sustainable needs (g/day)		
	Calcium (Ca)	Phosphorus (P)	Magnesium (Mg)
10	1	0,70	0,18
20	1	0,70	0,35
30	2	1,40	0,53
40	2	1,40	0,70
50	3	2,10	0,88
60	3	2,10	1,06
70	4	2,80	1,23
80	4	2,80	1,41
Daily growth (g)	Additional daily needs for body weight growth (g/day)		
50	1	0,50	0,14
100	1	0,70	0,27
150	2	1,40	0,41
200	2	1,40	0,55
End of pregnancy	2	1,40	0,60
milk/kg day	1	1	1
2.5–3.5% fat	2	1,40	1,00
3.5–5.0% fat	3	2,10	1,00

The ratio Ca:P should be maintained between 1,2:1 and 2,5:1. The lower ratio (below 1:1) leads to urolithiasis (formation of urinary or kidney stones) especially in male animals. Consuming large quantities of Ca is not associated with the effects of acute danger, but can disrupt resorption and to cause a deficit in P and certain bivalent cations (Mg, Mn, etc.).

Goats with high lactation may suffer from puerperal paresis (milk fever), as a consequence of metabolic hypocalcaemia (low concentration of Ca in the blood). Even though this phenomenon can be connected to Ca in the food, it is also associated with the activity of parathyroid hormone, which is included in the release of Ca from the bones. The absence or delayed activity of parathyroid hormone in early lactation results with decreasing the content of Ca in the blood and the occurrence of a mild form of milk fever. This phenomenon is less common at goats compared to cows, and if it occurs, it should be treated

with intravenous application of solution containing Ca and glucose.

Phosphorus is especially important for consumption of forage food and the metabolism in the rumen. Goats show smaller consequences of the low content of P, but still need to consume adequate amounts of P because it is considered as important macroelement for the goats production. The great selectivity of goats in food choices, lead to taking meals that contain more P.

The following table (Tab. 51) shows the daily needs of microelements at goats.

Of all macroelements, special importance in the goats' nutrition have Na, Cl, Mg, K and S. Of these, only Na and Cl (salt) should be routinely given to animals if they want. The Mg deficiency, can occur at goats when grazing young grass (pasture tetany). The content of S in the meal may be small, particularly for Angora goats (breed for wool production) that have great needs for amino acids containing S. Most common foods contain adequate amounts of Mg, K and S.

Table 51
Daily needs of microelements at goats

Elements	Concentration in the meal (mg/kg dry matter)
Iron (Fe)	40
Zink (Zn)	40
Manganese (Mn)	40
Copper (Cu)	10
Selenium (Se)	0,10
Cobalt (Co)	0,11
Iodine (J)	/

Microelements that have the greatest significance are the following: Fe, J, Cu, Mo, Mn, Co and Se. However, none of these microelements are considered routine deficient. The potential insufficiency is of regional character. But given that some of these microelements have a thin line between the amount which causes the deficit and their toxicity, it is necessary to consider certain circumstances when giving these microelements as desired.

For example, there are many open questions about the sensitivity of goats of copper poisoning. It is considered that goats are less susceptible to copper poisoning comparing to sheep, but quantities greater than 15 ppm should be avoided because it can cause some problems.

1.11.13.6. Vitamins needs at goat

In the nutrition of goats, few vitamins may be periodically limited because most of them are microbiologically synthesized in rumen of the adult goats. From fat-soluble vitamins, the deficit is likely only for vitamin A, which limits the production at goats. All B complex vitamins, are synthesized by bacteria in the rumen, with the exception of vitamin B12 in regions with a cobalt deficit. Needs for vitamins A and D at goats are shown in the following table (Tab. 52).

Table 52
Daily needs of vitamins A and D at goats

Body weight (kg)	Maintenance needs	
	Vitamin A (I.U./day)	Vitamin D (I.U./day)
10	400	84
20	700	144
30	900	195
40	1200	243
50	1400	285
60	1600	327
70	1800	369
80	2000	411
Body weight growth (g/day)	Additional needs for growth	
	Vitamin A (I.U./day)	Vitamin D (I.U./day)
50	300	54
100	500	108
150	800	162
200	1100	216
End of pregnancy	1100	213
Milk (kg/day)	3800	760

Vitamin A is not present in the plant's tissues, but it is synthesized in the body of animals from beta carotene that is present in

plants. The level of precursor is usually in relation to plant pigments (green, yellow, etc.). Although the plants in active growth are rich with provitamin A, influenced by weather conditions, the amount of provitamin A decreases. After the synthesis, vitamin A can be deposited in the liver of animals, while the metabolism is performed when necessary. Seasonal and cyclical growth of forage foods as well as the selective grazing of the goats, completely prevents the deficit in vitamin A at the goats when free grazing. Deficiency of this vitamin can occur in stable bred animals and goats that graze during the long dry period or cold weather. The lack also occur when exhausted body reserves of vitamin A, and when consumed small amounts of green food, or no green food at all.

1.11.13.7. Water needs at goats

The quantity, quality and availability of water are important elements for the health and nutrition of the goats. Given that water drinking is associated with food consumption and food consumption is associated with the productivity of animals, general recommendation is the goats to have free access to water, in order the quantity of drank water to be maximum, so the consumption of forage food won't be limited. It should be stressed that goats are very sensitive compared with other species in terms of water quality, and they refuse to drink slightly polluted water. Not to mention water contaminated with faeces and urine. It is the same with unclean food too, therefore, we should take account of these facts.

The quantity and frequency of water drinking varies depending on the breed of goats, lactation and meal. Based on the metabolic body mass, we could generally say that goats consume smaller quantities of water compared to sheep and animal. However, it could be significantly influenced by the type of food. It may be concluded that goats take smaller amounts of water when eating forage food with lower quality and higher amounts of water when consuming forage food of higher quality.

The lactation of goats influences the amount of water needed. Namely, despite the maintenance needs for each kg of milk produced, it is necessary to provide 1,43 liters of

water. Besides the previous factors, the water drinking is also influenced by the following factors:

water content in plants, salt consumption, temperature of the external environment, water temperature and concentration of electrolytes in the water.

The goats should be provided with permanent and free access to clean fresh water, even when grazing or consume foods with high water content. Nevertheless, even though the goats are relatively resistant to short periods without water, insufficient water consumption over a longer period, leads to reduced food consumption and reduced production.

The goats' needs for water vary depending on the external environment, the type of food that they use as well as on the animal itself. Water content in various foods has a significant impact on drinking water. For example, 1 kg silage with 25% dry matter provide 750 g of water, while 1 kg of hay with 85% dry matter provides only 150 g water.

Given that goat milk contains 87% water, goats with high production, have greater needs in terms of goats with lower milk production. For every kg of dry matter consumed, goat should receive about 4 liters of water. This means that when eating straw or on pasture, water consumption will be lower. Animals that during the day consume 2 kg of hay and certain quantities of concentrate can drink up to 13 liters of water.

1.11.13.8. Composition and quantity of food at goats according to physiological stage

Because it is about establishing repro-center for goats of Alpine and Saanen breed whose morphological and production characteristics are mentioned above, the diet of breeding heads from the Alpine breed which belongs to the production direction milk–meat, regarding the composition of food should be considered the following traits: average body weight – 50 kg (goats) or 70 kg (male goats–bucks), fertility of 150–180% and lactation of 600–700 kg for lactation period of 240–300 days.

On the other hand, the diet of breeding heads from Saanen breed, regarding the composition of food should be considered the

following traits: average body weight – 50–85 kg (goats) or 75–100 kg (male goats), fertility of 180–250% and lactation of 800–900 kg for lactation period of 240–300 days.

1.11.13.8.1. Nutrition of pregnant goats

The pregnancy period of the goats matches with the last stage of lactation and drying period. At the early pregnancy, the nutriment needs of the fetus are low, so it does not require additional nutriment quantities up to two months before birth, when the goats dry. The nutrition of the goats at the end of pregnancy should be carefully controlled in order to avoid problems when giving birth and to achieve maximal milk production with high quality in the next lactation. At this stage of the pregnancy, nutrition should not be above needs, but also not under the needs, because you can result with metabolic disorders during early lactation (ketosis) and a reduced lactation. In obese goats, the appetite decreases, while at thin goats body reserves for the synthesis of milk are very small. At the same time, the obese goats have difficulties when giving birth, while the thin ones could give birth to kids with reduced viability. If the goats at the end of pregnancy are given large amounts forage food, in that case would consume relatively large amounts of dry matters in the early stage of lactation and produce more milk in relation to goats who consumed small amounts forage food.

At the end of the pregnancy in meal of the dried goats should be added certain amounts of additional mineral substances. However, we should be aware because the increased consumption of Ca leads to the emergence of milk fever. For example, goats weighting 70 kg should be given approximately 6 g Ca and 4,2 g P per day, at the end of the pregnancy.

Given that the total food needs of goats consist of sustainable and production food, goats during early pregnancy should receive only a certain quantity of food. Specifically, the both breeds (Alpine and Saanen) projected for breeding in repro-center, would be on certain quantity of food according to the projected breeding technology (extended lactation) the first 3 months of the pregnancy when the lactation is low, and also when the pregnancy is low.

Based on the stated norms, total food needs by the goat, per days during pregnancy

period are shown in Tab. 53.

Table 53

Structure of food per goat, per days and total, in pregnancy

Production phase	Body weight kg	Period	Herbage kg	Hay kg	Concentrate kg
Pregnancy (first three months or 90 days)	50	Daily	4	/	0,3
		For 90 days	360	/	27
Pregnancy (last two months or 60 days)	50	Daily	5	1,5	0,4
		For 60 days	300	90	24
*Annually per goat		150 days	660	90	51

If the goat from the forage part eats only hay without herbage, it has to get 2–3 kg, depending on weight and productivity. Here, also should be considered the wastage of the food that at goats may amount to 30–40%. The amount of concentrate remains unchanged.

Anticipated hay or herbage can be replaced or partially substituted by other forage or concentrated fodders (silage, crop, etc.).

1.11.13.8.2. Nutrition of goats in lactation period

When it comes to feeding goats in lactation, it is necessary to know that the average energy needs for milk production amount to 5.1 MJ/ liter. It is often at the beginning of the lactation the goats not be meet energy needs. So the nutritionists recommend at this time the goats to be given some energetic additives (30–40 g/day per head), a week before and a week after giving birth. When using such a product could be achieved more effects:

- Providing a high input of dry substances,
- Increases milk production,
- Increases the amount of proteins in milk
- Increases the amount of fat in milk
- Improving production,
- Maintain fitness,
- Reduces the risk of ketosis.

The lactation curve at goats is similar as at cows. Maximal daily lactation at goats occurs between 8th and 12th week of the lactation. When the milk quantity is lowers, it is 2,5% per week. In many cases, the lactation curve at goats is relatively flat. Sharp curves

of the lactation can be achieved as a result of inadequate nutrition during drying period and early lactation.

The higher milk production at goats is correlated with high consumption of nutrients during early lactation, when should be taken at most 40–50% forage foods in a meal. As at cows, at the goats with high lactation too there is a tendency of losing body weight during early phase of lactation (80–100 g /day). Although at the goats that decline is smaller in terms of cows, there is a tendency to maintain high daily lactation at the expense of decomposition of the body weight. For these reasons, the goat very quickly react to changes in the provision of nutriment compared to cows.

The maximal daily lactation (peak lactation) usually occurs before the maximal appetite, that could be reached even after the 10th week after giving birth. For these reasons, it is very important in early lactation to be provided a meal containing a highly enough concentration of nutriment, in order to ensure high milk production with little loss of body mass. The meal should be formed in accordance with the genetic potential of the goats for milk production.

In milk production, the goal should be set depending on the breed and the breeding manner at high dairy breeds with 1000 liters of milk, with more than 3,5% milk fat and more than 3,2% milk proteins. To accomplish this goal, it is necessary to provide enough quantity of high quality forage food so that additional food should be used only during the early and middle stages of lactation. To

achieve maximal production of quality milk, it is necessary to take the following measures:

- Providing adequate nutrition of goats at the end of pregnancy, in order to avoid overfeeding and underfeeding of animals. This can be achieved using high quality forage food and taking meals for lactation before giving birth;

- The concentrate fodders should be introduced gradually in the meal – during of 4–6 weeks after giving birth;

- Maximal consumption forage foods can be accomplished by: providing quality forage foods, giving fresh forage foods several times a day;

- During one meal should not be included concentrate more than 0,5 kg.

If there are sufficient quantities of high quality forage foods, they may be given ad li-

bitum (optional) with the same daily amounts of concentrate during the lactation. The various lactation is also as a result of consuming various amounts of forage food, so the goats with higher lactation has a greater need for consumption of these foods.

Unlike the sustainable part, the meal for milk production at goats is changing along with the quantity of milk produced during the day. For each kg produced milk with 4% fat and quantity over 0,5 kg, despite the specified quantity, it is necessary to add food in amount of 3,18 MJ ME. The production meal for milk contains a higher proportion of proteins and calcium compared with that for pregnancy.

Based on the stated norms, the total food needs per goat during lactation are shown in Tab. 54.

Table 54

Structure of food per goat in lactation, per days and total

Production phase	Body weight (kg)	Period	Herbage (kg)	Hay (kg)	Concentrate (kg)	Salt (g)
Lactation of goats (1/3 – 100 days)	50	Daily	6	1,5	0,3	12–15
		For 100 days	600	150	30	1500
Lactation of goats (2/3 – 110 days)	50	Daily	7	1,0	0,3	15–17
		For 110 days	770	110	33	1870
*Annually per goat		210 days	1370	260	63	3370

In the previous table is not given the structure of the food for the last third of the goats' lactation, given that this period coincides with the first three months of the pregnancy at goats and the quantity for this period is given in Table 53.

Standard meal for lactating goats with live weight of 50 kg and daily milk production of 2 kg in summer, will consist of 6–7 kg pasture, 1 to 1,5 kg hay and 0.3 kg concentrate.

However, generally, it should be known that for every liter of goat milk produced over 0,5 kg, with adequate fat, on the specified amount of food is also added:

- 0,75 kg hay or 2,25 kg grass with a fat content of 3 to 3,5%

- 1,0 kg hay or 3,0 kg grass with a fat content of 4%.

1.11.13.9. Nutrition of bucks (male goats)

The nutrition of breeding male goats varies during the mating season and the rest of the year. In mating season the amount of forage food should be significantly reduced, and the concentrate quantity to be limited to 0,3 to 0,6 kg /day.

Larger quantities of concentrate can be given only when mating season is short and intense. Concentrates should be introduced gradually 50–60 days before the mating season. During the other part of the year, the nutrition of the male goats should be adjusted in terms of maintenance of the body weight or improving the shape. In this period the forage foods are the only choice. The consumption of forage food can vary from 13 to 16 g /kg body

weight. If the quality of the forage food is bad, then additional foods should be provided. But the consumption may be restricted if the quality of forage food is high. It is necessary the breeding male goats to take additional quantities of mineral substances and vitamins, especially salt, but the needs of Ca (4–6,5 g/day) and P (3–5,5 g/day) are lower at male goats in relation to goats in lactation. Consuming large amounts of P and Mg can cause urinary stones.

It is recommended the male goats throughout the year to be separated from the goats, housed in group or individual stalls where they will be kept in breeding condition. One to two months before the period of intense exploitation should be started their preparation in accordance with the norms on male goats in exploitation. Before the mating-season would also be made correction of the hoofs, if there is a need to do the same.

Due to the shorter period of exploitation, the male goats will be on certain amount of food 8–10 months during the year. The nutrition norms of male goats in and out of season are given in the following table (Tab. 55).

T a b l e 55

Daily nutriment needs for male goats in and out of season

Period	Methabolic energy (MJ/day)	Digestible proteins (g/day)	Calcium (g/day)	Phosphorus (g/day)
Season	11,84	240	8,0	12
Out of season	8,88	140	12,0	15

To meet the nutriment needs of the male goats in the period of resting and reproductive activity it is projected the structure of the food quantity shown in Table 56.

T a b l e 56

Structure of food for male goats, per days and total

Production phase	Body weight (kg)	Period	Herbage (kg)	Hay (kg)	Concentrate (kg)	Salt (g)
Resting period	80	Daily	5	0,0	0,3	10–15
			245	1225	0,0	73,5
Period of intensive use	75	Daily	6	1,0	0,6	15–20
			120	720	120	72
*Annually per male goat			1945	120	145,5	5162,5

The increasing of the participation of concentrates in the food quantity at male goats (from 0.3 to 0.6 kg/day), will begin 6–7 weeks before the start of their reproductive use. This is especially important because the process of spermatogenesis begins exactly this period, 50–60 days before the mating season i.e. mating of goats. Concentrate would not be given 6–7 weeks after completion of this period. In the mixture for breeding male goats the participation of the oats should be around 40%.

1.11.13.10. Nutrition of breeding offspring

The nutrition of the breeding offspring (male and female) should be directed towards

achieving good growth and development in order, to achieve insemination and giving birth at the age of 12–15 months. The animals that give birth at the age of 12 months, during insemination (at 7 months of age) should have 60% of the adult animal's weight. Animals giving birth at 15 months should reach the normal body weight, when inseminated at 10 months of age, with an average daily growth of 140g/den. During the growing of breeding offspring, it is recommended using a variety of foods, in order the animals to gradually adapt to changes in the composition of the meal. It is also recommended using meals with a high quantity of forage foods, in order to be achieved the effect in consuming forage foods during the next lactation and decreasing the nutrition costs. During the first lactation, it is

necessary to provide energy and proteins for gaining 8–10 kg body weight (about 30g/per day), despite the needs for milk production. The nutriment needs for the replacement offspring i.e. the kids left for replacement the

flock, as well as the weaned lambs and ewes are shown in Tab. 57.

The amounts of food for weaned kids (kids for breeding), based on the given norms are shown in Tab. 58.

Table 57

Nutrient needs for breeding kids depending on the age and the live weight

Age (month)	Live weight, (kg)	Growth (g/day)	Energy (MJ/day)	Digestible prot. (g/day)	Ca (g/day)	P (g/day)
2	12,6	160	4,00	80	3,6	1,6
3	17	155	4,12	77	3,5	1,6
4	21,65	140	4,63	74	3,5	1,7
5	25,85	130	4,92	68	3,2	1,7
6	29,75	120	5,06	62	2,9	1,7
7	33,35	110	5,14	60	2,7	1,6
8	36,65	100	5,22	58	2,5	1,5
9	39,65	90	5,30	56	2,4	1,4

Table 58

Amount of food for breeding kids (offspring for replacement)

Age (month)	Live weight (kg)	Period	Herbage (kg)	Hay (kg)	Concentrate (kg)	Salt (g)	Milk (kg)
2–3 (60–90 days)	18	Daily	2	0,5	0,6	9	1,0
		30 days	60	15	18	270	30
3–5 (90–150 days)	22,5	Daily	4	0,3	0,4	6–10	/
		For 60 days	240	18	24	480	/
5–7 (150–210 days)	27	Daily	4,5	0,3	0,3	6–10	/
		For 60 days	270	18	18	480	/
7–9 (210–270 days)	33	Daily	6	0,4	0,4	6–10	/
		For 60 days	360	24	24	480	/
Total per head			930	75	84	1710	30

1.11.13.11. Feeding kids

The weight of the kids at birth is 2,5–4,0 kg depending on sex, breed, mother's age and number of the kids at birth. Normally born and well developed kid starts with suckling of milk one hour after birth and without somebody else's help. But if it does not happen, or the goat does not allow the kid to suckle, then the assistance of the breeder is necessary. This phenomenon is common among young mothers. In such cases, the udder should be previously cleaned, and the first jets of milk should be milked, so the kid could suckle.

Kid should suckling from the mother during the first two days of life, to consume the required amounts of colostrum, because it is consisted of the necessary defensive substances (immunoglobulins) that are necessary for increasing the immunity of the newborn kid from the effects of harmful agents from the external environment. Later establishes and starts to function its immune system.

The colostrum is synthesized from the milk gland during the last days of the pregnancy, and during the first 24–48 hours after birth. Colostrum contains more albumin and globulins and less casein. Protein content of

colostrum is not equal and as time goes by (from birth), and the quality rapidly changes.

The first day of the secretion, colostrum contains 75% albumin and globulins and 25% casein. After 48 hours, colostrum has 75% casein and 25% albumin and globulins, suggesting the secretion of the milk first. Until one month old, the milk is the basic food of the kid. As it grows, more important for its growth and development are the hay and concentrate. The earlier the kid starts consuming hay and concentrate, the better its digestive tract develops. For these reasons from 10–15 days after birth, the kid should be allowed to eat quality hay so the micro flora in its rumen could be formed. Additionally, they are given concentrate, that in its composition contains oats.

The kids, like lambs, at the end of the second week after birth, besides colostrum begin to eat limited amounts of concentrates and lucerne hay. By the age of two months

(60 days), giving herbage to the kids should be avoided due to risk of diarrhea.

After this period (60 days) the kids should get used to the herbage, or to go to pastures occasionally in the vicinity of the farm. Otherwise, they should be provided with herbage (withered) at the facility, where they are bred. The change from hay consumption to herbage consumption is done gradually, to avoid disturbance of the digestive tract. Young animals should not be left without additional concentrate. Taught to consume coarse, green and concentrated foods the kids are easily weaned from colostrum at age 2 months. They develop normally and reach the required live weight by the insemination. The nutriment needs of the kids, depending on age and live weight are given in the following table (Tab. 59).

The food quantities for kids (male and female), based on the given norms are given in Tab. 60.

Table 59

Nutrient needs for kids depending on the age and the live weight

Age (month)	Live weight (kg)	Growth (g/day)	Energy (MJ/day)	Digestible prot. (g/day)	Ca (g/day)	P (g/day)
0–30	7,5	165	3,18	80	3,1	1,3
30–60	12,5	165	3,62	79	3,4	1,5

Table 60

Food quantities for kids (male and female) aged up to 60 days

Age (month)	Live weight (kg)	Period	Herbage (kg)	Hay (kg)	Concentrate (kg)	Salt (g)	Milk (kg)
0–30	7,5	Daily	0	0,2	0,3	7	1,0
		30 days	0	6	9	21	30
30–60	12,5	Daily	0	0,4	0,5	8	1,5
		30 days	0	12	15	24	45
Total per head			0	18	24	45	75

1.11.13.12. Food balance at goats

Based on the stated nutriment needs and the structure of the food quantities at both goat breeds projected for breeding in the repro-center has been prepared a balance of the annual needs of some fodders in the repro-center, per goat categories. The balance like at sheep includes four most important types of fodders: herbage – that will be pro-

vided from the pasture during the year, hay – provided from the plough areas (for the period: fall, winter, spring), concentrate and salt. When calculating the balance, it has been taken into consideration the total number of goats from both breeds (Alpine and Saanen), given that food needs are quite close. The food balance is calculated for a period of 6 years (2013–2018), for each year separately and total (Tab. 61).

Table 61

Annual nutriment needs at the goat repro-center, by categories and years

Category	Number	Herbage (tons)	Hay (tons)	Concentrate (tons)	Salt, gr	Milk, kg
2013						
Breeding goats (pregnant goats +goats in lactation)	100	203	35	11,4	337	/
Male goats	6	11,67	0,72	0,87	31	/
Offspring for replacement (ewesand weaned lambs)	/	/	/	/	/	/
Kids for selling (m. And f.)	/	/	/	/	/	/
Total	106	215	35,72	12,27	368	/
2014						
Breeding goats (pregnant goats +goats in lactation)	98	199	34,3	11,17	330	/
Male goats	6	11,67	0,72	0,87	31	/
Offspring for replacement (ewesand weaned lambs)	52	48,36	3,9	4,37	89	1560
Kids for selling (m. And f.)	86	/	1,55	2,06	3,87	6450
Total	242	259	40,47	18,47	454	8010
2015						
Breeding goats (pregnant goats +goats in lactation)	96	195	34	11	324	/
Male goats	6	11,67	0,72	0,87	31	/
Offspring for replacement (ewesand weaned lambs)	104	97	7,8	8,74	178	3120
Kids for selling (m. And f.)	86	/	1,55	2,06	4	6450
Total	292	304	44	23	537	9570
2016						
Breeding goats (pregnant goats +goats in lactation)	144	292	50	16,42	485	/
Male goats	12	23,34	1,44	1,75	62	/
Offspring for replacement (ewesand weaned lambs)	126	117	9,45	10,58	215	/
Kids for selling (m. and f.)	128	/	2,30	3,10	6	9600
Total	410	432,34	63,19	31,85	768	9600
2017						
Breeding goats (pregnant goats + goats in lactation)	192	390	67,2	22	647	/
Male goats	16	31	1,92	2,33	83	/
Offspring for replacement (ewesand weaned lambs)	172	160	12,9	14,45	294	5160

Kids for selling (m. and f.)	170	/	3,06	4,08	8	12750
Total	550	581	85,08	42,86	1032	17910
2018						
Breeding goats (pregnant goats +goats in lactation)	262	532	91,7	29,87	883	/
Male goats	20	39	2,4	2,91	104	/
Offspring for replacement (ewes and weaned lambs)	230	214	17,25	19,32	394	6900
Kids for selling (m. and f.)	234	/	4,21	5,62	11	17550
Total	746	785	115,56	57,72	1392	24450

*Total food quantity for breeding goats is calculated for heads weighting 50 kg

Given that the herbage will be provided from pasture, according to data presented in Tab. 61, in 2013, when the total number of goats in repro-center is 106 (100 goats and 6 bucks) the hay needs are 36 tons, concentrate 12 tons and about 370 kg of salt. After 5 years, i.e. in 2018 when the total number of goats of all categories in repro-center would be 746 heads, the hay and concentrate needs amount to 116 or 58 tons, respectively.

1.11.13.13. Technique of feeding goats

The technique of feeding goats is particularly important for proper use of all nutrients that the goat takes by mouth. The goats' nutrition generally will consist of nutrition in the stable period and nutrition in the grazing period.

When stable nutrition, the forage food will be given 3 times a day, and concentrated 2 times a day (with the exception of dairy goats during the largest daily lactation when milked three times a day).

At dairy goats milked by machine, the nutrition schedule should be the following:

- At 5 am it takes 1/3 of the daily amount of concentrate (during the morning milking)
- At 7 pm 1/2 the daily meal of hay,
- At 13 o'clock the second 1/3 of the concentrate,
- At 17 o'clock last 1/3 of the concentrate (during the evening milking)
- From 18–20 hours the second half of the daily meal of hay.

During the period when goats are dried, the technique of feeding is similar to the previous in that the concentrate is given in two meals during the day.

Usually during the pasture period, the nutrition of the commercial goat flocks mainly consists of pasture and concentrate as an addition. Since we are talking about growing high-quality goat heads in the repro-center, despite the pasture and the concentrate it is also projected ad mixture of certain amount of hay. Hay is not meant to be given only during the first three months of the pregnancy which usually covers the period from September to November.

The schedule of feeding during the pasture period is the following:

- At 5 pm will be given 1/3 of the daily amount of concentrate (during the morning milking)
- After milking is given the first half of the hay,
- Go to pasture after the morning dew,
- At 14 o'clock the second 1/3 of the concentrate,
- At 17 o'clock last 1/3 of the concentrate (during the evening milking)
- After milking the second half of the hay.

However, because of greater practicality, the concentrate will be given three times a day, only when the goats are milked three times. Otherwise, they will it in the morning and in the evening.

1.11.14. Labor needs in the goats' repro-center

Taking into account the structure of both flocks of Alpine and Saanen breeds projected for breeding in goat's repro-center, the labor needs are similar with those of sheep. The first three years (2013, 2014 and 2015.) would have minimum two employees. Fourth year

that number would be increased for one more, i.e. three, and this number would be the same for 2 more years (2016 and 2017), while the sixth year (2018), the number of employees would be increased to four. In addition to this number, an employee must have a university degree in agricultural or biotechnological sci-

ences because of the complexity of things, as well as the legislation that requires the farms of this type to have a highly qualified staff.

To implement the measures for health protection, repro-center will conduct a contract with an authorized veterinary service.

1.12. TECHNICAL SOLUTION FOR THE SHEEP REPRO-CENTER

1.12.1. OBJECTS FOR HOUSING SHEEP

1.12.1.1. General preconditions

When building housing objects for sheep, as well as all other domestic animals, it is necessary to pay attention to several important basic elements, such as:

1. To gradually increase the farm;
2. To project farm in order to satisfy the requirements for the next 5 years;
3. To be realistic in forecasting;

In addition, we should have realistic assumptions about the size of investment, size of the farm, available labor, the production system that should be in accordance with the maximal utilization of natural resources, etc.

Although it is known that sheep do not require special housing conditions, however when designing new facilities or reconstruction of the existing, should be met some basic requirements:

1. Protection from cold and rainy weather, i.e. good protection of the sheep from adverse weather conditions,
2. Optimal spaciousness, lighting and ventilation,
3. Shade in summer period,
4. Well cleaned and dry surface, which means dry effluent,
5. Protection from wild animals and other predators,
6. Storage for food, mat and equipment,
7. Possibility for implementation of mechanized work, with suitable work space, as well as adequacy for easy maintenance of hygiene.

Generally, housing buildings for sheep should provide:

- Good ventilation, without draft,

- Comfortable and dry space for laying,
- Enough space for mangers that will prevent food wastage,
- Enough stal (group and individual) for the projected sheep number,
- Supply of water and electricity,
- Storage for hay and silage,
- To provide suitable access for people and machinery,
- Access to road,
- To be fully adapted to local climatic conditions,
- To offer pleasant ambient to the sheep,
- Objects must be economical, i.e. the investments to be minimal.

When constructing these facilities, they should:

- Meet all regulations concerning animal welfare,
- Meet state requirements for planning of such facilities,
- Be properly designed for the purpose of agricultural production or to meet the prescribed standards in this area,
- Be located at an appropriate place, to provide a firm, flat surface, at least 35 m away from a watercourse,
- Meet the regulations on the environmental protection.

Although all the conditions will be projected in the construction or architectural project, in the next chapters we will mention the more important construction traits that should meet the objects of this type.

1.12.1.2. Location

The farm will be located on a total area of 6,6 ha in area of the village Burilchevo, municipality of Cusinovo–Oblesovo. The village has access to asphalt road, and last 1000 meters from the village to the location itself are land road, which will probably need further tamponed.

The location according to the inspection of the spot is provided with water from the rural water–supply, and also has an electricity supply. Although the water has been used to watering the heads, it must be controlled additionally (physically, chemically and microbiologically), in order to examine its sanitary

and technical correctness. At the beginning this water–supply would satisfy the farm's needs of water, and if there is a necessity in the later period could be made a new bore–whole for water. The terrain is drained with no presence of high underground waters, but there is one part of the location where it is possible to occur. The natural inclination (about 5–7%) is adequate for object of its type. The location itself provides free access to pastures, in diameter of 5 km. At this location there are other buildings about 30 years old, where were housed the sheep of ZZ "Mosha Pijade" from the village Gorni Podlog, Kocani (Figure 9).



Figure 9. Facilities on the location projected for the construction of the sheep' repro-center

Although our proposal is to build completely new facilities, where could be started the production process, there is an opportunity for reconstruction of existing ones. The reconstruction of existing facilities would significantly reduce the costs at the beginning of production.

When building the facility, it is advisable the same to have a southern or southeastern

exposure, preferably with natural shelter protected from the north side.

1.12.1.3. Zootechnical norms and ambient conditions of the facility

Important norms that should be met in the field of spatial planning in the construction are shown in the following table (Tab. 62):

Table 62

Norms for special planning when locating sheep farm

Ordinal number	Minimal distances between the farm and the appropriate object (m)	
1.	House	25
2.	Road	5
3.	Rivers	35
4.	Lakes, pools	200
5.	Sources, wells	35
6.	Populated area	50
Minimal distances from threshing barn (m)		
1.	Road	5
2.	House	50
Minimal distances from lagoons (m)		
1.	Sources, wells	35
2.	Populated area	200
3.	Road	5

When designing the facility for sheep breeding should be taken into account of basic zootechnical norms for housing of certain sheep categories (Tab. 63 and 64). The building should represent a whole from organizational point of view, and at the same time to be functional and appropriate for the type of production.

At the farm must provided all necessary conditions for life, in order to achieve maximal sheep production.

Climate conditions that have a great significance in sheep breeding are the temperature and humidity:

Air temperature: The sheep do not require special conditions regarding the heat because they are not so sensitive to low temperatures. The object for the sheep should be constructed so that it does not have too high nor too low temperature. During the winter, temperatures in the building must not be below +6°C, while in summer over +25°C. During winter, the optimal temperature in the facility should be between +12 and +15°C. In the room that is designed for lambing, in winter the temperature must not be below 12°C. It is best if the temperature is maintained around +18°C.

Table 63

Zootechnical norms for sheep housing

Cathegories	Covered area, m ²
Sheep	1,2–1,7
Rams	1,8–2,2
Offspring	0,7–1,0
Lambs	0,6–0,8

Table 64

Ambiental conditions for sheep

Optimal temperature	10–18 °C
Optimal humidity	75–80%
Air circulation	0,5 m/s maximum
Ventilation per head	20m ³ /h
Air needs per sheep	5–6 m ³
Nutrition area	Lenght, sm
–sheep	40
–offspring	30
–lambs	20
Natural lighting	1/20 from the floor area
Intensity of illumination	100 lx
Effluents	Min 150% of the covered area

Humidity: In order to ensure optimal air humidity in the facility, the space inside should have adequate dimensions, good thermal isolation of the space inside, and proper ventilation. The saturation of the air in the building with water vapor caused by sheep' breathing and secretion of urine, the mat dampens and evaporates. This water vapor stays at the cold walls and the ceiling where it condenses and transformes again into drops that fall again and moisten the mat. Regardless of the season, humidity in the building should not be above 75%.

Lighting in the building, both natural and artificial is also very important factor. The direct sunlight is especially important because of its role in the creation of vitamin D in the skin of sheep, because of its bactericidal action, influence on the process of metabolism, and the mental condition of the animals. It is already mentioned that for optimal natural lighting, when positioning the windows, their

surface in relation to the surface of the floor should be 1/20. Of course, besides the natural, the object also needs artificial lighting, especially during the winter.

Ventilation is very important moment for providing suitable environmental conditions in the facility. The sheep in the sheep pen when breathing spend large amounts of oxygen, and emit significant amounts of carbon dioxide and water vapor. At the same time the decomposition of the urine and the feces creates ammonia, sulphur hydrogen and other gases. This pollutes the air, so it can quite adversely affect the sheep' health and their production. Due to hygiene maintenance in the sheep pen, the air contaminated with various gases, dust and microorganisms, as well as the excess of vapour should be constantly ventilated, and to simultaneously brings fresh and clean air. This constant air exchange in the building must not adversely affect the maintenance of optimum temperature in the building nor to cause draft. Usually in the sheep pens with smaller capacity, the ventilation can be solved by building gutters and inlets for airing that operate on the basis of the difference in temperature between the external and internal air. The ventilation channels that take off the polluted air and water vapor are build in a form of chimney, whose dimensions range from 40x40 to 70x70 cm. These channels on the top have cover, which prevents entry of rain and snow. Thus the fresh air enters through the windows, while the warm or heated air rises up and goes out through the openings in the roof. In the larger sheep pens, the ventilation could be done with electric fans. They operate on the principle of absorption of heated air and taking it out, as well as bringing fresh air into the object. The maximal speed of such infiltrated air must not be greater than 0,5 m/s.

1.12.1.4. General construction traits of the object

Under the projected structure of the flock and the dynamics of increasing the number of sheep in the period 2013–2018, the farm in 2018 would have 513 sheep heads from all categories. Of them, 217 dairy sheep, 10

rams, 147 heads for replacement and 137 lambs. According to zootechnical norms, and the projected number of heads of all categories, in 2018 the newly built facility is supposed to have a total covered area of 574 m².

Floor. At the construction of the building, the floor is quite important part, because he must be very good heat insulator. Cold floors cause fever, reduce the resistance of the body, cause diseases, especially mastitis at sheep. Good floor is of great importance for the breeding healthy offspring. It is preferred the floor for the sheep to be pressed earth, and it must have a slight inclination, so it will allow leakage of the waste water and other liquids in the gutter, which must be positioned so that waste water would freely leak out of the facility, and would be collected in the channel. If the ground is too permeable, it can be covered with a layer of sand. The concrete floor is not recommended because it is cold and tight, and mat in that case would be constantly wet from urine, which would increase the possibility of various diseases at the sheep. The floors of the building can be made in various ways, but mainly two types of floors are practised: floors of pressed earth (loam) and latticed floor.

If applied latticed floor, then using a straw as a mat is obligatory, which for the animals is still the best and the most appropriate mat. Moreover, it allows comfortable resting and good thermal insulation because of the fact that the straw absorbs moisture and binds the ammonia from the feces and the urine. For this purpose, the most convenient is the wheat straw. It is thought that sheep with two lambs daily need about 0,5–1 kg of straw.

The latticed floor can be made from wood and metal bars, but the most used, especially in pig farms is the floor from the plastic bars. (Figure 10).

When constructing this type of floors, it should be considered to be provided enough space for collection of the waste water. Under the bars it is projected concrete pit with depth of about 50 cm. In such facilities with lattice floors, the straw mat is completely unnecessary.



Figure 10. Metal lattice floor at a sheep farm
(Ph.D. Nikola Pacinovski, 2011)

Walls: The walls of the building function as thermal insulation, the ability to maintain cleanliness, successful implementation of disinfection and lighting in the sheep pen depend on their quality. The quality of the walls primarily depend on the foundations that should not reach the level of the groundwater, and must be constructed of material that is impervious to water. The part between the foundation and the wall should have hydro-isolation layer, because the rising damp can rise to the top of the wall. So, the moistened walls will always be cold, and thus the entire facility. In the colder areas it recommended the walls have better thermal insulation, for maintaining optimal temperature in the building during the winter. On the inner side, the walls must be painted with material that is impervious to water, and should be whitewashed at a height of 1.5 m.

In our country, the walls of the farms are built from various materials, but usually the one that is easy and cheap to purchase. For example, in mountainous regions where there is timber, for construction of the walls could be used the timber too. However, the most recommended are hollow blocks.

Roof: The roof of the building can be on one or two ducts and the height of the eaves

should be at least 2,3 m. The roof can be built from various materials (tiles, sheet metal, etc.), but it is better to be a sandwich system with sheet metal, with some insulator (polystyrene, tervol etc.). In order to achieve a better lighting at many parts of the roof are set transparent plates (glass or plastic). This saves energy for lighting, and achieves optimum illumination of the building with natural light during the darkest days of the year.

Ceiling: The ceiling (if built) must also be a good heat insulator, even better than the walls, because large amount of heat goes through it. If there is no ceiling, the roof on the inside must be heat insulated. As insulator could be used compressed straw with thickness of about 15 cm, polystyrene or polyurethane with a thickness of 5 cm. The height from the ceiling to the floor should be between 2,7 and 3 m.

Windows: The windows are placed on the longitudinal sides of the building, at a height of 1,8 m from the floor. The dimensions of the windows are different, but mostly rectangular, with a smaller height than length. It is desirable to open at lower axis inwards (uncovering windows). The windows could be made of wood or metal, but the tree has better thermal traits and better endures the impact of

the environment on the sheep pen. The total area of windows in relation to the surface of the floor should be at least 1/20. Windows play a significant role as a natural illuminators of the facility, but also as a good fan or ventilator.

Doors: The doors of the facility for sheep breeding are usually placed on the eastern and southern side of the building, on the longer side. The sheep go out through it in the yard or on pasture. In addition to this, there is also another main door at the side part of the building, for entering the central passageway for nutrition. For easy communication, in the nutrition corridor is set double door with dimensions 2 x 2 m, which allows entry of machinery (tractor). On the side toward the effluent are placed at least two doors with dimensions 1 x 2 m, for easier entering and exiting of the sheep in and out of the facility. Every door should open outwards.

1.12.1.5. Internal organization of the facility

Very rarely at the sheep farms in Macedonia can be seen building for sheep that have multiple rooms separated with appropriate partitions. Usually our sheep pens on the inside are divided by extemporary fences that are made only in the period during

the lambing until the moment when the lambs are sold for meat.

However, the inner part of the sheep building should be organized in several sections:

- Section for housing of the sheep,
- Section for breeding offspring,
- Section for lambs,
- Section for milking with reception room for the milk,
- The section for the rams should be in a separate object within the facility,
- Hospital (for housing sick animals).

The nutrition corridor very often is centrally located, but somewhere there are side corridors. Our recommendation is this building to have only one central corridor, which will meet all needs of the production process. On both sides of the hall will be set feeders (mobile) which will supply food to the sheep in the cold months of the year.

Stalls for sheep: The front side of the stall should allow sheep feeding, with opening at the partitions themselves. In the remaining period of the year (warmer months), feeding of the sheep will be in the effluent, also in specially designed crib for forage and concentrated food (combined cribs), (Figure 11).



Figure 11. Combined cribs for sheep and goats (Ph.D. Nikola Pacinovski, 2008)

The manner of organization of the partitions within the facility is a decision of the breeder itself, but we should still keep in mind that any configuration should allow good communication of each partition with the nutrition corridor, as well as between the partitions among themselves. The partitioning inside the building for creating stalls and partitions is made by movable harrows or other appropriate partitions (wooden or metal). These partitions must always have space for passage of the lambs from one to the other part.

Stalls for rams: The room where the rams would be housed should be located in the southeastern part of the object, while it should be separated by a wall with the object where the sheep are housed, in order to be reduced the visual and other contacts with sheep. It is especially important the rams to be isolated throughout the year out of the mating season.

Milking area: The milking areas as integral parts of buildings for sheep housing, are built on farms where sheep breeds with high lactation are bred (Figure 12).



Figure 12. Modern sheep milking system

So far in the Republic of Macedonia have been made several attempts to introduce the machine milking of sheep, but they all failed. Reasons for this are more, but most often are mentioned the following: it takes a lot of effort while sheep get used to go to the room for machine milking, they have proportionally small udders that are unsuitable for machine milking moulds, the workers don't get used to changes easily, there is fear of losing the job to them, but as the biggest reason is the small amount of milk per milking sheep.

At the construction place, the milking room should be located in the northwestern part of the building. It is separated with re-

maining space in the building by solid walls, and on its northern side is organized a special room in which the milk will be collected. Sheep milking in the milking room can be at platform or with dugged channel. If the farm has a smaller capacity, it is advisable to organize the milking with a platform with 2x6 milking stations. This approach allows milking with cans that have 6 milking units, and if farms have a larger number of sheep in that case should be organized milking room with milk line and channel. When manipulation, is used the nutrition corridor through which the sheep are taken to and from the milking room that has entry and exit door. Next to the milk-

ing room there is another room where the engine from milking machine is installed, as well as the lactofreeze and the boiler for warm water. This room communicates directly with the milking platform over a door through which the milk in cans or through a system of pipes is collected directly into the lactofreeze. This room communicates with the external environment through a door, and over the same door the milk is taken out.

However, given the fact that in the repro-center will be bred a breed which belongs to the combined sheep breeds, at the beginning it is not planned construction of milking area with a system for milking.

Installations in the building: In the sheep farm, except the milking machine with a system of pipes (for vacuum and milk if there is such), are also installed plumbing and electrical installation.

The plumbing is designed to supply sheep with water during the stable period. It is possible to supply using automatic waterholes, that are installed in the stals—one to two, and in addition to supplying this installation provides water to the milking room (if any), as well as in the space for accepting the milk. Very often, in our country the watering is done in the watering trough. The total quantity of water required per sheep is 5–8 liters per day. But the best for the sheep is to always have a sufficient amount of water available. Water must be fresh and clean, because if it is contaminated can cause many diseases. The water temperature is desirable to be between 12 and 16°C.

Electrical instalation should provide lighting of the building and electrical points for use of electric machines. For lighting of the building are used lamps: one lighting place (100 W) on every four meters on both sides of the building, which will provide the required 100 lx of 1m² floor area. If there is milking area, the object will need additional lighting of 2–3 bulbs.

Although in sheep breeding they are used very rarely, the facility must provide points for heating lamps as well as lighting in the effluent, i.e. the yard, for protection from wild animals and other predators. Such a facilities is necessary to have lightning conductor, according to the prescribed standards for commercial buildings.

Effluent: The effluent is placed along the entire southern length of the building, with undertaking the southeastern and southwestern corner of the building. For better functionality, the effluent is partitions in 2–4 pieces, with the possibility of communication between each part. The necessary area of the effluent is about 2 to 2,5 m² per head. The slope of the effluent should be up to 5%. At the effluents are located combined feeders for forage and concentrated food and watering trough with automatic regulation of the water flow. This type of effluent should be also made for the rams and lambs. At the beginning, due to savings, the effluent will be opened, but later it is suggested be covered, because the previous experience shows that during the winter, this part is very muddy, which creates many problems in the breeding. All this would be passed if certain roof construction is built, and the area is opened at all four sides, due to ventilation.

Equipment: For normal functioning of the farm it is necessary to own equipment for everyday operation (Tab.65).

T a b l e 65

Equipment for the repro-center's needs

Equipment	Purpose
Tractor with trolley	Transport of food, manure, etc.
Wheelbarrow	– // –
Automatic waterholes	Supplying the sheep with water in the object
Buckets for feeding lambs with milk	For lambs that are weaned earlier, without mother, etc.
Feeders for concentrate (for lambs)	Only for lambs' nourishing
Mobile combined feeders	For separating forage and concentrated food for sheep
Automatic waterholes, troughs for watering	Watering the sheep with water. Mobile and portable to the object and the effluent depending on the weather conditions
Lactofreezer	For storing and cooling milk at +4 0C
Boiler for warm water	Provides warm water at the farm
Milking machine	Machine sheep milking

1.12.1.6. Supporting facilities

Within the sheep repro-center will be projected the following supporting facilities:

- *Hayloft*: a space for keeping the forage food (given in the balance of food), as well as space for storing straw, which will be used as a mat. In many farms the hayloft, i.e. the facility for housing forage food is located in the attic of the building, which is contrary to applicable laws for fire protection. Because of that, it should be built special area for the hay, that is covered only from above while from all sides is open,

- *Warehouse*: for storing the concentrated part of the food also given in the state-

ment. Usually, there is a small space where related devices and equipment are kept, as well as a small reserve of medical products and drugs,

- *Room for accommodation of employees*: there are bedrooms, kitchen and bathroom for workers on the farm,

- Within the farm there should be and septic tank to collect all waste water from the farm, granary, i.e. barn (if the farm produces silage), the lagoons for animal waste disposal, stationary for sick animals, disinfection barrier, etc.

1.13. TECHNICAL SOLUTION FOR THE GOAT REPRO-CENTER

1.12.1. OBJECTS FOR HOUSING GOATS

1.12.1.1. General preconditions

General preconditions for building facilities for goat breeding are almost identical to those that should be considered when building facilities for sheep, so we won't mention them again.

Important construction traits that should meet the facilities where the goats will be housed, within the repro-center are given below.

1.13.1.2. Location

The farm will be located in area of the village Vrbica, municipality of Cesinovo–Oblesevo. The village has access to asphalt road to the village Sokolarci, and last 2000 meters

from the village to the location itself are land road, which is quite bad and should be additionally tamponed. The location according to the inspection of the spot is provided with water from the rural water–supply, and also has an electricity supply. Before using the water, it must be controlled its sanitary and technical correctness. If there is a necessity, at the farm could be made a new borehole for water.

The terrain is drained with no presence of high underground waters. There is a natural inclination that is adequate for object of its type. The location itself provides free access to pastures, in diameter of minimum 5 km. At the site already exists inadequate object that is used by local sheep breeders (Figure 13).



Figure 13. Location projected for construction of goat repro-center

During the construction, the facility will have a southern or southeastern exposure, and at the back side there is a natural shelter for protection from northern winds.

1.13.1.3. Zootechnical norms and ambient conditions of the facility

Norms that should be met in the field of spatial planning are the same as those for the construction of facilities for sheep (Tab. 62).

When designing *the facility for goat breeding* should be taken into account of basic zootechnical norms for housing of certain goat categories (Tab. 67 and 68). The building should represent a whole from organizational point of view, and at the same time to be functional and appropriate for the type of production.

Table 66

Zootechnical norms for goats housing

Categories	Covered area, m ²
Goats	1,2–1,5
Male goats	2,5
Offspring	0,7–1,0
Kids	0,3–0,5

Table 67

Ambiental conditions for goats

Optimal temperature for goats	10–25 °C
Optimal temperature for kids	12–20 °C
Optimal humidity	60–80%
Air circulation	0,5 m/s., max
Ventilation per head	20 m ³ /hour
Air needs per goat	5–6 m ³
Nutrition area	Length, cm
–goats	40
–offspring	30
–kids	20
Natural lighting	1/20 from the floor area
Intensity of illumination	100 lx
Effluents	Min 150% of the covered area

The interior of the goat housing object will be organized according to the needs of the projected breeding technology.

The goat repro-center will have the same supporting objects as the one for sheep: hay-loft, warehouse, veterinary hospital, rooms for accommodating employees, etc. that would be used according to the farm's needs.

At the farm must be provided all the necessary conditions for life in order to be achieved maximal production of the goats.

Climate conditions that have a great significance in sheep breeding are the temperature and humidity:

Air temperature: The goats, compared to the sheep are more sensitive to low temperatures, especially the kids. Regarding the ideal temperature, the object for goats should be constructed so in it, during the year, there is no major deviation in temperature, i.e. nor too low nor too high. Bearing in mind that in our country, the kidding of goats and the highest milk production is in winter, we should pay attention the temperature in the object during that period not be lower than + 7 °C, because it can result with negative consequences (reducing the lactation). The ideal temperature for goats is between +10 and +15 °C. Because of that, the breeder must provide the basic conditions in order this temperature to be maintained on this level. As to the offspring, the room temperature should not be lower than +12 °C. The best temperature for kids ranges from +15 to +18 °C. It should also be avoided the temperature in the room where they are housed not to rise above +27 °C, because it has negative impact on the goats' health, and on reducing their production.

Humidity: The increase of the humidity in the object for goats is as a result of many factors, among which the most important is the great overcrowding of animals. Many processes happening inside affect its growth. The ventilation in the building affects the maintenance of the relative humidity in it, which in ideal conditions should range between 60 and 70%, while the highest upper limit should not exceed 85%. Because of that, it is required the building to have a hygrometer in it for measuring the humidity.

Goat averagely ejects from 1,2–1,5 liters of fluid a day, and to this amount should also be added the urine that evaporates from the mat. Therefore it is necessary the excess wa-

ter (in the watering places etc.) in the object to be taken out.

Ammonia: Ammonia is very dangerous for the goats' health. Mat releases significant amounts of ammonia, which if not taken out of the object, irritates the bronchi of the animals and threatens their health. By regularly cleaning the trash every month and a half, the ammonia is removed that allows maintenance of clean air and effective protection from insects (flies, etc.).

Insulation and ventilation allow regulation of temperature, humidity and ammonia levels in the facility.

Lighting: For proper lighting in the facility, the greatest significance have the windows. Therefore, during the construction of new facilities or the eventual remodeling of the old, special attention must be paid to having enough windows with appropriate dimensions. It must be taken into consideration that windows do not serve only as a source of daylight, but also enable the ventilation in the object. In order to provide good natural lighting in the building, it is recommended the surface of the windows to be 20–30% of the total area of floor space. Anyway, despite natural lighting, inside the building there should be provided artificial lighting too. It is necessary not only for successful milking and feeding the goats, but also for helping the goat during giving birth, and in other cases. The artificial lighting is especially important during the winter, when most of the work is carried out in darkness. A 40–60W bulb, provides light for 15–20 m² floor area.

Ventilation: The clear air is in the objects for breeding goats very important moment for providing suitable ambient conditions in the facility. Given the fact that generally all conditions that apply to ventilation of the facilities for sheep apply to goats too, we will not stay on this topic.

1.13.1.4. General construction characteristics of the object

Under the projected structure of the goat flock of both breeds (Alpine and Saanen) in the period 2013–2018, the farm in 2018 would have 746 goat heads of both breeds. Of them, 262 dairy sheep, 10 male goats, 230 heads for replacement and 234 kids. According to zootechnical norms, and the projected number

of heads of all categories, in 2018 the newly built facility is supposed to have a total covered area of 670 m². According to zootechnical standards shown in Table 66, the following areas by categories are considered: dairy goat – 1,3 m², goat – 2,5 m², offspring – 0,8 m² and kids – 0,4 m².

Floor: During the construction of the facility, special attention should be paid to the floor. The floor in the stable has a significant influence on the goats' health condition, and hygiene in it. It is important the floor be slightly higher than the level of the ground around the farm. This enables proper leakage of the waste waters, while reducing the possibility of penetration of the groundwater and the surface water in the building at the same time.

The floor in the stable can be made so that first the surface layer of the ground is retrieved and thrown, and then is compacted. After that, on the compacted soil is put one layer of sand (gravel), while over it a layer of pressed clay with a thickness of 10cm. Concrete floors should be avoided, because in that case the mat will always be wet from the urine, that will cause the spreading of various diseases.

If the floor of the building is from compressed soil, in that case using a mat of straw is obligatory. For this purpose the most commonly used is the wheat straw. Daily per goat should be provided around 0,5 kg of straw.

There is a possibility the floor in the object for goat breeding to be made from bars (wooden, metal or plastic), i.e. latticed floor (Figure 14).

As with sheep, when constructing such floors, we should pay attention to provide sufficient space for the collection of urine and feces. Under the bars, usually there is a concrete pit with a depth of about 50 cm. In the objects with latticed floors, the straw mat is completely unnecessary.

Walls: The main goal when constructing the stable is maintaining a proper temperature in it, i.e. the temperature to be warm during the winter and cool during the summer. During construction of the walls, we should pay attention to the choice of construction material. Best material building stables for goats are porous blocks.



Figure 14. Metal lattice floor at a goat farm
(Ph.D. Nikola Pacinovski, 2011)

Apart from the individual positive traits that should be considered during the construction of the stable (the ability for thermal insulation, strength, durability), the construction material must possess two important properties: resistance to fire and suitable for disinfection.

In our conditions, the most commonly used material for constructing facilities for housing goats are used: stone, wood, concrete blocks, block elements made of various materials, block-adobe, etc.

These various construction materials from hygienic point of view don't have equal value, so the conditions in the stable, depending on the material that is used for their construction would be different. For example, concrete has high thermal conductance, so it is a poor thermal insulator and is not recommended for building walls. According to previous experiences, the best thermal properties have hollow etc. blocks. Despite the good thermal and insulating traits, these blocks have advantage that due to their size could be very easily and fastly constructed, which significantly cheapens the construction of the fa-

cility. Also, it is desirable the stable to be plastered in height of 1,5 m with cement mortar from the inner side, because of the possibility for their washing and disinfection. Plastering of the outer walls is very important because the mortar contributes to better thermal insulation.

Roof: In general, the roofs of such buildings in of our country are built with an usual slope. The construction of the roof can be concrete, wooden or steel. However, mostly it is wooden. If the roof is quality made with thermoinsulative material, in that case the ceiling is not neccessary. Thus, the stable gets a significantly larger volume, and the height of the walls in this case could be significantly smaller, that actually means saving in material and thus lower costs. The roof of the building can be in two or one duct, and the height of the eaves should be at least 2,3 m. The roof can be built from various materials (tiles, etc.), but it is better to be a sandwich system of sheet metal with additional insulator.

Ceiling: The ceiling has a very important function in maintaining the proper microclimate in the facility. If the ceiling is not properly

built, the heat losses through it could be up to 40% of total heat losses.

Ceiling is usually made of wood or similar material. Concrete ceiling is avoided because in that case is obtained a cold surface. This ceiling during cold autumn and winter days, from the inner side causes condensation, i.e. creating vapour, which would lead to the creation of dampness in the building. The height from the ceiling to the floor should be between 2,4 and 3 m.

Windows: For successful implementation of ventilation, as well as providing enough light in the building, special attention should be paid to the windows.

The windows in the stable are placed as high as possible towards the ceiling, i.e. the upper third of the walls. This prevents when opening them, the cold air to directly hit the animals. Because of that, the lower horizontal edge of the window should be at least 150 to 170 cm above the stable's floor. The windows are placed on the longitudinal sides of the building and preferably on the southern side. It should be avoided placing the windows on the northern side of the building and in the room for kids, if they are housed separately. Thus, it is prevented the excessive cooling of the stable, or adverse effects of the cold northern winds, especially in winter.

The dimensions of the windows are different, but mostly rectangular, with a smaller height than length. It is desirable to open them at the horizontal axis and only the upper part. In that way, the cold air at the entrance of the stable is directed towards the ceiling, not towards animals.

The windows could be made of wood or metal, but the tree has better thermal properties and better submits the impact from the stable's environment. The total area of windows in relation to the surface of the floor should be at least 1/20. Windows play a significant role as a natural illuminators of the facility, but also as a good fan or ventilator.

Doors: The doors of the facility for goat breeding are usually placed on the eastern and southern side of the building, on the longer side, and they serve to connect the interior of the building with effluent. The number of doors from one and the other side depends on the stable's size.

In addition to this, there is also another main door at the side part of the building, for entering the central passageway for nutrition. For easy communication, in the nutrition corridor is set double door with dimensions 2 x 2 m, which allows entry of machinery (tractor). On the side toward the effluent are placed at least two doors with dimensions 1 x 2 m, for easier entering and exiting of the sheep in and out of the facility. Every door should open outwards.

1.13.1.5. Internal organization of the facility

Unlike sheep, goats can be bred by free and bound system. However, our recommendation is in the mentioned repro-center to be applied free system of raising goats.

The most important elements to consider when determining the arrangement inside the building for goat housing are:

- The milking section is composed of waiting-room, milking area and place for collecting the milk,
- Place for resting of the goats with mat,
- Passageway for feeding and serving,
- Length of mangers per goat,
- Required air volume,
- Ventilation,
- Calculation of required storage surface,
- Possible future expansion.

The inner part of the goat breeding object should be organized in several sections:

- Section for housing of the goats,
- Section for breeding offspring,
- Section for kids,
- Section for milking with reception room for the milk,
- The section for housing male goats (this section should be physically separated from the object where the goats are housed,

In the central part of the building will be located corridor for nutrition, which will meet all needs of the production process. On both sides of the hall will be set feeders (mobile) which will supply food to the goats.

Stalls for goats: The stalls for goats are made in order to facilitate the production process, during certain periods when there is a need for it. Usually it is the period when the goats are pregnant, gave birth to kids or without them. At that time the stable inside is partitioned off with movable harrows in order

to form the stalls. These harrows are mostly wooden (or metal) and should not be heavy in order to easily move them from one place to another.

Each stall must have contact with the nutrition corridor in order to allow feeding of the goats. In the remaining period of the year (warmer months), feeding of the goats is done in effluent, in specially made feeders for forage and concentrated food (Figure 11).

Stalls for male goats: When breeding goats is particularly important to separately breed the male goats from the goats, in order

to reduce the visual and all factor contacts with the goats. It is quite important to establish a practice of isolating the male goats throughout the year out of the mating season.

Milking area: The milking areas are required supporting facilities of the modern goat breeding farms (Figure 15). In the Republic of Macedonia there are many goat farms that apply machine milking. The reason for this is that the goats more easily get used to the mechanized milking, and because they have very convenient udders for that purpose.



Figure 15. Modern system for milking goats (2 x 24)
(Ph.D. Nikola Kozarovski, Florina, Republic of Greece, 2009)

As a rule the milking room should be located in the northwestern part of the building, while on its northern side to be organized a special room in which the milk would be collected. The goat milking in the milking room can be at platform or with dugged channel.

According to the envisaged size of the repro-center, it is recommended mounting a system for milking 2 x 12 (with 24 milking units), that would meet the needs of the repro-center in the period of the maximal heads' number (262 dairy heads in 2018).

In the milking area itself, there is entry and exit door through which the goats come and go (through the nutrition corridor). By milking area is associated room in which to install the engine from machine milking, lactofreeze, boiler for hot water. Next to the milking room there is another room where the engine from milking machine is installed, as well as

the lactofreeze and the boiler for warm water. This room communicates directly with the milking platform over a door through which the milk in cans or through a system of pipes is collected directly into the lactofreeze. From this room, through another door, the milk is taken out.

Installations in the building: Installations in the goat breeding object are almost identical to that at the facility for sheep. Namely, besides milking machine with a system of pipes (for vacuum and milk), are also installed plumbing and electrical installation.

What was already mentioned about water supply and the electrical installation in buildings for sheep, completely applies to the object for goat breeding.

Effluent: The effluent is placed along the southern length of the building. The necessary area of the effluent is about 2 m² per head. The slope of the effluent should be up to 5%.

At the effluents are located combined feeders for forage and concentrated food. This type of effluent should be also made for the male goats and the kids.

Equipment: For normal functioning of the farm it is necessary to own equipment for everyday operation. All that was mentioned before in the section for necessary equipment in the sheep' reprocenter applies in the goats' repro-center too (Table 65).

1.13.1.6 Supporting facilities

Within the goat repro-center will be projected the following supporting facilities:

– *Hayloft:* A space for keeping the forage food (given in the balance of food), as well as space for storing straw, which will be used as a mat. The hayloft should be built within the commercial yard itself, on a certain distance from the object where the goats are housed.

Usually from all sides it is open, and covered only from above.

– *Warehouse:* For storing the concentrated part of the food also given in the statement. Usually, there is a small space where related devices and equipment are kept, as well as a small reserve of medical products and drugs,

– *Room for accommodation of employees:* there are bedrooms, kitchen and bathroom for workers on the farm,

– *Hospital ward:* for housing the sick animals,

– Within the farm there should also be septic pit for collecting the waste water from the farm, if there is not a drainage, silo pit i.e. silo trap (if the farm produces silage), lagoons, or strictly specified place for manure disposal, etc.

1.14. DISEASES AND PREVENTIVE CARE FOR SHEEP AND GOATS

1.14.1. INTRODUCTION

Preventive care for sheep and goats in the Republic of Macedonia includes regular treatment of sheep and goats with their offspring (lambs and kids) with appropriate antiparasitic medicines and vaccines to prevent the occurrence of certain diseases. At the same time this protection provides maintenance of their health, shape, improved conversion, while reducing the cost for food per kg growth, faster growth and development of young animals.

The prevention includes proper posture of sheep and goats, proper nutrition and everything that implies proper health management of the entire flock.

Preventive care of sheep and goats is implemented against parasitic, infectious and other diseases. All these diseases can cause major physical and financial damages that occur as a consequence of the costs for animals' treatment as well as direct damages from the animals' death.

Bearing in mind that parasitic diseases could be internal and external, most common

internal parasitic diseases in sheep and goat breeding are: liver fluke or fascioliasis, cestodiasis, trichostrongyliasis and metastrongylosis. From the external parasitic diseases, the biggest problem is the scabies, and then piroplasmosis.

In sheep breeding, the biggest problem from the infectious diseases is the infectious limping, enterotoxemia and brucellosis (vaccination prevents its spreading). Also, it may occur Q-fever and enzootic abortion.

Other diseases that occur in sheep and goat breeding, are often as a result of improper management with sheep and goats, which are: acidic and alkali indigestions, intoxication, etc.

After the delivery can occur diseases associated with inflammation of the birth roads, mostly due to the lagging the liner or parts of it, as well as the birth fluids.

Milk gland diseases appear in the form of various inflammation of the udder or parts of it, that are called mastitis. They can occur in acute and chronic form.

Bad conditions for breeding animals allow the emergence of infectious limping, but also

the occurrence of bronchopneumonia or scabies.

1.14.2. MAJOR DISEASES AT SHEEP AND GOATS ON THE TERRITORY OF THE REPUBLIC OF MACEDONIA

1.14.2.1. Parasitic diseases at sheep and goats

Liver fluke (fascioliasis). The liver fluke is caused by the large (*Fasciola hepatica*) and small (*Dicrocoelium dendriticum*) liver fluke. Liver fluke is the most common disease at all ruminants, including sheep and goats. This disease can be very bad and cause great damage in the sheep and goat production.

Liver fluke commonly occurs in swampy, marshy and areas with high groundwater, especially in periods of strong rainfalls.

Manners of infection of animals and life cycle of the parasite. To complete its life cycle, i.e. the liver fluke of egg to infect the host must pass a certain period through certain transitional hosts, which for the large liver fluke are freshwater snails of the family Lymnaeidae (here the most common is the snail *Galba truncatula*), while for the small liver fluke are the ants, so they can reproduce

asexually (Figure 16). Briefly, the adult organisms live in the liver of the definitive host (sheep and goats) and feed with membranes of the biliary tract. Their eggs pass through the liver and via intestines arrive in the external environment with faeces. If they fall in an environment with enough water, the eggs complete development to miracidia that come out of the cover in 9–10 days during the warm periods. After getting out, miracidia have 24 hours to find a suitable transitional host (snail). After that, the development continues in the digestive system of the snails. Then from the snail come out small cercaria which in water convert into metacercariae, that climb the meadow grasses. From there the metacercariae are taken with food mostly by sheep, and rarely by goats (sheep graze low grasses, while the goats usually browse shrubs), where the parasites are released from the metacercariae and penetrate through the digestive tract to the liver.

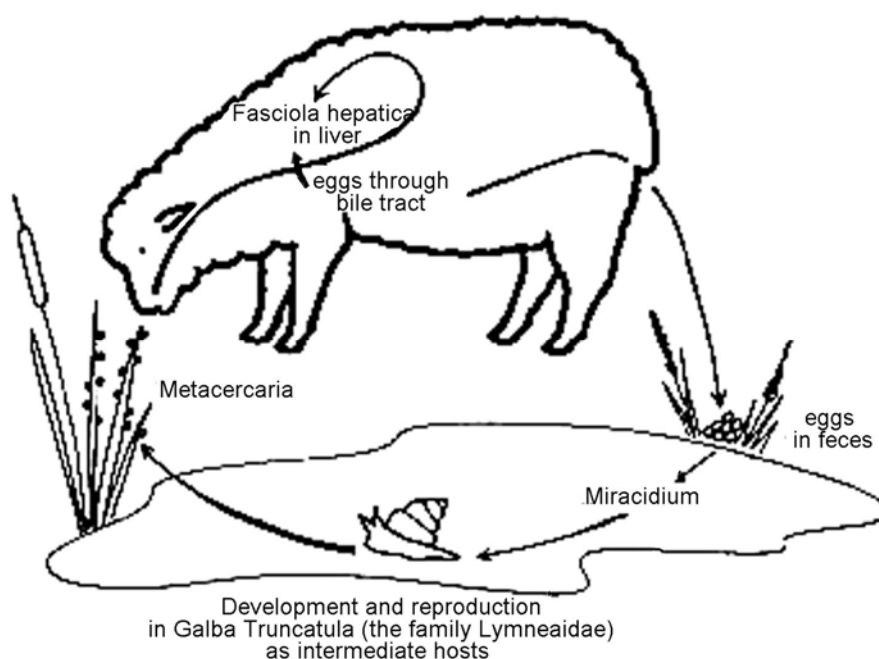


Figure 16. Development cycle of the large liver fluke

The disease can occur in acute or chronic form. The acute form usually lasts 4 to 6 weeks. At that time develops inflammation of the abdominal scarf and problems with digestion. The sheep cease to eat, to ruminate, get diarrhea, suddenly lose weight, and the wool is plain and tears to pieces. Body temperature is elevated up to 42°C.

Pregnant animals could have abortions. The disease can last a very shortly and the animals could die for 7 days. The emergence

of this form is usually before the end of summer, autumn and early winter.

Chronic form lasts longer than 6 weeks. The animal doesn't graze too much, slowly loses its weight, the wool becomes thinner and falls. The most characteristic sign is the appearance of swelling under the mandible (Fig. 17) and collection of fluid in the abdominal cavity. The temperature in the chronic form remains within normal limits. The disease usually occurs during winter and spring.



Figure 17. Sheep with swelling under the mandible
(One of the most characteristic symptoms of chronic liver fluke)

The preventive care consists of regular treatment of animals of all age categories with appropriate antiparasitis medicines that could be found under various commercial names. If animals were strongly invaded by the liver fluke, after the treatment with these agents, is necessary to give them quality food, vitamins and minerals for fast recovery.

If besides other symptoms, the animal also has diarrhea, it is necessary to provide a medicine for preventing diarrhea, recommended by the veterinarian.

Protection against the occurrence of liver fluke at the flock consists of melioration rearrangement of pastures and meadows, i.e. their drying to prevent the development of the snail *Galba truncatula*, as transitional host for this parasitic disease. Also one of the preventive measures is storing the hay for 6 months before giving it to the animals.

Cestodiasis (infestation with worms).

This phenomenon is caused by the paved worms, parasites which as adult organisms live in the intestines. The adult paved worms are long and up to several meters. They have a head, neck and numerous limbs where the eggs are kept. When the limbs mature, they break off from the body and effluent into the environment with the faeces.

Symptoms are found mainly in young animals and rarely in the old ones. Usually suffer the lambs that go to pasture when their intestines could be found a great number of worms. Such heads lag in growth, have difficulties in digesting food, diarrhea, they are anemic, gradually lose their weight, and at worst they can die.

Preventive protection from the invasion consists of regular treatment of the animals with appropriate antihelminthics, for a month

after going to pasture. In severe cases the animals are given vitamins and minerals in order to recover faster.

Metastrongylozis. This parasitic disease is caused by parasites which among people are known as lung fiber. They live in the bronchi, bronchioles and alveoli of the lungs. They have a fiber shape (hence the name among the people), white to yellowish color, and a length of 1 cm.

The clinical symptoms of the disease begin with a short and dry cough. Later the cough becomes wet, so the animals through the nose and mouth spew mucus, and in severe forms of the disease they spew blood. Breathing becomes rapid, while body temperature is within the normal boundaries.

At severe cases develops pneumonia, animals breath atypically, that could be noted observing the the area of the ribs, and it is said that the animal "pumps". In such cases the body temperature of the animal is higher. With further development of the disease, the animal stops eating and dies at the end.

Preventive care includes regular treatment of the sheep, goats, and lambs with medicaments every 3 to 4 months. Lately it is recommended double vaccination of the offspring with Difil vaccine at the age of 2 to 4 months, in a distance of one month. As a preventive protection could be avoiding grazing of the animals on dewy, wet or flooded pastures, as well as rotational grazing.

Coccidiosis. The disease most frequently occurs at the offspring (lambs and kids), followed by diarrhea, anemia, weakness and eventually ends with death, if not treated in time. At the adults it is manifested by decreased milk production.

The protection from this disease requires a clean environment every day but without water usage, because moisture is one of the conditions for development of this parasite. All wet areas where offspring is bred should be dried. For better management, it is necessary to separate the offspring by age. The feeders for the kids should be made so they can not climb on them and contaminate them with the stool. If the diarrhea is frequent, then the offspring's nutrition should always have coccidiostats.

At the beginning, the diarrhea should be treated with additional electrolytes by mouth (Nelit) or intravenously, and after that with vitamins and antiinflammatory products as basic therapy. The most acceptable is the use of sulphonated products (sulphadimidine) as primary anticoccidial preparations, as well as antibiotics for great protection from anti-bacterial septicemia, which can occur due to impaired intestines.

Scabies at the sheep. This disease is caused by scabiei. In the past this disease caused great harm in the sheep production. Today it appears rarely, especially due to poor storage conditions and poor prevention. The disease usually spreads among the sheep in the flock by purchasing so-called sick, i.e. "scabious sheep." Due to poor storage conditions, sick animals very quickly transmit the scabies on healthy animals. The poor nutrition also reduces the general immunity of the animals, so they quickly get the disease comparing to the sheep in good shape. The first symptoms of the disease are itching of the animals on various objects, etc.

At the beginning, the disease appears on the wither, and then spreads through the back and neck, and finally towards the abdomen. With the further development of the disease, the falling of the wool is increasing (Figure 18).

If the scabies spread too much, all the wool may fall. In milder forms, despite the itching, during the shearing on the skin could be observed swellings and dirt, that are rarely seen at the sheep that are not sheared. The disease usually occurs in winter and early spring.

Preventive care of sheep consists of bathing the sheep in separate pools that have contact acaricides. The bathing of the sheep should be repeated 3 times in periods of 7–10 days.

Facilities that housed animals infected with scabies, must be mechanically cleaned and washed with one of the acaricides. If not implemented disinfection at the facility, then it must be left empty for two months. During that time all living scabiei will be dead. The proper nutrition and adequate storage conditions in the stables slows the spreading of the scabies.



Figure 18. Scabious sheep at the beginning of the wool falling

Piroplasmosis (Babesiosis). This disease at sheep could be caused by can be protozoal parasites *Babesia ovis* and *Babesia motasi*. On the animals they are transmitted by ticks that suck blood from infected animals. This protozoan could be multiplied at the ticks too. When transferring of ticks from sick to healthy sheep by sucking their blood, at the same time they take the parasite.

Symptoms of the disease: the animal has an elevated temperature up to 42°C, ceases to eat, secretes dark red urine, becomes anemic (white mucous membrane), and jaundice occurs in the later period. In severe forms, the disease ends in death after 7 days. Sometimes the acute form can turn into chronic. Young animals get the disease more easily than the older ones, but the recovery is also faster.

Preventive care includes cleaning the animals from ticks, and bathing them in acaricide substances, every 2 to 3 weeks during their invasion. Given that ticks in the winter are stucked at the bushes, it is necessary to clean the bushes around the pasture. In spring it is better to graze the animals far from the bushes.

If this disease occurs, the sheep can be treated with Imizol (Imidocarb dipropionate), the only registered drug for the treatment of

this disease. Treatment is conducted in double dose given within 2 weeks, that increases the immunity that can last several weeks up to 6 months.

1.14.2.2. Infectious diseases in sheep and goats

Infectious limping. It is said that the infectious limping is a disease of the shepflocks. Usually it occurs as a result of poor storage conditions and poor care of the sheep' owner. The flock usually could be diseased with purchasing infected animals. Cause of the disease is a bacterium *Dichelobacter nodosus* (*D. nodosus*), formerly known as *Bacteroides nodosus* and before that as *Fusiformus nodosus*. It transmitted to the healthy animals from the infected ground, so they can infect with just passing through a contaminated pasture. The initiators are microorganisms that live without oxygen. They cause decay of the hoofs, and thus limping. Symptoms begin with redness on the skin between the hoofs, then a slight swelling, and at the end to appear necrotic wound. After this, the animal begins to limp. The subsequent development of the disease destroys the whole hoof, so the sheep limps all the time and practically walks on three legs (Figure 19).



Figure 19. Sheep infected with a contagious limping

When the limping takes more legs, the animals graze squatting. Later they graze and, lay down more and start to lose weight. When examining the hoofs could be felt stong and unpleasant odor, while when opening the hoofs could be seen that the cornea is separated from the other part, so it does not have its function. In later stages, the disease can progress so much, so inflammation could be spread to the bone, that results with sepsis and the animal dies.

Preventive care consists mostly of keeping the sheep in appropriate conditions, which

includes maintaining a dry surface with no mud and mostly dry pastures. Preventively, the sheep can be get through a pool with 5% solution of blue stone (Figure 20).

It should be organized rotational grazing with change every 10 to 15 days. Once the disease appears, it is necessary to separate sick from healthy sheep and to start the treatment. The treatment consists of removing the sick part of the hoof. Then the cleaned hoof is washed with a disinfectant (Cetavlon, 10% solution of formaldehyde, etc.) and at the end sprayed with antibiotic spray.




Basic symptoms	Consequences	Treatment
<ul style="list-style-type: none"> – Abnormal skin growing around the hoof, redness between the hoofs. – Swelling above the hoofs. – Unpleasant odor from the hoof. 	<ul style="list-style-type: none"> – The whole hoof may fall off. – It is infectuous. 	<ul style="list-style-type: none"> – Pruning the hoofs – Put 9,5 parts water 0,5 parts bluestone in a dish; it could also be used formaline. – Lead the sheep to pass trough the dish with blue stone (formaline) every day.
		

Figure 20. Symptoms and treatment of the contagious limping at sheep

After that the animals should be bred on dry mat until they are healed, and if necessary, the hoofs should be cleaned and sprayed with the spray many times.

Prevention consists of regular trimmers the hoofs which can be 2 to 3 times during the year (Figure 21).

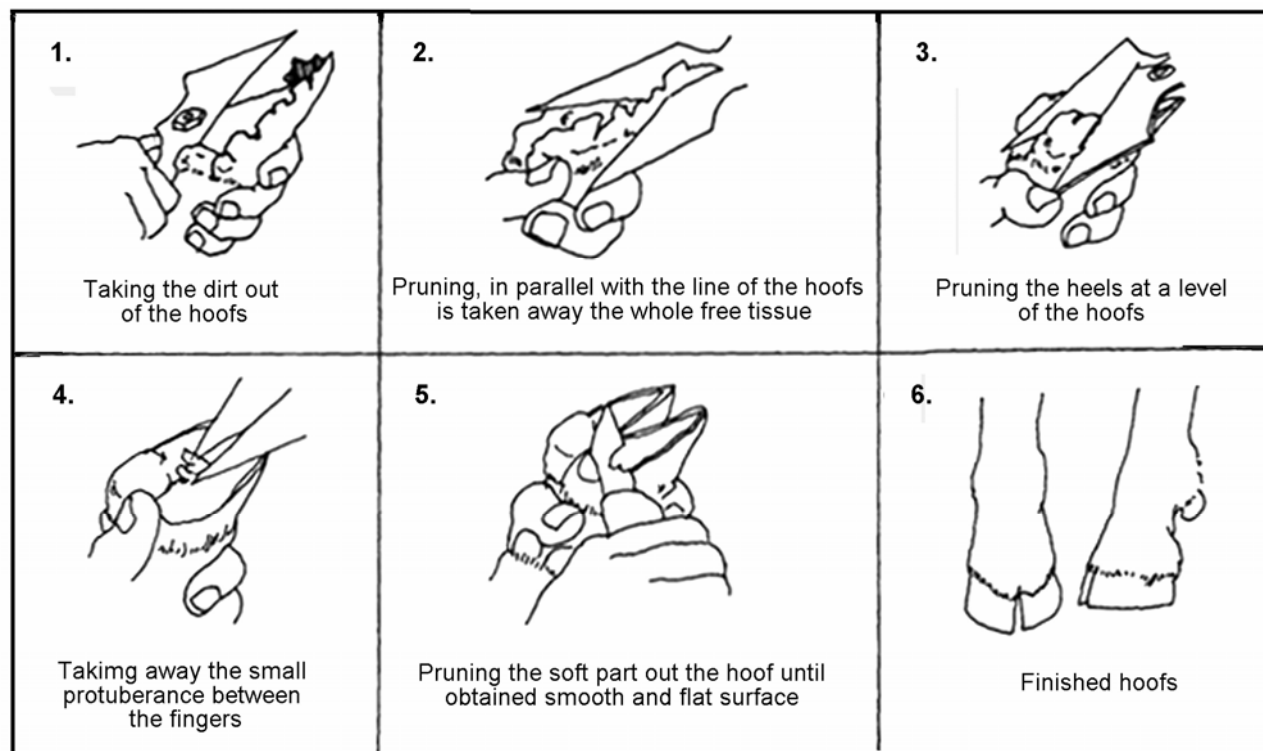


Figure 21. Preventive cleaning and pruning of the hoofs

Caprine arthritis and encephalitis (CAE). Caprine arthritis and encephalitis (CAE) is a viral infection caused by a retrovirus that leads to chronic disease of the joints and rarely of the brain (encephalitis) at kids younger than 6 months. The virus is together with white blood cells and therefore any secretion that contains within itself these blood elements is a potential source of the virus for other goats in the flock. What is important is that not all goats infected with the virus show symptoms, but the same can spread the virus. Therefore, it is recommended all goats to be examined serologically in order to detect the carriers and to remove or separate them from the healthy animals.

The most common symptom at adult goats is arthritis or swelling of the joints, and it seems that they have little knags. Despite that, the sick goats may at worst lose the milk or to reduce the production for at least 25%, whereas at kids can occur increased number

of deaths after the birth due to the occurrence of inflammation of the brain.

The arthritis at kids should not be confused with arthritis that can be of different origin, as a bacterial or due to lack of vitamins and minerals, and after 3–4 weeks of life due to infection with mycoplasma.

Because the disease is caused by a virus similar to AIDS virus in humans, there is no successful way of treatment, so the prophylaxis is the basic way of protection from this dangerous disease which is also called the "silent killer". The most important is during the introduction of new heads in a healthy flock to be applied quarantining, i.e. separately housing of the new animals, at least for two weeks, not only because of CAE, but also for other diseases. Given that the most common way of transmitting the disease is from the mother to the kid during the breastfeeding, it is best in those flocks where there is an outbreak of this disease the kids to be immediately separated from the mother and to be fed

by nipples, so that the colostrum (which by the way should be given as soon as possible—during the first two hours of the kid's life) of the mother should be previously pasteurized (to be kept in a water bath at 56–59°C for 1 hour) and then the kids to be fed by nipple.

What makes this disease even more dangerous is that there may be heads that have viruses (and spread the same) but don't have antibodies, so at the testing they are not confirmed as sick.

Enterotoxemia. This disease is caused by bacteria of the genus clostridia, that live in the food, land and placenta. They develop when there are favorable conditions, such as reduced resistance of the organism, overeating of the animals, etc. Usually it occurs during the spring when sheep and goats go grazing after the winter period, without getting used to it. The disease occurs at lambs and kids during the breastfeeding the first weeks of life.

The disease often occurs in peracute and acute way. The peracute flow is hardly visible due to the rapid progress. The animals normally graze, eat, and in the morning they may die.

The acute flow is milder, lasts 3 to 4 days, but it also ends in death of the infected animals. During the illness, the animal's temperature is increased (up to 41,5 °C), have diarrhea, do not eat, move uncontrollably and have cramps. Sometimes the animals are sleepy, and another moment excited, spin in a circle, bang into obstructions, breath rapidly and flippantly and may have colored urine. If the animal survives, it may have permanent nervous disorders, while the pregnant goats may abort. Due to rapid progress of the disease, usually it could not be cured, so it is best to implement prevention with vaccination of adult and young heads with a multivalent vaccine against clostridia. Preventive care includes regular vaccination of animals, and gradually getting used to transition from one to another kind of food. Vaccination usually takes place 30 days before delivery and at the young heads kept for breeding vaccinated for a first time, the vaccination is double at a distance of three weeks (21 days). Particular care should be taken at the transition from winter nourishment with dry food to spring nourishment, when they are taken to fresh and lush pasture.

Brucellosis. Brucellosis is an infectious disease that can occur with acute and chronic flow. It is caused by the bacteria of the genus *Brucella*. At sheep and goats the disease is caused by *Brucella melitensis*. Symptoms of brucellosis are uncharacteristic because in female animals often goes without symptoms, with occasional abortions during the late pregnancy, sometimes with placentitis. More characteristic are the symptoms at the rams and male goats where could occur epididymitis and orchitis (inflammation of the testes), that lead to irregular reproduction, and thus to economic losses. The disease can be transmitted from animal to animal by direct contact, which is the most often at rams and male goats, while the sheep and goats are usually infected by mating with infected males. Basic symptoms of the disease are lesions on the epididymis, the membrane of the testis and the testis itself, placentitis and abortion of sheep and goats and occasionally perinatal death of the offspring. At natural infections rarely could be seen acute form of the illness. After such a phase that can be very mild, even undiscovered, there are lesions on the epididymus and scrotal layers. The membranes often thicken, become fibrous and stick with each other. Also may occur fibrous atrophy, which is often incurable. Only in a small number of cases these lesions are transient, and usually the microorganisms are present in sperm for a long time, without any visible changes.

For treatment of brucellosis can be used chlortetracycline and streptomycin, but the treatment is economically unprofitable and can be applied only at extremely valuable male heads.

Preventive protection from this disease consists of an examination of all animals before mating season and destruction of diseased animals. Because it is a zoonosis, products from infected animals must not be used. This measure is provided in the annual order for preventing the spread of infectious diseases by the Agency for Food and Veterinary, and it is conducted by authorized veterinary associations.

The preventive care in the recent years is implemented through vaccination of young lambs and kids up to 6 months of age with live vaccine.

Q-fever. It is a disease at sheep and goats which has a mild nature. The emergence of this disease is important because this disease is a zoonosis, i.e. it can be transmitted from animals to humans. Cause of disease is bacteria *Coxiella burnetii* which is very resistant microorganism, both in the nature and on various disinfectants. The source of infection are the sick sheep and goats and their products, meat, milk, cheese, then urine, faeces, mats and uterus water, contaminated food, water, objects and floor where the sick animals live.

The source of infection are usually the ticks which suck blood and could transmit the disease from infected to healthy animals. Besides this direct insertion of the cause in the blood, the same can be transmitted to healthy animals through the respiratory tract, consuming contaminated food, through injuries on the skin, with natural mating of animals and through breast channel of the udder.

By abating this disease, the animals acquire immunity. What is most problematic in this disease is the fact that animals often show no signs of disease. The disease usually has a milder nature and quickly passes. In se-

vere cases, body temperature rises, the animals do not eat, have a clear nose secret, sometimes cough and get pneumonia. The pregnant animals abort in the second half of the pregnancy.

Diagnosing the disease can be made by bacteriological and serological examination.

Preventive protection for the this disease include vaccination of healthy animals with Coxevac vaccine. This vaccination is recommended only for high risk groups or if the presence of this cause on the terrain is proven, and often to protect people who work with animals. It is best to perform regular blood test for presence of microorganisms in the flock, so the sick animals can be used for breeding. Attention should be paid to bringing new animals in the flock, so the same are put in quarantine and tested of Q fever, and even after it is confirmed that they are healthy to be brought into the flock.

The disease could be treated with antibiotics such as tetracycline, but given the weak visible symptoms they are rarely used for the animals.

1.14.3. PREVENTIVE HEALTH CARE FOR SHEEP AND GOATS

1.14.3.1. Prevention of parasitic diseases at sheep and goats

It is suggested the first treatment for parasites in sheep and goats to be done two to three weeks before the spring pasture, i.e. at the end of March. Usually, the sheep and goats are treated with certain antiparasitic. The dosage and the method of application is different for different antiparasitics. In this application, should be chosen an instrument that has a very short waiting period, because in this period the sheep and the goats are in lactation. The second treatment is done before the mating season at the end of July, and the third treatment is done month to month and a half before the scheduled lambing and kidding, usually in late November.

The lambs and kids could be given certain antiparasitic at the age of one and a half months. The same treatment is repeated at the age of 3 months. If necessary (in case of diarrhea, or discharging parasites with the

stool), may be repeated individual treatment earlier in diseased animals. The lambs and kids are treated only in cases when a huge number of the adult heads are invaded, which could transmit the parasites to the younger. Otherwise, the treatment of the lambs and kids with antiparasitic must be avoided (due to the waiting period), except the heads that are planned for breeding (replacement).

1.14.3.2. Prevention of infectious diseases in sheep and goats

Prevention of infectious diseases in sheep and goats are planned and carried out by planned and legal-mandatory vaccinations.

1. At the age of 3–6 months are vaccinated the breeding lambs and kids, with a vaccine against brucellosis, prescribed by the Agency for Food and Veterinary under the Ministry of Agriculture, Forestry and Water Management. To prevent the spreading of the

disease, from the heads older than 6 months that are not vaccinated is taken blood, and the presence of brucellosis is analyzed. All positive heads are slaughtered.

2. Treatment against enterotoxemia is made once or twice a year (depending on whether it is made for the first time or as a regular procedure). The vaccination is performed with one of the belowmentioned vaccines ("dozivak", "klostrivak", "poliovin", "koglavaks" and others) per 2 ml, regardless of age and body weight. Double treatment (at a distance of 21 days) is conducted only at animals that are vaccinated for the first time.

It is the best to vaccinate the female individuals at the end of the third month of pregnancy, and if necessary a second vaccination, it is performed three weeks before the expected lambing. For goats, it is usually conducted 4 weeks before the kidding, after an dose of antihelminthic treatment is performed. This vaccination provides a high amount of antibodies in colostrum so the lambs and kids will get much better passive protection. After that, it is sufficient only single vaccination during the year (in equal time intervals) to maintain immunity. If possible, it is the best this vaccination to be planned 1 month before lambing and kidding (commonly used this way).

Lambs and kids from vaccinated sheep and goats are vaccinated when 2 months old, and those from not vaccinated ones at the age of 4 weeks.

1.14.3.3. Other activities and treatments for preventive protection of sheep and goats

1. Injection of 50 mg vitamin E and 1 mg selenium per 20 kg body weight, 3 weeks before the anticipated date for lambing and kidding, in order to improve the status of the organism and better preparation for the effort (partus) that follows,

2. Preparation of facilities for lambing and kidding (cleaning and disinfection, preparation for warming the youth if very cold),

3. Disinfection of the umbilical cord of the lambs and kids after lambing and kidding with 7% iodine solution or other suitable solution,

4. Feeding the kids with colostrum during the first hour after the birth, from a goat which

is negative of CAE (goat arthritis and encephalitis – caprine arthritis encephalitis),

5. The weak and sick kids should be given Vitamin E – 25mg and 0.25mg selenium,

6. Castration of male lambs and kids that are not kept for breeding (this is not obligatory),

7. Checking the lambs and kids (for breeding) for genetic deformities, especially hermaphroditism and irregular structure of the nipples (periodic check for presence of more than 1 hole on the teats),

8. Check and possible correction of the sheep and goats' hoofs at least 4 times per year, or when necessary,

9. If limpingta is a problem in the flock, the sheep and goats at least once a week to go through a water bath with dissolved blue-stone or formaldehyde,

10. Permanent control of occurrence of flies and other insects, with appropriate insecticides and strict waste management,

11. Regular bathing the sheep and goats before the summer with some of the available insecticides, for control of fleas, lice and scabies,

12. When fungal skin diseases, all animals should be individually treated with appropriate antifungal agent,

13. At least twice a year (February and October) is performed examining of the sheep and goats' faeces for presence of eggs of parasites (based on the results of the analysis – the parasites present, it is determined which product will be used for antihelminthic treatment). Usually, the feces testing should be performed before and after the treatment with antihelminthic, in order to be noticed the efficiency of the preparation.

Certain activities are mainly applied to goats and rarely to sheep, and because of that which are set aside as a separate group of treatments. These are:

1. *Cutting the horns of the kids* – This activity is realized in several ways (with rings, products based on sodium hydroxide etc.). It is only for female goats, in order to get greater number of hornless goats in the flock. Because of its aggressive temperament, the goats with horns could cause themselves serious injuries, especially during the pregnancy, also causing huge material damages,

2. *Treatment of goats and kids (for weaning) with coccidiostats*, in those flocks where the coccidiosis is present. This is not mentioned about sheep, because according to the previous experience, this parasite disease occurs more frequently in kids than in lambs. The adult heads are only reservoirs and carriers of the parasites (coccidia), while the young heads (kids) and suffer and die,

3. If there is a problem *with pneumonia in the flock*, the goats before delivery should be vaccinated (mostly against *Pasteurella*), as well as the kids before weaning, double in an interval of 3–4 weeks.

4. Periodically (at least once a week) is done examining the udder of goats for *mastitis*. Soaking the nipples into a special disinfectant after milking and drying them with special remedies for reducing the risk of subclinical mastitis. If there is a presence of abnormal secretions such as pieces in the milk, abnormal consistency and color, and anatomical changes of the udder (warm, swollen), should be started with a treatment immediately after the first signs appear. This applies only to goats due to significantly higher lactation and larger udder compared to the sheep',

5. In mechanical milking, the machine must be checked if it is functioning well and the hygiene during the milking should be on a highest level, to prevent the spread of masti-

tis. Milking the mastitic heads last or disinfection of milking machine after milking a mastitic goat,

6. During the drying of the goats should be treated two halves of the udder, with remedy for drying of cows. Of the nipples (as for after milking) should be done twice a day (for 3 days)

1.14.3.4. Disinfection of the facilities for housing sheep and goats

Disinfection of the facilities is very important segment of preventive protection of sheep and goats. In general, annually should be made two disinfection treatments. The first is usually performed one month after the cleaning of the deep mat (end of May), and the second in late fall (end of October). In our country, as a disinfectant quite often is used quicklime, which as a fine powder is scattered on the floor of the objects cleaned from manure. After that the floor is sprayed with water, which causes a chemical reaction, i.e. a kind of fumigation, which penetrates in every pore of the building, causing destruction of all harmful microorganisms (bacteria, viruses, etc.). Besides this, there are many disinfectants that are found under a different commercial name.

1.15. THEORETICAL AND REAL NEEDS OF QUALITY AND HIGH QUALITY MALE HEADS FROM THE PROPOSED SHEEP AND GOAT BREEDS IN THE REPRO-CENTERS

From real and objective perspective, it should be noted that if the repro-centers are formed, the same must sell breeding heads to the farmers—sheep and goats' breeders from the whole country, not just to those in EPR. Past experience shows that often happened some heads ready for sale not be sold because of lack of interest of our farmers. It is a long-time practice the sheep and goats breeders throughout the state to keep the male heads for breeding from their own flocks. Reasons for avoiding the purchase of breeding heads, according to them is the unsatisfactory quality of the heads offered for sale by existing repro-centers, and quite often the

price. Here, huge importance also has the fear of being brought any disease, which happened to farmers breeding animal purchased from unregistered farms for selling breeding animals.

However, if we analyze the situation, we can get at least the information about what are theoretical needs of male heads in EPR and in the state, when they would be replaced according to the estimated dynamics.

For example we will analyze the number of sheep and goats in 2011, when were registered a total of 742.572 sheep (Tab. 9). Of this number, about 542.077 are breeding sheep, in reproduction. Bearing in mind that for

every 20–25 sheep is needed one male head shows that within this number about 22.000 are breeding rams. On the other hand, if we consider that the rams could be used on average 5 years, this means that each year should be replaced about 4.000 rams. This figure refers to all breeding sheep in the country.

As it is about forming a repro-center for sheep of breed Merinolandschaf, according to data in Table 15, the total number of sheep recorded as crossbreds Merinolandschaf and Merinolandschaf on a national level is 203.638 heads. According to the projected percentage of coverage, this figure needs about 10.200 rams. The annual need for regular replacement of this number of rams is 2040 rams. These numbers refer to the needs for the whole country.

If we analyze the figures in EPR, in that case we come to this conclusion: the total number of sheep in the EPR for 2011 is 129.977 heads, of which 94.883 are breeding sheep (Tab.11). To cover this number are needed about 4744 rams. To ensure regular renewal of this figure, annually are needed nearly 950 rams. However, this figure refers to rams needed to cover the sheep from all breeds represented in the region.

According to the data in Table 16, the total number of sheep of breed Merinolandschaf, as well as the crossbreds with this breed in EPR for 2011 is 10.071 heads. The required number of rams for this figure is about 500 heads. According to the projected dynamics of replacement (20%), the annual need for replacement of these rams is approximately 100 male heads. Thus, theoretically, the repro-center will not have a problem with sales of male breeding heads, if there is demand by all farmers in EPR, sheep breeders of the breed Merinolandschaf.

Analyzing the situation in goat breeding, according to Table 10, the total number of goats in the republic in 2011 was 67.387 goat heads, of which 49.192 heads breeding goats. To cover this number, theoretically are required 2.460 male goats. Given the fact that in goat breeding, the male goats could be used averagely for 5 years, this means that each year on the national level are required 492 male heads for regular replacement of existing the male goats.

If we analyze the figures in EPR, the number of goats in 2011 was 19.902 heads, of which 14.528 are breeding goats (Tab. 13). The required number of male goats to cover this number is 726 male goats, for whose regular annual replacement are needed about 145 heads.

All these data, although theoretically, reflect the real situation in these two farm sectors regarding the needs of male heads, if we seriously approach realization of genetic improvement of existing sheep and goat populations.

Even in the worst form of forecast, our assumption is that due to the high quality of male heads that would be offered for sale during the first years in both repro-centers, there won't be any particular problem for their placing on the market. The only thing we should pay attention to is maintaining the quality of the breeding material, which will only be achieved by implementing appropriate mating plan on one side, and implementation of a quality food on farms on the other side. Of course, there must be permanent education of farmers in EPR and continuous promotion of the two repro-centers, the quality of heads that are offered, as well as the degree of improvement that will be achieved by the eventual purchase of breeding heads.

1.16. SUBJECTS IN THE CHAIN OF MOVEMENT OF THE LIVESTOCK PRODUCTS

When it comes to sheep and goat breeding, inevitably arises the question of how and where will be placed the two main products of these two branches which are meat (lamb and kid's), milk (sheep and goat) or products from sheep and goat milk (white soft cheese, yel-

low cheese - cashkawaal, etc.). When it comes to lamb, as mentioned above, it is one of the strategic agricultural products, which for decades has export character and which regularly every year carries a significant inflow of foreign funds in the country. The same ten-

dency also has the kid's meat (exported to Italy), because every year the demand for it increases (Tab. 25). Also, there is no with the purchase of sheep milk, and slowly but surely the goat milk also enters in the capacities for milk production. The only problem is perhaps the fact that dairy products from sheep and goat milk are still unavailable on the European markets (EU members), due to strict criteria in those countries.

Thus, before we overcome these barriers on the international markets, we should rely on the opportunities and facilities available in our country. In that respect, given the purpose of this Study, we should analyze the capacities of the EPR.

According to the official Register of approved facilities for products of animal origin of the Agency for Food and Veterinary, in the Republic of Macedonia there are 82 dairies (facilities for processing of fresh milk, facilities for processing milk and producing milk products with traditional characteristics), 16 slaughterhouses and 47 facilities for meat processing.

Of them, within the EPR there are 10 dairies including: Dairy Ltd – Stip, Dairy Malesh – vil. Smojmirovo, Berovo, Natasha DOOEL Dairy LLC – vil. Robovo, Berovo Osogovo–Milk Milk Industry DPTU – vil. Sokolarci, Cesinovo–Obleshevo Alpina Dej DPT, Probistip ZZ Sloga, vil. Sofilari – Stip, Maleshevsko DOOEL – vil. Budinarci, Berovo, Rudine MM Ltd – Delcevo, Alpi Med DOOEL – vil. Grdovci, Kocani, Probimak 2 – vil. Ratavica, Probistip. Most of these dairies purchase the milk from producers (farmers), while there are some who processed milk exclusively from their own production. There should certainly

be mentioned the dairy "Zdravje" from Radovo, Strumica, which is the largest capacity for milk production in Eastern Macedonia, and second in the state. According to the business plans of this dairy and the contacts we made with the management team, the dairy does not have limit in terms of quantities for purchase of sheep and goat milk. In other words, there is still a great need for these two types of milk.

In terms of processing facilities for meat in this region is placed of the largest slaughterhouses in the country (ZI–VA AD, Slaughterhouse with refrigerator from Stip), which has been certified for slaughtering lambs and goats for export to the EU. It is a great advantage and the same should be used. An additional advantage is the presence of animal husbandry market in the village Obleshevo, which is one of the major animal husbandry markets in the country. Maybe it should be worked on joining the sheep and goat breeders, for organized associations of the farmers' interests, or taking a common opinion about the price of a product. Almost every year regularly happens the traders coming for purchase to offer prices that do not correspond to actual market price of lamb and kid's meat. All this will be overcome if the associations function as those in many European countries, which represent powerful associations with which the traders and often the state negotiate to resolve the specific problems or to create new strategies in the sector.

All this gives hope that the sheep and goat breeding in this region can grow upwards, and as such to become a solid source of existence for many families in this region, especially in rural areas.

1.17. FINANCIAL ANALYSIS OF THE INVESTITION

1.17.1. FINANCIAL ANALYSIS OF THE INVESTITION–REPRO-CENTER FOR SHEEP FROM THE MERINOLANDSCHAF BREED

The financial analysis begins with the reduction of all amounts of valuable sizes, so all items receive different value. For analysis to be understandable and measurable, the same values, i.e. permanent prices are being used.

The first step in the financial analysis is specification of investment costs (permanent

and permanent circulating assets), then the sources of financing and obligations towards them. This section covers the inputs and outputs in the production in order keep a records of the necessary expenses and the financial success.

This financial analysis refers to the investment in repro-center for sheep of the Merinolandschaf breed and it is made into two simulations. The first simulation involves investment in facilities, while the second simulation is not about the investment in facilities and equipment, assuming that they exist.

1.17.1.1. SIMULATION 1

1.17.1.1.1. Investments in permanent (fixed) assets

The permanent (fixed) assets are used gradually for many years. Because they are not spent in one production cycle, they gradually transfer its value to new products.

In this financial analysis, investment in fixed assets related to the costs for purchasing basic flock, construction of facilities and procurement of equipment.

The investment in basic flock includes purchase of 106 heads of sheep from franco farm in Germany. It amounts 4.331.415 denars or 70.429 euros (Tab. 68). The euro's value is calculated according to the exchange rate of the National Bank of RM (06.03.2012), i.e. average rate of 61,5 denars and the same will be used in the further calculations of the financial analysis.

The total investment in fixed assets (cost of purchasing basic flock, building facilities and technological equipment) amount to 18.224.695 denars or 296.337 euros (Tab. 69). The largest share in total fixed assets belong to the construction of buildings which is 13.067.280 denars or 212.476 euros.

1.17.1.1.2. Production costs

The basis for calculation of production costs and projected income is the anticipated technological capacity. This section includes analysis of the material production costs (basic and subsidiary), and other expenses such as amortization, insurance and salaries.

Tangible production costs. Basic, as well as the most important material of production is the food for animal husbandry, which enables their production. It covers most of the material costs, and its value is 750.880 denars, or 12.208 euros (Tab. 71).

Subsidiary materials project: veterinary services (medicines and vaccines), hygienics and disinfectants, electricity, wood and water. Subsidiary materials amount to 143.570 denars (2.334 euros), (Tab. 71).

Material costs besides food and subsidiary materials used in production also include the costs of investment maintenance. The value of the investment maintenance includes ongoing maintenance of equipment and facilities. Since we are talking about new facilities and equipment, it is projected a low rate of investment maintenance that is 0.5% of the technological equipment (Tab. 70). As the buildings are new construction, maintenance over the economic life of the project it is not planned. They project 4.130 denars or 67 euro annual cost for maintenance.

The total value of the projected material costs amounts 898.580 denars or 14.611 euro (Tab. 71).

Costs for insurance and investment maintenance. The total costs are increasing for the value of insurance which is required to be implemented due to assuring the security of fixed assets, and removing the risk that may arise during the exploitation.

Insurance costs refer only to the basic flock, while the facilities and equipment will not be insured. The total value of the insurance costs is 344.400 denars (5.600 euros) (Tab. 72).

Calculation of gross salaries. In determining the required number of workers have been projected three workers, of which one with a high education. Due to the necessity of constant engagement of the employees, the gross monthly salary will be paid for 12 months. The sum of the gross salaries paid monthly within one year represents an annual cost of salary and amounts 856.800 denars, or 13.932 euros (Tab. 73).

Calculation of amortization. The amortization is part of the transferred value of the fixed (basic) assets in the process of reproduction. As a basis for calculation of the amortization is used the acquisition value of the assets. The acquisition value of the assets is the purchasing cost of funds increased for the import expenses and taxes as well as all the other expenses relating to the procurement of the fixed asset and its release. In accordance with the Regulation on the method and the manner of calculating amortization (Official Gazette of RM, 10/2008) the annual rates of amortization amount to 2.5% for construction objects, 15% for the basic flock and 10% for technological equipment.

Table 68

Costs for purchasing basic flock

Type of cost	Measurement unit	Quantity	Unit price (MKD)	Total (MKD)	Total (EUR)
1. Basic flock				3.444.000	56.000
Milking sheep (two-year old ewe)	No.	100	30.750	3.075.000	50.000
Rams	No.	6	61.500	369.000	6.000
2. Costs for breeding heads selection from Germany				186.345	3.030
Airplane tickets	No.	3	30.750	92.250	1.500
Overnight	No.	9	6.150	55.350	900
Daily wages	No.	9	4.305	38.745	630
3. Quarantine costs for 30-day period				701.070	11.399
3.1. Food expences				92.220	1.499
Hay	kg	6.360	10	63.600	1.034
Concentrate	kg	1.590	18	28.620	465
3.2. Costs for laboratory analysis				608.850	9.900
Serological testing of brucellosis	No.	106	1.845	195.570	3.180
Parasitic laboratory analysis of the lungs and rumen	No.	106	1.845	195.570	3.180
Serological testing – Q fever	No.	6	1.845	11.070	180
Elisa-test with negative results of blue tongue	No.	6	1.845	11.070	180
Other expences	No.	106	1.845	195.570	3.180
Total costs for purchasing basic flock				4.331.415	70.429

Table 69

Total Investment in fixed assets

Type of fixed assets	Measurement unit	Quantity	Unit price (MKD)	Total (MKD)	Total (EUR)
1. Basic flock	no.	106		4.331.415	70.429
2. Construction objects				13.067.280	212.476
For sheep housing	m ²	574	17.220	9.884.280	160.720
Effluent with fence	m ²	500	600	300.000	4.878
Barn	m ²	150	2.000	300.000	4.878
Storage (for concentrate, food...)	m ²	50	17.220	861.000	14.000
Building for accommodating workers	m ²	40	17.220	688.800	11.200
Milking room	m ²	40	17.220	688.800	11.200
Room for collecting milk	m ²	20	17.220	344.400	5.600
3. Technological equipment				826.000	13.431
Lacto freezer (from 200 litres)	no.	2	120.000	240.000	3.902
Tractor	no.	1	360.000	360.000	5.854
Caravan	no.	1	90.000	90.000	1.463
Wheelbarrow	no.	2	2.500	5.000	81
Buckets for lamb watering	no.	10	1.500	15.000	244
Wooden feeders for concentrate (4m)	no.	10	2.000	20.000	325
Mobile metal combine feeders (4m)	no.	10	6.000	60.000	976
Watering trough (4m)	no.	10	3.000	30.000	488
Boiler for warm water	no.	1	6.000	6.000	98
Total				18.224.695	296.337

Table 70

Costs for investment maintenance

Asset	Value (MKD)	Maintenance rate (%)	Amount (MKD)	Amount (EUR)
Technological equipment	826.000	0,5	4.130	67
Total			4.130	67

Table 71

Tangible costs of production

Type of cost	Measurement unit	Quantity	Unit price (MKD)	Total (MKD)	Total (EUR)
1. Basic materials				750.880	12.208
Hay (lucerne)	kg	40.820	10	408.200	6.637
Concentrate	kg	16.610	18	298.980	4.861
Salt	kg	480	30	14.400	234
Grazing cost	kg	106	50	5.300	86
Straw	kg	8.000	3	24.000	390
2. Subsidiary materials				143.570	2.334
Veterinary services	no.	106	150	15.900	259
Disinfectants				2.000	33
Electricity	months	12	5.000	60.000	976
Wood	m ²	10	2.700	27.000	439
Water	m ²	1.289	30	38.670	629
3. Investment maintenance				4.130	67
Total				898.580	14.611

Table 72

Insurance of the basic flock

Basic flock	Value (MKD)	Premium (%)	Amount (MKD)	Amount (EUR)
Sheep	3.075.000	10	307.500	5.000
Rams	369.000	10	36.900	600
Total			344.400	5.600

Table 73

Costs for salaries

Qualification structure	Number of workers	Net salary per month (MKD)	Gross salary per month (MKD)	Annual salary costs (MKD)	Annual salary costs (EUR)
Unqualified workers	2	12.000	20.400	489.600	7.961
Workers with high education	1	18.000	30.600	367.200	5.971
Total	3	30.000	51.000	856.800	13.932

Table 74

Calculation of amortization

Basic asset	Measure- ment unit	Basic flock	Construction objects	Technological equipment	Total
Amortization basis	MKD	4.331.415	13.067.280	826.000	18.224.695
Amortization rate	(%)	15	2,5	10	
Annual amount of the amortization	MKD	649.712	326.682	82.600	1.058.994
Annual amount during the Project					
0	MKD	/	/	/	/
1	MKD	3.681.703	12.740.598	743.400	17.165.701
2	MKD	3.031.991	12.413.916	660.800	16.106.707
3	MKD	2.382.278	12.087.234	578.200	15.047.712
4	MKD	1.732.566	11.760.552	495.600	13.988.718
5	MKD	1.082.854	11.433.870	413.000	12.929.724
6	MKD	433.142	11.107.188	330.400	11.870.730
Value at the end of duration					
Amendment of the value	MKD	3.898.274	1.960.092	495.600	6.353.966
Present value	MKD	433.142	11.107.188	330.400	11.870.730

The amortization is part of the transferred value of the fixed (basic) assets in the process of reproduction. As a basis for calculation of the amortization is used the acquisition value of the assets. The acquisition value of the assets is the purchasing cost of funds increased for the import expenses and taxes as well as all the other expenses relating to the procurement of the fixed asset and its release. In accordance with the Regulation on the method and the manner of calculating amortization (Official Gazette of RM, 10/2008) the annual rates of amortization amount to 2.5% for construction objects, 15% for the basic flock and 10% for technological equipment. The amendment of the value represents the total amortization, calculated for a period of six years. Present value represents the balance of assets' value for which we can still calculate amortization and this value is added as a balance of the project's value in the last year of the economic life of the project. In this case, the technical lifetime of the basic flock ends after 5 years, in other words, very small value of the flock remains for use in the sixth year, while the remaining value is redeemed.

1.17.1.1.3. Recapitulation of tangible and intangible costs of production

These production costs include tangible and intangible (fixed and variable) costs that are required for normal operation of the project within one year (Tab. 75). In this case the displayed total costs are projected for the first five years of project. The increase of certain costs from year to year is due to the increase of the basic flock and the need for greater investment in means of production. This contributes to increasing the total costs of production needed during one production year.

1.17.1.1.4. Calculation of total revenue

The income from the operation include the produced products intended for the market: milk, lambs for breeding, wool and manure. Their value is 2.057.480 denars, and that value does not cover the subsidies (Tab. 76).

Aquiring subsidies every year increase the total income. They are calculated according to the Regulation on criteria for direct payments, the beneficiaries, the maximum amounts and manner of direct payments for 2012, published in Official Gazette of RM no.

22/2012, as follows: measure no. 21 under which the amount of direct payments of labeled sheep heads from all categories is 1.000 denars per head or 700 denars per one female lamb, measure no. 22 under which the direct payments for produced and sold sheep milk amount 3.5 denars per litre and measure no.23 under which direct payments for the purchasing male breeding heads (originals) is 20.000 denars. For the first operating year it is expected increasement of the total revenue from subsidies in amount of 282.440 denars, so the final income for the current year is expected to be 2.339.920 denars.

In the following years, the revenues continue to grow from year to year. The increase of the revenues is due to an increase in production capacity, as well as the final product (Tab. 77).

1.17.1.1.5. Calculation of current assets

Unlike the fixed assets that are used in more than one production year, current assets are the assets that are necessary for produc-

tion within one year. At the end of the year they are spent or transformed into another form through sale of the new products (eg. from tangible assets in cash and vice versa). The current assets include: supplies of raw materials and materials, unsold finished products, unfinished production, cash (money) and receivables (debts of buyers).

Turnover represents the circular flow of assets in the process of reproduction while the number of bound days represents the duration of the turnover of funds. The shorter the time of turnover of current assets, the greater economic efficiency of investment in those assets.

The necessary current assets are calculated on the basis of the average turnover ratio of the finances. The turnover ratio shows how many times the current assets are included in the total income from the production. The necessary current assets amount 770.338 denars, and they represent a remainder of the current assets and the funds from current operation (Tab. 78).

Table 75

Recapitulation of the production costs (MKD)

Type of cost	Year				
	2014	2015	2016	2017	2018
Basic materials	750.880	901.056	1.081.267	1.297.521	1.557.025
Subsidiary materials	143.570	157.213	174.266	195.582	222.228
Investment maintenance	4.130	4.130	4.130	4.130	4.130
Insurance	344.400	413.280	495.936	595.123	714.148
Gross salaries	856.800	856.800	856.800	1.101.600	1.101.600
Amortization	1.058.994	1.058.994	1.058.994	1.058.994	1.058.994
Total costs	3.158.774	3.391.473	3.671.393	4.252.950	4.658.125

Table 76

Projected income for the first year

Type of product	Measurement unit	Quantity	Unit price MKD	Total MKD
Milk	lit.	7.840	35	274.400
Lambs for breeding (m)	no.	65	15.000	975.000
Lambs for breeding (f)	no.	65	12.000	780.000
Wool	kg	416	30	12.480
Manure	kg	15.600	1	15.600
Subsidies				
Sheep	no.	100	1.000	100.000
Female lambs	no.	50	700	35.000
Milk	lit,	7.840	3,5	27.440
Rams	no.	6	20.000	120.000
Total				2.339.920

Table 77

Expected revenues per years (MKD)

Type of product	Year					
	2014	2015	2016	2017	2018	2019
Milk	274.400	268.800	319.200	408.000	520.800	520.800
Lambs for breeding (m)	975.000	975.000	1.050.000	1.650.000	2.100.000	2.100.000
Lambs for breeding (f)	780.000	780.000	840.000	1.320.000	1.680.000	1.680.000
Wool	12.480	12.240	15.960	20.400	26.040	26.040
Manure	15.600	15.300	19.950	25.500	32.550	32.550
Revenues from products	2.057.480	2.051.340	2.245.110	3.423.900	4.359.390	4.359.390
Sheep	100.000	183.000	232.000	306.000	376.000	376.000
Female lambs	35.000	45.500	49.000	77.000	98.000	98.000
Milk	27.440	26.880	37.240	47.600	60.760	60.760
Rams	120.000	0	0	0	0	0
Subsidies	282.440	255.380	318.240	430.600	534.760	534.760
Total	2.339.920	2.306.720	2.563.350	3.854.500	4.894.150	4.894.150

Table 78

Necessary current assets

Type of current assets	Total annual necessity	Number of bounded days	Turnover coefficient	Necessary current assets in MKD
A. Current assets				967.428
Permanent current assets				804.934
Supplies of raw materials and repro materials	898.580	10	36	24.961
Supplies of unfinished production	2.339.920	120	3	779.973
Other current assets				162.494
Assets on giro account	2.339.920	10	36	64.998
Receivables	2.339.920	15	24	97.497
B. Sources of current operation				197.090
1. Suppliers	898.580	15	24	37.441
2. Amortization	1.058.994	30	12	88.250
3. Gross salaries	856.800	30	12	71.400
B. Necessary current assets (A-B)				770.338

1.17.1.1.6. Investment financing sources and commitments towards them

Based on previous calculations has been made a recapitulation of the necessary funds for the investment financing, and an overview

of the sources of investment financing was given.

Necessary funds for investment financing. The investments represent a set of investments in fixed assets and permanent cur-

rent assets. Total investments amount to 18.995.033 denars or 308.862 euros (Tab. 79).

The investments in fixed assets participate with 96%, while the investment in current assets participates with 4% in the total value of the investment.

Financial sources. The entire financing of the investment will be provided by self-participation that will be spent on procurement of fixed and current assets (Tab. 80).

Table 79

Total investments

Structure of the assets	Value (MKD)	Value (EUR)	Participation (%)
Fixed assets	18.224.695	296.337	96
Current assets	770.338	12.526	4
Total	18.995.033	308.862	100

Table 80

Investment financing

Sources	Value (MKD)	Value (EUR)	Participation (%)
Self-participation	18.995.033	308.862	100
Bank loan	0	0	0
Total	18.995.033	308.862	100

17.1.1.7. Balance sheet and financial course of the project

The balance sheet is made in order to analyze the success from the project operation. The balance sheet data are used as initial information for evaluation of the financial and market success of the project.

Income statement. The financial analysis results of project's success are made for the first five years and the show a loss in the first four years of the project's operation. This situation occurs due to the high investments in fixed assets (construction materials and tech-

nological equipment). The data from the income statement are given in Table 81.

In accordance with the Official Gazette (159/2008) the rate for calculating taxes and other costs amount to 10% of the total profit or loss derived as the remainder of the revenues and expenditures during one financial year. Since the project has a net loss at the end of financial periods, there is not any allocation of the profit to funds and common spending.

Cost price. The sum of all costs that actually represent finances invested in means of production (materials, services and salaries) form the cost price of production. The sum of these costs represents the cost price of production. The market cost price represents the total revenues generated from the sales of products. The market cost price does not include the subsidies because they do not affect the products' price on the market (Tab. 82).

From Table 82 we can note that the remainder between the sales (market) price and its own cost price has a negative value. It is because of the high cost price of the production and the lower market value of the product. The higher cost price of the production, the lower financial results from the operations.

The cost price per unit product (Tab. 83) shows the production value of each product separately and thus allows comparison of the cost price of a given product to its market price. From the table we can see that the production value of all products is higher than the value which the products could reach on the market.

Financial course of the project. The financial course of the project includes all components (incomes and expenditures) from the beginning of the project till the end of the economic life of the project. The analysis starts with the expenses for the project preparation, i.e. with the investments (Tab. 84).

The remainder of the inflows and outflows of the project by years represents the net revenues. The net income course represents the cash or assets that are free to use in terms of settlement of all financial obligations. It is a basis for evaluation of the project's liquidity. Net inflows by year show a positive value that confirms the liquidity of the project.

Table 81

Income statement in the dynamics

Indicator	Investment project years					
	2014	2015	2016	2017	2018	2019
A. Expenditures	3.158.774	3.391.473	3.671.393	4.252.950	4.658.125	4.658.125
1. Costs of sold items	3.158.774	3.391.473	3.671.393	4.252.950	4.658.125	4.658.125
1.1. Tangible expenses	898.580	1.062.399	1.259.663	1.497.233	1.783.383	1.783.383
1.1.1. Basic materials	750.880	901.056	1.081.267	1.297.521	1.557.025	1.557.025
1.1.2. Subsidiary materials	143.570	157.213	174.266	195.582	222.228	222.228
1.1.3. Investment maintenance	4.130	4.130	4.130	4.130	4.130	4.130
1.2. Insurance	344.400	413.280	495.936	595.123	714.148	714.148
1.3. Gross salaries	856.800	856.800	856.800	1.101.600	1.101.600	1.101.600
1.4. Amortization	1.058.994	1.058.994	1.058.994	1.058.994	1.058.994	1.058.994
2. Financing expenditures	0	0	0	0	0	0
2.1. Interests	0	0	0	0	0	0
2.2. Other financing expenditures	0	0	0	0	0	0
B. Revenues	2.339.920	2.306.720	2.563.350	3.854.500	4.894.150	4.894.150
1. Revenues from sold items	2.057.480	2.051.340	2.245.110	3.423.900	4.359.390	4.359.390
2. Other revenues	282.440	255.380	318.240	430.600	534.760	534.760
B. Profit before taxation	0	0	0	0	236.025	236.025
C. Loss before taxation	818.854	1.084.753	1.108.043	398.450	0	0
Taxes, salaries and other expenses from the profit	81.885	108.475	110.804	39.845	23.603	23.603
D. Financial year profit	0	0	0	0	212.423	212.423
E. Financial year loss	900.740	1.193.229	1.218.848	438.295	0	0
Loss coverage from the previous years		900.740	2.093.968	3.312.816	3.751.111	3.538.689
F. Net profit for allocation	0	0	0	0	0	0
G. Net loss	900.740	2.093.968	3.312.816	3.751.111	3.538.689	3.326.266
Part for common consumption	0	0	0	0	0	0
Part for storing	0	0	0	0	0	0
Part for other funds	0	0	0	0	0	0
3. Not allocated profit	0	0	0	0	0	0

Table 82

Cost price of the production

Indicator	Value per years (in MKD)					
	2014	2015	2016	2017	2018	2019
1. Tangible expenses	898.580	1.062.399	1.259.663	1.497.233	1.783.383	1.783.383
1.1. Basic materials	750.880	901.056	1.081.267	1.297.521	1.557.025	1.557.025
1.2. Subsidiary materials	143.570	157.213	174.266	195.582	222.228	222.228
1.3. Investment maintenance	4.130	4.130	4.130	4.130	4.130	4.130
2. Insurance	344.400	413.280	495.936	595.123	714.148	714.148
3. Gross salaries	856.800	856.800	856.800	1.101.600	1.101.600	1.101.600
4. Amortization	1.058.994	1.058.994	1.058.994	1.058.994	1.058.994	1.058.994
5. Taxes and salaries	81.885	108.475	110.804	39.845	23.603	23.603
6. Common consumption	0	0	0	0	0	0
Cost price of the products	3.240.660	3.499.949	3.782.198	4.292.795	4.681.727	4.681.727
Market price of the products	2.057.480	2.051.340	2.245.110	3.423.900	4.359.390	4.359.390
Remainder	-1.183.180	-1.448.609	-1.537.088	-868.895	-322.337	-322.337

Table 83

Cost price per unit product

Type of product	Meas . unit	Quantity	Market price	Market value	Participation (%)	Allocation coefficient	Allocated costs per product	Cost price per unit product
Milk	lit.	7.840	35	274.400	13,34	1,53526	421.276	53,73
Lambs for breeding (m)	no.	65	15.000	975.000	47,39	1,53526	1.496.882	23.028,95
Lambs for breeding (f)	no.	65	12.000	780.000	37,91	1,53526	1.197.506	18.423,16
Wool	Kg	416	30	12.480	0,61	1,53526	19.160	46,06
Manure	Kg	15.600	1	15.600	0,76	1,53526	23.950	1,54
Total				2.057.480	100		3.158.774	

Table 84

Financial course of the project

Indicator	Year						
	0	1	2	3	4	5	6
A. Inflows	18.995.033	2.339.920	2.306.720	2.563.350	3.854.500	4.894.150	17.535.217
Total revenue	0	2.339.920	2.306.720	2.563.350	3.854.500	4.894.150	4.894.150
Sources for financing	18.995.033	0	0	0	0	0	0
Balance of the product value	0	0	0	0	0	0	12.641.067
B. Outflows	18.995.033	1.837.265	2.027.674	2.227.268	2.638.678	2.908.585	2.908.585
Investition	18.995.033	0	0	0	0	0	0
Operational costs	0	898.580	1.062.399	1.259.663	1.497.233	1.783.383	1.783.383
Salaries	0	856.800	856.800	856.800	1.101.600	1.101.600	1.101.600
Taxes	0	81.885	108.475	110.804	39.845	23.603	23.603
Part for funds	0	0	0	0	0	0	0
Obligations towards financial sources	0	0	0	0	0	0	0
C. Net inflows	0	502.655	279.046	336.082	1.215.822	1.985.565	14.626.632

1.17.1.1.8. Financial and market evaluation of the project

The financial and market evaluation of the project is most important for determining whether to implement the project. Hereinafter, it is considered in two ways, both static and dynamic evaluation of the project.

Static evaluation of project. The static evaluation of the investment analyzes the average annual value of the costs for supplying means of production and the average annual value of the revenues generated from this production (Tab. 85).

Table 85

Static assessment of the project

Indicator	Value of the indicator
Net profit per employee	779.973
Cumulativity	0,00%
Gross salary per employee	285.600
Energetic intensiveness	6,68%
Economy of the production	0,76
Reproductive capacity	5,58%

The analysis necessary for making a static evaluation of the project are used data taken from the balance sheet and the financial success of the project. The static evaluation should give an insight of the equipment and the efficiency of the project.

The gross profit per employee is the ratio between average revenues and the number of workers in manufacturing.

Accumulation shows the amount of allocated profit in terms of total investments.

Calculation of gross salary per employee shows the average gross salary in relation to the total number of employees.

Energy intensity indicates the energy consumption in relation to average investments for procurement of tangible assets for realizing the everyday production. The calculation in Table 85 shows that energy costs take 6.68% of total tangible costs used during one production year.

The economy of production represents a ratio between the market value of production and the average costs made during one production year. The production is considered economical if the economy coefficient is greater than 1. Since production costs are higher than the selling price of the products, the economy coefficient is 0,76, so the production is not economical. Reproductive ability is the ratio between amortization investments and the allocated profits on one hand, and total investments in one production year on the other.

Dynamic Assessment. Dynamic evaluation shows the profitability and liquidity of the project. The profitability analysis starts with the economy course of the project that shows the economic potential of the project (Tab. 86). Unlike static analysis, dynamic analysis includes the time factor, i.e. analyzes the investment by years in accordance with the economic course of the project.

Table 86

Economic course of the project

Indicator	Year						
	0	1	2	3	4	5	6
A. Inflows	0	2.339.920	2.306.720	2.563.350	3.854.500	4.894.150	17.535.217
Total revenue	0	2.339.920	2.306.720	2.563.350	3.854.500	4.894.150	4.894.150
Balance of the product value	0	0	0	0	0	0	12.641.067
B. Outflows	18.995.033	1.757.540	2.027.674	2.227.268	2.638.678	2.908.585	2.908.585
Investition	18.995.033	0	0	0	0	0	0
Operational costs	0	818.854	1.062.399	1.259.663	1.497.233	1.783.383	1.783.383
Salaries	0	856.800	856.800	856.800	1.101.600	1.101.600	1.101.600
Taxes	0	81.885	108.475	110.804	39.845	23.603	23.603
Part for funds	0	0	0	0	0	0	0
c. Net inflow	-18.995.033	582.380	279.046	336.082	1.215.822	1.985.565	14.626.632

Net inflows consist of net profits and the amortization which is separated from operating costs in the table. Net profits show positive results from the project's operation.

Return of investment period. Return of investment period represents the economic efficiency of the investment being evaluated according to the time required to repay all funds invested in the investment from the revenues derived from that investment (Tab. 87).

Table 87 shows the required years necessary for returning the investment, and that is the period when the net inflows will cover the full investment costs investment and thereby would achieve zero-balance. According to the calculation shown in the same Table, the repayment period of investment is 12 years and 4 months.

Present net value of the project. The present net (capital) value of the project aims to minimize any future effects of the project of their current value. Relative present net value of the project is calculated by discount factor of 10% and is 40,34% of the investments' value (Tab.88). According to the results obtained, the capital value of the investment is less than 0 amounts is -8.818.991 denars,

which means it is unacceptable as economically inefficient investment.

Table 87

Return of investment period

Year	Net inflow from economic course	Cumulative of net inflows
0	-18.995.033	-18.995.033
1	582.380	-18.412.653
2	279.046	-18.133.607
3	336.082	-17.797.525
4	1.215.822	-16.581.702
5	1.985.565	-14.596.137
6	1.985.565	-12.610.573
7	1.985.565	-10.625.008
8	1.985.565	-8.639.443
9	1.985.565	-6.653.879
10	1.985.565	-4.668.314
11	1.985.565	-2.682.749
12	1.985.565	-697.184
13	1.985.565	1.288.380
14	1.985.565	3.273.945

Table 88

Net present value at discount factor 10%

Indicator	0	1	2	3	4	5	6
Net inflow	-18.995.033	582.380	279.046	336.082	1.215.822	1.985.565	14.626.632
Discount factor	1,000000	0,909091	0,826446	0,751315	0,683013	0,620921	0,564474
Discount net inflow	-18.995.033	529.437	230.616	252.504	830.423	1.232.879	8.256.353
Capital value	-18.995.033	-18.465.596	-18.696.213	-18.948.716	-18.118.293	-16.885.414	-8.629.061
5. Relative net present value							40,34%

Internal profitability rate. The internal profitability rate is the rate in which the present net value of the project equals to zero. It equates the present value of negative net values in the economic course of the project with the current values of positive inflows. In this case, the internal profitability rate has a value lower than 0, indicating that the investment is not efficient and is followed by loss of 3,06% (Tab. 89). The calculated internal rate of -3,06% shows the extent of effective interest

calculation of the assets invested in the investment or the level of profitability of the investment.

Sensitivity analysis. Sensitivity analysis shows how profitable or economically worth the investment is by calculating the fixed costs and the level of influence on the revenues (Tab. 90). Forecasts suggest that this investment is not profitable due to the low revenue values compared to the necessary production costs.

Table 89

Internal profitability rate (MKD)

Year	Net inflow	Lower discount rate	Bankable net inflow	Higher discount rate	Bankable net outflow
0	-18.995.033	1,000000	-18.995.033	1,000000	-18.995.033
1	582.380	0,909091	529.437	0,900901	524.667
2	279.046	0,826446	230.616	0,811622	226.480
3	336.082	0,751315	252.504	0,731191	245.741
4	1.215.822	0,683013	830.423	0,658731	800.900
5	1.985.565	0,620921	1.232.879	0,593451	1.178.336
6	1.985.565	0,564474	1.120.800	0,534641	1.061.564
7	1.985.565	0,513158	1.018.909	0,481658	956.364
8	1.985.565	0,466507	926.281	0,433926	861.589
9	1.985.565	0,424098	842.073	0,390925	776.206
10	1.985.565	0,385543	765.521	0,352184	699.285
11	1.985.565	0,350494	695.928	0,317283	629.987
12	1.985.565	0,318631	632.662	0,285841	567.555
13	1.985.565	0,289664	575.147	0,257514	511.311
14	1.985.565	0,263331	522.861	0,231995	460.641
Capital value of the investition			-8.818.992		-9.494.407
Internal profitability rate					-3,06%

Table 90

Sensitivity of investment analysis (MKD)

Indicator	Fixed	Variable	Total
1. Tangible costs	179.716	718.864	898.580
2. Amortization	1.058.994	0	1.058.994
3. Intangible costs	68.880	275.520	344.400
4. Salaries	599.760	257.040	856.800
5. Taxes	8.189	73.697	81.885
6. Funds	0	0	0
Total expenses	1.915.539	1.325.121	3.240.660
Total income			2.339.920
Remainder			-900.740

1.17.1.2. Simulation 2

The second simulation concerns the financial analysis of the project that does not include costs for investments in construction objects and technical equipment. The assumption is that the objects are already built, and the equipment exists. The investments

include only investments for purchasing basic flock.

1.17.1.2.1. Investments in permanent (fixed) assets

The total procurement of fixed assets comprises the purchasing of basic flock: 100 milking sheep and 6 rams of the Merinolandschaf breed. The total cost for their purchase also include transport costs, costs for selection of breeding heads and quarantine costs that amount to **4.331.415 denars, or 70.429 euros**. These costs are shown in details in Table 68 of the previous simulation.

1.17.1.2.2. Production costs

The production costs are divided into tangible and intangible costs. The tangible costs include the costs for basic materials (food for animal husbandry) and subsidiary materials (Tab. 91). Other expenses include: insurance costs of basic flock, costs for personal income and amortization of basic flock.

Table 91

Production costs

Type of cost	Total (MKD)	Total (EUR)
1. Tangible costs	894.450	14.544
1.1. Basic materials	750.880	12.209
1.2. Subsidiary materials	143.570	2.334
2. Insurance	250.305	4.070
3. Gross salaries	856.800	13.932
4. Amortization	866.283	14.086
Total	2.867.838	46.632

Since all costs (except amortization costs) are the same as in the previous simulation, their detailed calculation is not shown separately in this simulation. The following table (Tab. 92) shows the calculation of amortization for primary flock.

Table 92

Calculation of amortization

Basic asset	Measurement unit	Basic flock
Amortization basis	MKD	4.331.415
Amortization rate	(%)	15
Annual amount of amortization	MKD	649.712
Repay per years		
0	MKD	0
1	MKD	3.681.703
2	MKD	3.031.991
3	MKD	2.382.278
4	MKD	1.732.566
5	MKD	1.082.854
6	MKD	433.142
Value at the end of the duration		
Correction of the value	MKD	3.898.274
Net book value	MKD	433.142

1.17.1.2.3. Recapitulation of tangible and intangible production costs

Movement of tangible and intangible production costs in the first five years of the investment are shown in Table 93.

1.17.1.2.4. Calculation of total revenue

Revenue from operations remains the same as in the first simulation because of the same amount of investment in the basic flock and the same amount of subsidies expected by years (Tab. 94).

1.17.1.2.5. Calculation of current assets

Current assets are different because of the changes in tangible operational costs. Their value amount to 804.502 denars (Tab. 95). This value is lower than the value of current expenses at the previous simulation due to lower production costs (tangible costs) that are reduced for the investment value.

1.17.1.2.6. Investment financing sources and commitments towards them

Total investments represent a set of basic and current assets necessary for production. The total investments value amounts 5.135.917 denars (Tab. 96). Total investments are enabled by the down payment (100%) without credit funds.

1.17.1.2.7. Balance sheet and financial course of the project

Income Statement. Despite the reduction in the costs' value, the income statement shows a loss in the financial operations of the project (Tab. 97) again. The reason is the high investment costs for the purchasing basic flock. However, this simulation shows greater profitability of the investment in relation to the previous one. All six analyzed years of the income statement end with a loss, so at the end of the year the profit is not allocated.

Cost price. The calculation of production cost price shows that the production costs in the first four years are greater than the revenues made in the same years (Tab. 98). Profitability of the production is noted in the next two analyzed years of production.

Financial course of the project. The analysis of financial course of the project shows positive results from net inflows in all the analyzed years (Tab. 99). Thus, the difference between projected inflows and outflows of finances give positive values which in the last years of the project increase. Positive net inflows indicate that the project during the year earned cash flows that confirms its liquidity.

Table 93

Recapitulation of the production costs (MKD)

Type of cost	Year				
	2014	2015	2016	2017	2018
Basic materials	750.880	901.056	1.081.267	1.297.521	1.557.025
Subsidiary materials	143.570	157.213	174.266	195.582	222.228
Insurance	344.400	413.280	495.936	595.123	714.148
Gross salaries	856.800	856.800	856.800	1.101.600	1.101.600
Amortization	649.712	649.712	649.712	649.712	649.712
Total costs	2.745.362	2.978.061	3.257.981	3.839.538	4.244.713

Table 94

Total revenues per year (MKD)

Type of product	Year				
	2014	2015	2016	2017	2018
Milk	274.400	268.800	319.200	408.000	520.800
Lambs for breeding (m)	975.000	975.000	1.050.000	1.650.000	2.100.000
Lambs for breeding (f)	780.000	780.000	840.000	1.320.000	1.680.000
Wool	12.480	12.240	15.960	20.400	26.040
Manure	15.600	15.300	19.950	25.500	32.550
Subsidies					
Sheep	100.000	183.000	232.000	306.000	376.000
Female lambs	35.000	45.500	49.000	77.000	98.000
Milk	27.440	26.880	37.240	47.600	60.760
Rams	120.000	0	0	0	0
Total	2.339.920	2.306.720	2.563.350	3.854.500	4.894.150

Table 95.

Necessary current assets

Type of current assets	Total annual necessity	Number of bounded days	Turnover coefficient	Necessary current assets in MKD
A. Current assets				967.314
Permanent current assets				804.819
Supplies of raw materials and repro materials и репроматеријали	894.450	10	36	24.846
Supplies of unfinished production	2.339.920	120	3	779.973
Other current assets				162.494
Assets on gyro account	2.339.920	10	36	64.998
Receivables	2.339.920	15	24	97.497
B. Sources of current operation				162.811
1. Suppliers	894.450	15	24	37.269
2. Amortization	649.712	30	12	54.143
3. Gross salaries	856.800	30	12	71.400
C. Necessary current assets (A–B)				804.502

Table 96

Allocation of investments

Structure of the assets	Value in MKD	Value in EUR	Participation (%)
Fixed assets	4.331.415	70.430	84
Current assets	804.502	13.081	16
Total	5.135.917	83.511	100

Table 97

Income statement

Indicator	Investment project years					
	2014	2015	2016	2017	2018	2019
A. Expenditures	2.745.362	2.978.061	3.257.981	3.839.538	4.244.713	4.244.713
1. Costs of sold items	2.745.362	2.978.061	3.257.981	3.839.538	4.244.713	4.244.713
1.1. Tangible expenses	894.450	1.058.269	1.255.533	1.493.103	1.779.253	1.779.253
1.1.1. Basic materials	750.880	901.056	1.081.267	1.297.521	1.557.025	1.557.025
1.1.2. Subsidiary materials	143.570	157.213	174.266	195.582	222.228	222.228
1.2. Insurance	344.400	413.280	495.936	595.123	714.148	714.148
1.3. Gross salaries	856.800	856.800	856.800	1.101.600	1.101.600	1.101.600
1.4. Amortization	649.712	649.712	649.712	649.712	649.712	649.712
2. Financing expenditures	0	0	0	0	0	0
2.1. Interests	0	0	0	0	0	0
2.2. Other financing expenditures	0	0	0	0	0	0
B. Revenues	2.339.920	2.306.720	2.563.350	3.854.500	4.894.150	4.894.150
1. Revenues from sold items	2.057.480	2.051.340	2.245.110	3.423.900	4.359.390	4.359.390
2. Other revenues	282.440	255.380	318.240	430.600	534.760	534.760
B. Profit before taxation	0	0	0	14.962	649.437	649.437
C. Loss before taxation	405.442	671.341	694.631	0	0	0
Taxes, salaries and other expenses from the profit	40.544	67.134	69.463	1.496	64.944	64.944
D. Financial year profit	0	0	0	13.465	584.493	584.493
E. Financial year loss	445.986	738.475	764.094	0	0	0
Loss coverage from the previous years	0	445.986	1.184.462	1.948.556	1.935.091	1.350.598
F. Net profit for allocation	0	0	0	0	0	0
G. Net loss	445.986	1.184.462	1.948.556	1.935.091	1.350.598	766.104
Part for common consumption	0	0	0	0	0	0
Part for storing	0	0	0	0	0	0
Part for other funds	0	0	0	0	0	0
3. Not allocated profit	0	0	0	0	0	0

Table 98

Cost price

Indicator	Value per years (in MKD)					
	2014	2015	2016	2017	2018	2019
1. Tangible expenses	894.450	1.058.269	1.255.533	1.493.103	1.779.253	1.779.253
1.1. Basic materials	750.880	901.056	1.081.267	1.297.521	1.557.025	1.557.025
1.2. Subsidiary materials	143.570	157.213	174.266	195.582	222.228	222.228
2. Insurance	344.400	413.280	495.936	595.123	714.148	714.148
3. Gross salaries	856.800	856.800	856.800	1.101.600	1.101.600	1.101.600
4. Amortization	649.712	649.712	649.712	649.712	649.712	649.712
5. Taxes and salaries	40.544	67.134	69.463	1.496	64.944	64.944
6. Common consumption	0	0	0	0	0	0
Cost price of the products	2.785.906	3.045.195	3.327.444	3.841.035	4.309.657	4.309.657
Market price of the products	2.057.480	2.051.340	2.245.110	3.423.900	4.359.390	4.359.390
Remainder	-728.426	-993.855	-1.082.334	-417.135	49.733	49.733

Table 99

Financial course of the project

Indicator	Year						
	0	1	2	3	4	5	6
A. Inflows	5.135.917	2.339.920	2.306.720	2.563.350	3.854.500	4.894.150	6.131.794
Total revenue	0	2.339.920	2.306.720	2.563.350	3.854.500	4.894.150	4.894.150
Sources for financing	5.135.917	0	0	0	0	0	0
Balance of the product value	0	0	0	0	0	0	1.237.644
B. Outflows	5.135.917	1.791.794	1.982.203	2.181.796	2.596.199	2.945.797	2.945.797
Investition	5.135.917	0	0	0	0	0	0
Operational costs	0	894.450	1.058.269	1.255.533	1.493.103	1.779.253	1.779.253
Salaries	0	856.800	856.800	856.800	1.101.600	1.101.600	1.101.600
Taxes	0	40.544	67.134	69.463	1.496	64.944	64.944
Part for funds	0	0	0	0	0	0	0
Obligations towards financial sources	0	0	0	0	0	0	0
C. Net inflow	0	548.126	324.517	381.554	1.258.301	1.948.353	3.185.997

1.17.1.2.8. Financial and market evaluation of the project

The financial and market evaluation of the project, as in the previous simulation is considered in terms of static and dynamic assessment of the investment.

Stastic evaluation. The statistic evaluation was made for the investment, not including costs for construction and technological materials (Tab. 100). The existing amortization only applies to basic flock.

Compared to the first simulation, the analysis shows that there isn't any change in

gross salaries per employee, and therefore the gross profit remains the same. Because of the fact that the loss is not allocated (which is shown in the income statement), the accumulation in this simulation is 0% too.

Table 100
Statistical assessment of the project

Indicator	Value of the indicator
Net profit per employee	779.973
Cumulativity	0,00%
Gross salary per employee	285.600
Energetic intensiveness	2,19%
Economy of the production	0,86
Reproductive capacity	12,65%

Difference could be noted in energy intensity, the economics of production and reproductive ability of the project. According to Table 100, the utilization of energy in one production year covers 2.19% of total tangible costs realized in the same year. The average coefficient of the production economy amounts to 0.86 (value less than 1) and shows that production is not economical. If the economy of production in this simulation is monitored for each year separately, the value of the economy coefficient rises above 1 (1,01) in the last two analyzed years, i.e. in the fifth and sixth year, which confirms the economy of production in these two years.

Dynamic assessment. The results in Table 101 show the economic course of the project over five years. The difference between inflows and outflows of funds show positive results.

Table 101
Economic course of the project

Indicator	Year						
	0	1	2	3	4	5	6
A. Inflows	0	2.339.920	2.306.720	2.563.350	3.854.500	4.894.150	6.131.794
Total revenue	0	2.339.920	2.306.720	2.563.350	3.854.500	4.894.150	4.894.150
Balance of the product value	0	0	0	0	0	0	1.237.644
B. Outflows	5.135.917	1.791.794	1.982.203	2.181.796	2.596.199	2.945.797	2.945.797
Investment	5.135.917	0	0	0	0	0	0
Operational costs	0	894.450	1.058.269	1.255.533	1.493.103	1.779.253	1.779.253
Salaries	0	856.800	856.800	856.800	1.101.600	1.101.600	1.101.600
Taxes	0	40.544	67.134	69.463	1.496	64.944	64.944
Part for funds	0	0	0	0	0	0	0
C. Net inflow	-5.135.917	548.126	324.517	381.554	1.258.301	1.948.353	3.185.997

Return of investment period. The analysis of the return of investment period shows that in the sixth year of the project, the investment will not only be paid, but the project would also make profit. According to this calculation, the investment will be fully paid and the difference between total expenditures and incomes will be equal to zero for 5 years and 3 months.

Present net value. Relative present net value is calculated by discount factor of 10%. Its value is 4.19% of the total investment value (Tab. 103).

Internal profitability rate. The internal profitability rate is 10.39% (Tab. 104). It is calculated using two discount rates, lower and higher, or 10% and 11% respectively. Internal

profitability rate has a positive value, higher than zero, indicating that the investment has an effective interest calculation of assets invested in the investment, or the profitability rate of the investment is positive, and the investment is efficient.

Sensitivity analysis. The sensitivity analysis shows a high profitability rate due to higher amortization costs that are completely fixed costs and costs for salaries that are mostly fixed costs (Tab. 105).

Table 102

Return of investment period

Year	Net inflow from economic course	Cumulative of net inflows
0	-5.135.917	-5.135.917
1	548.126	-4.587.791
2	324.517	-4.263.275
3	381.554	-3.881.721
4	1.258.301	-2.623.420
5	1.948.353	-675.066
6	1.948.353	1.273.287
7	1.948.353	3.221.640

Table 103

Net present value (MKD)

Indicator	0	1	2	3	4	5	6
Net inflow	-5.135.917	548.126	324.517	381.554	1.258.301	1.948.353	3.185.997
Discount factor	1,000000	0,909091	0,826446	0,751315	0,683013	0,620921	0,564474
Discount net inflow	-5.135.917	498.296	268.196	286.667	859.436	1.209.774	1.798.412
Capital value	-5.135.917	-4.637.621	-4.369.425	-4.082.758	-3.223.322	-2.013.548	-215.135
5. Relative net present value							4,19%

Table 104

Internal profitability rate (MKD)

Year	Net inflow	Lower discount rate	Bankable net inflow	Higher discount rate	Bankable net outflow
0	-5.135.917	1,000000	-5.135.917	1,000000	-5.135.917
1	548.126	0,909091	498.296	0,900901	493.807
2	324.517	0,826446	268.196	0,811622	263.385
3	381.554	0,751315	286.667	0,731191	278.989
4	1.258.301	0,683013	859.436	0,658731	828.882
5	1.948.353	0,620921	1.209.774	0,593451	1.156.253
6	1.948.353	0,564474	1.099.795	0,534641	1.041.669
7	1.948.353	0,513158	999.813	0,481658	938.441
Capital value of the investment			86.060		-134.491
Internal profitability rate					10,39

Table 105

Sensitivity analysis

Indicator	Fixed	Variable	Total
1. Tangible costs	178.890	715.560	894.450
2. Amortization	649.712	0	649.712
3. Intangible costs	68.880	275.520	344.400
4. Salaries	599.760	257.040	856.800
5. Taxes	4.054	36.490	40.544
6. Funds	0	0	0
Total expenses	1.501.297	1.284.610	2.785.906
Total income			2.339.920
Remainder			-445.986

1.17.2. FINANCIAL ANALYSIS OF THE INVESTMENT – REPRO-CENTER FOR GOATS OF THE ALPINE AND SAANEN BREEDS

For preparation of financial analysis Repro-center for goats of Alpine and Saanen breed, all the values are reduced to the same measurement units. Financial data are shown in denars and in euros, using permanent prices.

As in investment for repro-center for sheep from Merinolandschaf breed, this financial analysis is also made in two simulations. First financial analysis despite the investment in basic flock covers and investments in construction buildings and technological materials as part of the investments for procurement of fixed assets. The second simulation analyzes the basic assets of purchasing basic flock, assuming that the buildings and technological materials already exist.

1.17.2.1. Simulation 1

The first step in financial analysis is to determine the cost of fixed and permanent current assets, then the financing sources and commitments towards them. This section covers the inputs and outputs in the production in order to have to have under control the necessary costs and the financial success of the project.

1.17.2.1.1. Investments in permanent (fixed) assets

Permanent or fixed assets are used permanently, i.e. they are gradually spent, so they are available for many years. Because they are not spent in one production cycle, they gradually transfer its value to new products.

In this financial analysis, investment in fixed assets related to the cost of purchasing basic flock, construction of facilities and procurement of technological equipment (Tab. 106).

The investment in basic flock includes purchase of 100 heads of goats and 6 male goats. It amounts 4.135.845 denars or 67.250 euros. The euro's value is calculated according to the exchange rate of the National Bank of RM (06.03.2012), i.e. average rate of 61,5

denars and the same will be used in the further calculations of the financial analysis.

The total investment in fixed assets (cost of purchasing basic flock, building facilities and technological equipment) amount to 20.684.245 denars or 336.329 euros (Tab. 107). The largest share in total fixed assets belong to the construction of buildings which is 14.822.400 denars (241.015 euros) from total investments.

1.17.2.1.2. Production costs

Production costs consist of tangible and intangible costs that are necessary for normal functioning of the project. These costs are elaborated in details in the following tables.

Tangible production costs. Basic material of production is the food for animal husbandry, including its component parts. Subsidiary materials project: veterinary services (medicines and vaccines), hygienics and disinfectants, electricity, wood and water. It covers most of the material costs, and its value is 696.520 denars, or 11.326 euros. Subsidiary materials amount to 182.210 dinars (2.963 euros). The total value of projected tangible costs amounts 887.360 denars, or 14.429 euros (Tab. 108).

Investment maintenance requires relatively small investment because we are talking about new equipment and new facilities. Its value is 8.630 denars or 140 euros (Tab. 109).

Insurance costs. Other costs necessary for normal implementation of the activities also include intangible costs, or insurance costs for the basic flock. The construction objects and the equipment will not be insured. The total value of the insurance costs is 344.400 denars (5.600 euros), (Tab. 110).

Calculation of gross salaries. In determining the required number of workers have been projected three workers, of which one with a high education. Due to the necessity of constant engagement of the employees, the gross monthly salary will be paid for 12 months. The sum of the gross salaries paid monthly within one year represents an annual cost of salary and amounts 856.800 denars, or 13.932 euros (Tab. 111).

Table 106

Costs for purchasing basic flock

Type of cost	Measurement unit	Quantity	Unit price (MKD)	Total (MKD)	Total (EUR)
1. Basic flock				3.444.000	56.000
Milking goats (ewe)	no.	100	30.750	3.075.000	50.000
Male goats	no.	6	61.500	369.000	6.000
2. Costs for breeding heads selection from Germany				186.345	3.030
Airplane tickets	no.	3	30.750	92.250	1.500
Overnight	no.	9	6.150	55.350	900
Daily wages	no.	9	4.305	38.745	630
3. Quarantine costs for 30-day period				505.500	8.220
3.1. Food expenses				92.220	1.500
Hay	kg	63.600	1.034	63.600	1.034
Concentrate	kg	28.620	465	28.620	465
3.2. Costs for laboratory analysis				413.280	6.720
Serological testing of brucellosis	no.	106	1.845	195.570	3.180
Parasitic laboratory analysis of lungs and rumen	no.	106	1.845	195.570	3.180
Serological testing – Q fever	no.	6	1.845	11.070	180
Elisa-test with negative results of blue tongue	no.	6	1.845	11.070	180
Total costs for purchasing basic flock				4.135.845	67.250

Table 107

Total investment in fixed assets

Type of fixed assets	Measurement unit	Quantity	Unit price (MKD)	Total (MKD)	Total (EUR)
1. Basic flock	no.	160		4.135.845	67.250
2. Construction objects				14.822.400	241.015
For goat housing	m ²	670	17.220	11.537.400	187.600
Effluent with fence	m ²	670	600	402.000	6.537
Barn	m ²	150	2.000	300.000	4.878
Storage (for concentrate, food...)	m ²	50	17.220	861.000	14.000
Building for accommodating workers	m ²	40	17.220	688.800	11.200
Milking room	m ²	40	17.220	688.800	11.200
Room for collecting milk	m ²	20	17.220	344.400	5.600
3. Technological equipment				1.726.000	28.065
Lacto freezer (from 200 litres)	no.	2	120.000	240.000	3.902
Tractor	no.	1	360.000	360.000	5.854
Caravan	no.	1	90.000	90.000	1.463
Wheelbarrow	no.	2	2.500	5.000	81
Buckets for lamb watering	no.	10	1.500	15.000	244
Wooden feeders for concentrate (4m)	no.	10	2.000	20.000	325
Mobile metal comb. feeders (4m)	no.	10	6.000	60.000	976
Watering trough (4m)	no.	10	3.000	30.000	488
Boiler for warm water	no.	1	6.000	6.000	98
Milking machine	no.	1	900.000	900.000	14.634
Total				20.684.245	336.329

Table 108

Tangible costs of production

Type of cost	Measurement unit	Quantity	Unit price MKD	Total MKD	Total EUR
1. Basic materials				696.520	11.326
– Hay (lucerne)	Kg	35.720	10	357.200	5.808
– Concentrate	Kg	16.610	18	298.980	4.861
– Salt	Kg	368	30	11.040	180
– Grazing cost	Kg	106	50	5.300	86
– Straw	kg	8.000	3	24.000	390
2. Subsidiary materials				182.210	2.963
– Veterinary services	no.	106	150	15.900	259
– Disinfectants				2.000	33
– Electricity	months	12	5.000	60.000	976
– Wood	m ²	10	2.700	27.000	439
– Water	m ²	2.577	30	77.310	1.257
3. Investment maintenance				8.630	140
Total				887.360	14.429

Table 109.

Costs for investment maintenance

Asset	Value (MKD)	Maintenance rate (%)	Amount (MKD)	Amount (EUR)
Technological equipment	1.726.000	0,5	8.630	140
Total			8.630	140

Table 110

Insurance of the basic flock

Basic flock	Value MKD	Premium (%)	Amount (MKD)	Amount (EUR)
Goats	3.075.000	10	307.500	5.000
Billy goats	369.000	10	36.900	600
Total			344.400	5.600

Table 111

Costs for salaries

Qualification structure	Number of workers	Net salary per month	Qualification structure	Number of workers	Net salary per month
Unqualified workers	2	12.000	20.400	489.600	7.961
Workers with high education	1	18.000	30.600	367.200	5.971
Total	3	30.000	51.000	856.800	13.932

Calculation of amortization. The amortization is part of the transferred value of the fixed (basic) assets in the process of reproduction. As a basis for calculation of the amortization is used the acquisition value of the assets (Official Gazette of RM, 10/2008). The acquisition value of the assets is the purchasing cost of funds increased for the import expenses and taxes as well as all the other expenses relating to the procurement of the fixed asset and its release. In accordance with the Regulation on the method and the manner of calculating amortization (Official Gazette of RM, 10/2008) the annual rates of amortization amount to 2.5% for construction objects, 15% for the basic flock and 10% for technological equipment. The amendment of the value represents the total amortization, calculated for a period of six years (Tab.112).

Present value represents the balance of assets' value for which we can still calculate amortization and this value is added as a balance of the project's value in the last year of the economic life of the project. In this case, the technical lifetime of the basic flock ends after 5 years.

1.17.2.1.3. Recapitulation of tangible and intangible production costs

In this case the displayed total costs are projected for the first five years of project

(Tab.113). The increase of certain costs from year to year is due to the increase of the basic flock and the need for greater investment in means of production.

1.17.2.1.4 Calculation of total revenue

The income from the operation include the produced products of the repro-center: milk, kids for breeding and manure, plus the subsidies value (Tab. 114).

The revenues from sales in the first (2014) year amount to 2.689.600 denars (Tab. 115). This year the value of subsidies increases the income for 281.200 denars. In the following years, the revenues continue to grow from year to year. The increase of the revenue is due to an increase in production capacity, as well as the final product.

The subsidies are calculated according to the Regulation on published in Official Gazette of RM no.22/2012, as follows: measure no. 24 under which the amount of direct payments of labeled goat heads from all categories is 900 denars per head or 300 denars per one female kids, measure no. 25 under which the direct payments for produced and sold sheep milk amount 3.5 denars per litre and measure no.26 under which direct payments for the purchasing male breeding heads (originals) is 4.500 denars.

Table 112

Calculation of Amortization

Basic asset	Measurement unit	Basic flock	Construction objects	Technological equipment	Total
Amortization basis	MKD	4.135.845	14.822.400	1.726.000	20.684.245
Amortization rate	(%)	15	2,5	10	
Annual amount of the amortization	MKD	620.377	370.560	172.600	1.163.537
Annual amount during the Project					
0	MKD	0	0	0	0
1	MKD	3.515.468	14.451.840	1.553.400	19.520.708
2	MKD	2.895.092	14.081.280	1.380.800	18.357.172
3	MKD	2.274.715	13.710.720	1.208.200	17.193.635
4	MKD	1.654.338	13.340.160	1.035.600	16.030.098
5	MKD	1.033.961	12.969.600	863.000	14.866.561
6	MKD	413.585	12.599.040	690.400	13.703.025
Value at the end of duration					
Amendment of the value	MKD	3.722.261	2.223.360	1.035.600	6.981.221
Present value	MKD	413.585	12.599.040	690.400	13.703.025

Table 113

Recapitulation of the production costs (MKD)

Type of cost	Year				
	2014	2015	2016	2017	2018
Basic materials	696.520	835.824	1.002.989	1.203.587	1.444.304
Subsidiary materials	182.210	200.852	223.222	250.067	282.280
Insurance	344.400	413.280	495.936	595.123	714.148
Investment maintenance	8.630	8.630	8.630	8.630	8.630
Gross salaries	856.800	856.800	856.800	1.101.600	1.101.600
Amortization	1.163.537	1.163.537	1.163.537	1.163.537	1.163.537
Total costs	3.252.097	3.478.923	3.751.114	4.322.543	4.714.499

Table 114

Revenues made in the first year

Type of product	Measurement unit	Quantity	Unit price MKD	Total MKD
Milk	lit.	39.200	20	784.000
Kids for breeding (m)	no.	90	12.000	1.080.000
Kids for breeding (f)	no.	90	9.000	810.000
Manure	kg	15.600	1	15.600
Subsidies				
Goats	no.	100	900	90.000
Female kids	no.	90	300	27.000
Milk	lit.	39.200	3,5	137.200
Billy goats	No.	6	4.500	27.000
Total				2.970.800

Table 115

Expected revenues by years (MKD)

Type of product	Year					
	2014	2015	2016	2017	2018	2019
Milk	784.000	768.000	1.152.000	1.536.000	2.096.000	2.096.000
Kid's for breeding (m)	1.080.000	1.080.000	1.560.000	2.040.000	2.820.000	2.820.000
Kid's for breeding (f)	810.000	810.000	1.170.000	1.530.000	2.115.000	2.115.000
Manure	15.600	15.300	21.600	28.800	39.300	39.300
Revenues from products	2.689.600	2.673.300	3.903.600	5.134.800	7.070.300	7.070.300
Goats	90.000	185.400	253.800	342.000	460.800	460.800
Female kid's	27.000	27.000	39.000	51.000	70.500	70.500
Milk	137.200	134.400	201.600	268.800	366.800	366.800
Male goats	27.000	0	0	0	0	0
Subsidies	281.200	346.800	494.400	661.800	898.100	898.100
Total	2.970.800	3.020.100	4.398.000	5.796.600	7.968.400	7.968.400

1.17.1.1.2. Calculation of current assets

Current assets are essential for normal functioning of the production process. They are used not more than one year and at the end they are spent.

Turnover represents the circular flow of assets in the process of reproduction while the number of bound days represents the duration of the turnover of funds. The shorter the time

of turnover of current assets, the greater economic efficiency of investment in those assets.

The current assets are calculated on the basis of the average turnover ratio of the finances. The necessary current assets amount 1.015.886 denars, and they represent a remainder of the current assets and the funds from current operation (Table 116).

Table 116

Necessary current assets

Type of current assets	Total annual necessity	Number of bounded days	Turnover coefficient	Necessary current assets in MKD
A. Current assets				1.221.221
Permanent current assets				1.014.916
Supplies of raw materials and repro materials	887.360	10	36	24.649
Supplies of unfinished production	2.970.800	120	3	990.267
Other current assets				206.306
Assets on giro account	2.970.800	10	36	82.522
Receivables	2.970.800	15	24	123.783
B. Sources of current operation				205.335
1. Suppliers	887.360	15	24	36.973
2. Amortization	1.163.537	30	12	96.961
3. Gross salaries	856.800	30	12	71.400
C. Necessary current assets (A–B)				1.015.886

1.17.1.1.3. Investment financing sources and commitments towards them

Based on previous calculations has been made a recapitulation of the necessary funds for the investment financing, and an overview of the sources of investment financing was given.

Necessary funds for investment financing. The investments represent a set of investments in fixed assets and permanent current assets. Total investments amount to 21,700,131 denars or 352,848 euros (Tab. 117).

The investments in fixed assets participate with 95%, while the investment in current assets participates with 5% in the total value of the investment.

Financial sources. The financing of the investment will be provided by 100% self-participation that will be spent on procurement of fixed and current assets (Tab. 118).

Table 117

Investments

Structure of the assets	Value (MKD)	Value (EUR)	Participation (%)
Fixed assets	20.684.245	336.329	95
Current assets	1.015.886	16.518	5
Total	21.700.131	352.848	100

Table 118

Investment financing

Sources	Value (MKD)	Value (EUR)	Participation (%)
Self-participation	21.700.131	352.848	100
Bank loan	0	0	0
Total	21.700.131	352.848	100

1.17.2.1.7. Balance sheet and financial course of the project

The balance sheet is made in order to analyze the success from the project operation. The balance sheet data are used as initial information for evaluation of the financial and market success of the project.

Income Statement. In accordance with Official Gazette of RM (159/2008) the rate for calculating taxes and other expenditures is 10% of the total profit or loss derived as the remainder of the revenues and expenditures

in one financial year. Since the project has a net loss at the end of financial periods there is no distribution of profit by funds and common spending.

The income statement's results are made for the first six years and the show a loss in the first three years of the project' operation. This situation occurs due to the high investments costs. The loss is fully covered in the fourth year, so in the fourth, fifth and sixth year the project has a net profit that is subject to allocation. Data from the income statement are given in table 119.

Table 119

Income statement in the dynamics

Indicator	Years					
	2014	2015	2016	2017	2018	2019
A. Expenditures	3.252.097	3.478.923	3.751.114	4.322.543	4.714.499	4.714.499
1. Costs of sold items	3.252.097	3.478.923	3.751.114	4.322.543	4.714.499	4.714.499
1.1. Tangible expenses	887.360	1.045.306	1.234.841	1.462.283	1.735.214	1.735.214
1.1.1. Basic materials	696.520	835.824	1.002.989	1.203.587	1.444.304	1.444.304
1.1.2. Subsidiary materials	182.210	200.852	223.222	250.067	282.280	282.280
1.1.3. Invesment maintenance	8.630	8.630	8.630	8.630	8.630	8.630
1.2. Insurance	344.400	413.280	495.936	595.123	714.148	714.148
1.3. Gross salaries	856.800	856.800	856.800	1.101.600	1.101.600	1.101.600
1.4. Amortization	1.163.537	1.163.537	1.163.537	1.163.537	1.163.537	1.163.537
2. Financing expenditures	0	0	0	0	0	0
2.1. Interests	0	0	0	0	0	0
2.2. Other financing expenditures	0	0	0	0	0	0
B. Revenues	2.970.800	3.020.100	4.398.000	5.796.600	7.968.400	7.968.400
1. Revenues from sold items	2.689.600	2.673.300	3.903.600	5.134.800	7.070.300	7.070.300
2. Other revenues	281.200	346.800	494.400	661.800	898.100	898.100
B. Profit before taxation	0	0	646.886	1.474.057	3.253.901	3.253.901
C. Loss before taxation	281.297	458.823	0	0	0	0
Taxes, salaries and other expenses from the profit	28.130	45.882	64.689	147.406	325.390	325.390
D. Financial year profit	0	0	582.197	1.326.651	2.928.511	2.928.511
E. Financial year loss	309.426	504.705	0	0	0	0
Loss coverage from the previous years	0	309.426	814.131	231.934	0	0
F. Net profit for allocation	0	0	0	1.094.717	2.928.511	2.928.511
G. Net loss	309.426	814.131	231.934	0	0	0
Part for common consumption	0	0	0	110.160	110.160	110.160
Part for storing	0	0	0	109.472	292.851	292.851
Part for other funds	0	0	0	875.085	2.525.500	2.525.500
3. Not allocated profit	0	0	0	0	0	0

Cost price. Sum of all production costs (materials, services and salaries) established the cost of production. The market cost price does not include the subsidies because they do not affect the products' price on the market. The analysis of the market price of production subsidies are not included because they do not affect pricing of products on the market.

From Table 120 we can note that the remainder between the sales price and its own cost price has a negative value in the first two years of production due to lower market price of the product of truly necessary production costs.

The cost price per of each product separately is shown in Table 121. From the table we can see that the production value of the products (i.e. production expenses) are higher compared to the market value of the products.

Financial course of the project. The financial course of the project includes all components (incomes and expenditures) from the beginning of the project till the end of the economic life of the project. The analysis starts with the expenses for the project preparation, i.e. with the investments (Tab. 122).

Table 120

Cost price (MKD)

Indicator	Years					
	2014	2015	2016	2017	2018	2019
1. Tangible expenses	887.360	1.045.306	1.234.841	1.462.283	1.735.214	1.735.214
1.1. Basic materials	696.520	835.824	1.002.989	1.203.587	1.444.304	1.444.304
1.2. Subsidiary materials	182.210	200.852	223.222	250.067	282.280	282.280
1.3. Investment maintenance	8.630	8.630	8.630	8.630	8.630	8.630
2. Insurance	344.400	413.280	495.936	595.123	714.148	714.148
4. Gross salaries	856.800	856.800	856.800	1.101.600	1.101.600	1.101.600
5. Amortization	1.163.537	1.163.537	1.163.537	1.163.537	1.163.537	1.163.537
6. Taxes and salaries	28.130	45.882	64.689	147.406	325.390	325.390
7. Common consumption	0	0	0	110.160	110.160	110.160
8. Part for storage	0	0	0	109.472	292.851	292.851
Cost price of the products	3.280.226	3.524.805	3.815.803	4.689.581	5.442.900	5.442.900
Market price of the products	2.970.800	3.020.100	4.398.000	5.796.600	7.968.400	7.968.400
Remainder	-309.426	-504.705	582.197	1.107.019	2.525.500	2.525.500

Table 121

Cost price per unit product

Type of product	Meas. unit	Quantity	Market price	Market value	Participation (%)	Allocation coefficient	Allocated costs per product	Cost price per unit product
Milk	lit.	39.200	20	784.000	29,15	1,20914	947.964	24,18
Lambs for breeding (m)	no.	90	12.000	1.080.000	40,15	1,20914	1.305.869	14.509,65
Lambs for breeding (f)	no.	90	9.000	810.000	30,12	1,20914	979.402	10.882,24
Manure	kg	15.600	1	15.600	0,58	1,20914	18.863	1,21
Total				2.689.600	100		3.252.097	

Table 122

Financial course of the project

Indicator	Year						
	0	1	2	3	4	5	6
A. Inflows	21.700.131	2.970.800	3.020.100	4.398.000	5.796.600	7.968.400	22.687.311
1. Total revenue	0	2.970.800	3.020.100	4.398.000	5.796.600	7.968.400	7.968.400
2. Sources for financing	21.700.131	0	0	0	0	0	0
3. Balance of the product value	0	0	0	0	0	0	14.718.911
B. Outflows	21.700.131	1.772.290	1.947.988	2.156.330	2.711.289	3.162.204	3.162.204
4. Investition	21.700.131	0	0	0	0	0	0
5. Operational costs	0	887.360	1.045.306	1.234.841	1.462.283	1.735.214	1.735.214
6. Salaries	0	856.800	856.800	856.800	1.101.600	1.101.600	1.101.600
7. Taxes	0	28.130	45.882	64.689	147.406	325.390	325.390
8. Part for funds	0	0	0	0	219.632	403.011	403.011
9. Obligations towards financial sources	0	0	0	0	0	0	0
C. Net inflows	0	1.198.510	1.072.112	2.241.670	3.085.311	4.806.196	19.525.107

The remainder of the inflows and outflows of the project by years represents the net revenues. The net income course represents the cash or assets that are free to use in terms of settlement of all financial obligations. It is a basis for evaluation of the project's liquidity. Net inflows by year show a positive value that confirms the liquidity of the project.

1.17.2.1.8. Financial and market evaluation of the project

The financial and market evaluation of the project is most important for determining whether to implement the project. Hereinafter, it is considered in two ways, both static and dynamic evaluation of the project.

Static evaluation of project. The analysis necessary for making a static evaluation of the project are used data taken from the balance sheet and the financial success of the project. The static evaluation should give an insight of the equipment and the efficiency of the project (Tab. 123).

The gross profit per employee is the ratio between average revenues and the number of workers in manufacturing. Accumulation shows the amount of allocated profit in terms of total investments. The average accumulation of the investment is 5,09%. Calculation of gross salary per employee shows the average gross salary in relation to the total number of employees. Energy intensity indicates the ener-

gy consumption in relation to average investments for procurement of tangible assets for realizing the everyday production. The calculation in Table 123 shows that energy costs take 0,07% in total tangible costs used during one production year.

The economy of production represents a ratio between the market value of production and the average costs made during one production year. The production is considered economical if the economy coefficient is greater than 1. The results show the economy of the production which amount 1,23, so the investment is economically profitable and the production is economical. Reproductive ability is the ratio between amortization investments and the allocated profits on one hand, and total investments in one production year on the other.

Table 123

Static assessment of the project

Indicator	Value of the indicator
Net profit per employee	990.267
Cumulativity	5,09%
Gross salary per employee	285.600
Energetic intensiveness	0,07%
Economy of the production	1,23
Reproductive capacity	5,36%

Table 124

Economic course of the project

Indicator	Year						
	0	1	2	3	4	5	6
A. Inflows	0	2.970.800	3.020.100	4.398.000	5.796.600	7.968.400	22.687.311
Total revenue	0	2.970.800	3.020.100	4.398.000	5.796.600	7.968.400	7.968.400
Balance of the product value	0	0	0	0	0	0	14.718.911
B. Outflows	21.700.131	1.772.290	1.947.988	2.156.330	3.806.006	6.090.715	6.090.715
Investition	21.700.131	0	0	0	0	0	0
Operational costs	0	887.360	1.045.306	1.234.841	1.462.283	1.735.214	1.735.214
Salaries	0	856.800	856.800	856.800	1.101.600	1.101.600	1.101.600
Taxes	0	28.130	45.882	64.689	147.406	325.390	325.390
Part for funds	0	0	0	0	1.094.717	2.928.511	2.928.511
c. Net inflow	-21.700.131	1.198.510	1.072.112	2.241.670	1.990.594	1.877.685	16.596.595

Dynamic Assessment. Dynamic evaluation shows the profitability and liquidity of the project. The profitability analysis starts with the economy course of the project that shows the economic potential of the project (Tab. 124). Unlike static analysis, dynamic analysis includes the time factor, i.e. analyzes the investment by years in accordance with the economic course of the project

Net inflows consist of net profits and the amortization which is separated from operating costs in the table. Except the year when the investment for starting the project was made, the net profits show positive results from the operation.

Return of investment period. Return of investment period represents the time required to repay all funds of the investment (Tab.125). The Table shows that in order the investment to be returned should pass more time. According to the calculations, the repayment period of investment is **12 years and 1 month**.

Net present value of the project. The relative present net value of the project is calculated by discount factor of 10%. This method aims to minimize any future effects of the project of their current value. The relative net present value of the investment is 28.32% or in average, the investment is worth 9.951.173 dinars (Tab. 126).

Table 125

Return of investment period

Year	Net inflow from economic course	Cumulative of net inflows
0	-21.700.131	-21.700.131
1	1.198.510	-20.501.621
2	1.072.112	-19.429.509
3	2.241.670	-17.187.839
4	1.990.594	-15.197.245
5	1.877.685	-13.319.561
6	1.877.685	-11.441.876
7	1.877.685	-9.564.191
8	1.877.685	-7.686.507
9	1.877.685	-5.808.822
10	1.877.685	-3.931.138
11	1.877.685	-2.053.453
12	1.877.685	-175.768
13	1.877.685	1.701.916

Internal profitability rate. The internal-profitability rate of is the one in which the net present value of the project is equal to zero. It equates the present value of negative net values in the economic progress of the project with the current values of positive inflows (Tab. 127).

In this case, the internal profitability rate has a value lower than 0, indicating that the investment is not efficient and is followed by loss of 4,16%. The calculated internal rate of -4,16% shows the extent of effective interest

calculation of the assets invested in the investment or the level of profitability of the investment.

Sensitivity analysis. Sensitivity analysis shows how profitable or economically worth the investment is by calculating the fixed costs

and the level of influence on the revenues. Forecasts suggest that this investment is not profitable due to the low revenue values compared to the necessary production costs. (Tab. 128).

Table 126

Net present value at discount factor 10%

Indicator	0	1	2	3	4	5
1. Net inflow	-21.700.131	1.198.510	1.072.112	2.241.670	1.990.594	1.877.685
2. Discount factor	1,000000	0,909091	0,826446	0,751315	0,683013	0,620921
3. Present value	-21.700.131	1.089.555	886.043	1.684.200	1.359.602	1.165.894
4. Present net value	-21.700.131	-20.610.577	-19.724.534	-18.040.334	-16.680.731	-15.514.837
5. Relative net present value						28,32%

Table 127

Internal profitability rate

Year	Net inflow	Lower discount rate	Bankable net inflow	Higher discount rate	Bankable net outflow
0	-21.700.131	1,000000	-21.700.131	1,000000	-21.700.131
1	1.198.510	0,909091	1.089.555	0,900901	1.079.739
2	1.072.112	0,826446	886.043	0,811622	870.150
3	2.241.670	0,751315	1.684.200	0,731191	1.639.090
4	1.990.594	0,683013	1.359.602	0,658731	1.311.266
5	1.877.685	0,620921	1.165.894	0,593451	1.114.314
6	1.877.685	0,564474	1.059.904	0,534641	1.003.887
7	1.877.685	0,513158	963.549	0,481658	904.403
8	1.877.685	0,466507	875.954	0,433926	814.777
9	1.877.685	0,424098	796.322	0,390925	734.033
10	1.877.685	0,385543	723.929	0,352184	661.291
11	1.877.685	0,350494	658.117	0,317283	595.758
12	1.877.685	0,318631	598.288	0,285841	536.719
13	1.877.685	0,289664	543.898	0,257514	483.531
Capital value of the investition			-9.294.876		-9.951.173
Internal profitability rate					-4,16%

Table 128

Profitability rate (MKD)

Indicator	Fixed	Variable	Total
1. Tangible costs	177.472	709.888	887.360
2. Amortization	1.163.537		01.163.537
3. Intangible costs	68.880	275.520	344.400
4. Salaries	599.760	257.040	856.800
5. Taxes	2.813	25.317	28.130
6. Funds	57.931	57.931	115.862
Total expenses	2.070.393	1.325.696	3.396.089
Total income			2.970.800
Cover			-425.289

1.17.2.2. Simulation 2

The second simulation is made in order to project financial analysis not including the costs of the investment in construction objects and technical equipment. The assumption is that the objects are already built, and the equipment exists. The investments include only investments for purchasing basic flock.

1.17.2.2.1. Investments in permanent (fixed) assets

The total procurement of fixed assets comprises the purchasing of basic flock: 100 milking goats of Alpine and Saanen breed (50 from each breed) and 6 male goats (3 from

each breed). The total cost for their purchase also include transport costs, costs for selection of breeding heads and quarantine costs that amount to 4.135.845 denars or 67.250 euros. These costs are shown in details in Table 106 of the previous simulation.

1.17.2.2.2. Production costs

The production costs are divided into tangible and intangible costs. The tangible costs include the costs for basic materials (food for animal husbandry) and subsidiary materials. Other expenses include: insurance costs of basic flock, costs for personal income and amortization of basic flock. (Tab. 129).

Since all costs (except amortization costs) are the same as in the previous simulation, their detailed calculation is not shown separately in this simulation. In Table 130 is shown only the calculation of amortization for primary flock.

1.17.2.2.3. Recapitulation of tangible and intangible production costs

Movement of tangible and intangible production costs of production per years is shown in Table 131. In this table are omitted the investment maintenance costs because it is anticipated the technological equipment and construction objects to be existing, so they are not included in the this project's investment.

1.17.2.2.4. Calculation of total revenue

Revenue from operations remains the same as in the first simulation because of the same amount of investment in the basic flock and the same amount of subsidies expected by years (Tab. 132).

1.17.2.2.5. Calculation of current assets

Current assets are different because of the changes in tangible operational costs.

Their value amount to 1.061.270 dinars (Tab. 133). This value is lower than the value of current expenses at the previous simulation due to lower production costs (tangible costs) that are reduced for the investment value.

Table 129

Production costs

Type of cost	Total (MKD)	Total (EUR)
1. Tangible costs	878.730	14.288
1.1. Basic materials	696.520	11.326
1.2. Subsidiary materials	182.210	2.963
2. Insurance	344.400	5.600
3. Gross salaries	856.800	13.932
4. Amortization	620.377	10.087
Total	2.700.307	43.907

Table 130

Calculation of amortization

Basic asset	Measurement unit	Basic flock
Amortization basis	MKD	4.135.845
Amortization rate	(%)	15
Annual amount of amortization	MKD	620.377
Payment per years		
0	MKD	0
1	MKD	3.515.468
2	MKD	2.895.092
3	MKD	2.274.715
4	MKD	1.654.338
5	MKD	1.033.961
6	MKD	413.585
Value at the end of the duration		
Correction of the value	MKD	3.722.261
Net book value	MKD	413.585

Table 131

Recapitulation of the production costs (MKD)

Type of cost	Year				
	2014	2015	2016	2017	2018
Basic materials	696.520	835.824	1.002.989	1.203.587	1.444.304
Subsidiary materials	182.210	200.852	223.222	250.067	282.280
Insurance	344.400	413.280	495.936	595.123	714.148
Gross salaries	856.800	856.800	856.800	1.101.600	1.101.600
Amortization	620.377	620.377	620.377	620.377	620.377
Total costs	2.700.307	2.927.133	3.199.324	3.770.753	4.162.709

Table 132

Projected total revenues per year (MKD)

Type of product	Year				
	2014	2015	2016	2017	2018
Milk	784.000	768.000	1.152.000	1.536.000	2.096.000
Kid's for breeding (m)	1.080.000	1.080.000	1.560.000	2.040.000	2.820.000
Kid's for breeding (f)	810.000	810.000	1.170.000	1.530.000	2.115.000
Manure	15.600	15.300	21.600	28.800	39.300
Subsidies					
Goats	90.000	185.400	253.800	342.000	460.800
Female kid's	27.000	27.000	39.000	51.000	70.500
Milk	137.200	134.400	201.600	268.800	366.800
Male goats	27.000	0	0	0	0
Total	2.970.800	3.020.100	4.398.000	5.796.600	7.968.400

Table 133

Necessary current assets

Type of current assets	Total annual necessity	Number of bounded days	Turnover coefficient	Necessary current assets in MKD
A. Current assets				1.220.981
Permanent current assets				1.014.676
Supplies of raw materials and repro materials	878.730	10	36	24.409
Supplies of unfinished production	2.970.800	120	3	990.267
Other current assets				206.306
Assets on gyro account	2.970.800	10	36	82.522
Receivables	2.970.800	15	24	123.783
B. Sources of current operation				159.712
1. Suppliers	878.730	15	24	36.614
2. Amortization	620.377	30	12	51.698
3. Gross salaries	856.800	30	12	71.400
C. Necessary current assets (A-B)				1.061.270

1.17.2.2.6. Investment financing sources and commitments towards them

Total investments represent a set of basic and current assets necessary for production. The total investments value amounts 55.197.115 dinars (Tab. 134).

Moreover, 80% of them include investments in fixed assets and 20% investments in working capital. Total investments are enabled by the down payment (100%) without credit funds

1.17.2.2.7. Balance sheet and financial progress of the project

Income Statement. The income statement is presented in table 135. This simulation shows positive results, i.e., profit allocated in all the year of the project's operation. After the realized profit at the end of the financial period, the net profit is allocated to the funds, and part of it is goes for common consumption.

Table 134

Allocation of total investments

Structure of the assets	Value i(MKD)	Value (EUR)	Participation (%)
Fixed assets	4.135.845	67.250	80
Current assets	1.061.270	17.256	20
Total	5.197.115	84.506	100

Table 135

Income statement per years

Indicator	Investment project years				
	2014	2015	2016	2017	2018
A. Expenditures	2.700.307	2.927.133	3.199.324	3.770.753	4.162.709
1. Costs of sold items	2.700.307	2.927.133	3.199.324	3.770.753	4.162.709
1.1. Tangible expenses	878.730	1.036.676	1.226.211	1.453.653	1.726.584
1.1.1. Basic materials	696.520	835.824	1.002.989	1.203.587	1.444.304
1.1.2. Subsidiary materials	182.210	200.852	223.222	250.067	282.280
1.2. Insurance	344.400	413.280	495.936	595.123	714.148
1.4. Gross salaries	856.800	856.800	856.800	1.101.600	1.101.600
1.5. Amortization	620.377	620.377	620.377	620.377	620.377
2. Financing expenditures	0	0	0	0	0
2.1. Interests	0	0	0	0	0
2.2. Other financing expenditures	0	0	0	0	0
B. Revenues	2.970.800	3.020.100	4.398.000	5.796.600	7.968.400
1. Revenues from sold items	2.689.600	2.673.300	3.903.600	5.134.800	7.070.300
2. Other revenues	281.200	346.800	494.400	661.800	898.100
B. Profit before taxation	270.493	92.967	1.198.676	2.025.847	3.805.691
C. Loss before taxation	0	0	0	0	0
Taxes, salaries and other expenses from the profit	27.049	9.297	119.868	202.585	380.569
D. Financial year profit	243.444	83.671	1.078.808	1.823.262	3.425.122
E. Financial year loss	0	0	0	0	0
Loss coverage from the previous years	0	0	0	0	0
F. Net profit for allocation	243.444	83.671	1.078.808	1.823.262	3.425.122
G. Net loss for allocation	0	0	0	0	0
Part for common consumption	85.680	37.652	85.680	110.160	110.160
Part for storing	24.344	8.367	107.881	182.326	342.512
Part for other funds	133.420	37.652	885.248	1.530.776	2.972.450
H. Not allocated profit	0	0	0	0	0

Cost price. The calculation of production cost price shows positive results. According to that, the production costs will be fully covered by revenues generated in the same year. This analysis confirms the profitability of the production (Tab. 136).

Financial course of the project. The analysis of financial course of the project shows positive results from net inflows in all the analyzed years. The difference between projected inflows and outflows of finances give positive values and confirms its liquidity (Tab. 137).

Table 136

Cost price

Indicator	Value per years (in MKD)					
	2014	2015	2016	2017	2018	2019
1. Tangible expenses	878.730	1.036.676	1.226.211	1.453.653	1.726.584	1.726.584
1.1. Basic materials	696.520	835.824	1.002.989	1.203.587	1.444.304	1.444.304
1.2. Subsidiary materials	182.210	200.852	223.222	250.067	282.280	282.280
2. Insurance	344.400	413.280	495.936	595.123	714.148	714.148
3. Gross salaries	856.800	856.800	856.800	1.101.600	1.101.600	1.101.600
4. Amortization	620.377	620.377	620.377	620.377	620.377	620.377
5. Taxes and salaries	27.049	9.297	119.868	202.585	380.569	380.569
6. Common consumption	85.680	37.652	85.680	110.160	110.160	110.160
Cost price of the products	24.344	8.367	107.881	182.326	342.512	342.512
Market price of the products	2.837.380	2.982.448	3.512.752	4.265.824	4.995.950	4.995.950
Remainder	2.970.800	3.020.100	4.398.000	5.796.600	7.968.400	7.968.400

Table 137

Financial course of the project

Indicator	Year						
	0	1	2	3	4	5	6
A. Inflows	5.197.115	2.970.800	3.020.100	4.398.000	5.796.600	7.968.400	9.443.254
Total revenue	0	2.970.800	3.020.100	4.398.000	5.796.600	7.968.400	7.968.400
Sources for financing	5.197.115	0	0	0	0	0	0
Balance of the product value	0	0	0	0	0	0	1.474.854
B. Outflows	5.197.115	1.872.604	1.948.792	2.396.440	3.050.324	3.661.425	3.661.425
Investition	5.197.115	0	0	0	0	0	0
Operational costs	0	878.730	1.036.676	1.226.211	1.453.653	1.726.584	1.726.584
Salaries	0	856.800	856.800	856.800	1.101.600	1.101.600	1.101.600
Taxes	0	27.049	9.297	119.868	202.585	380.569	380.569
Part for funds	0	110.024	46.019	193.561	292.486	452.672	452.672
Obligations towards financial sources	0	0	0	0	0	0	0
C. Net inflow	0	1.098.196	1.071.308	2.001.560	2.746.276	4.306.975	5.781.829

1.17.2.2.8. Financial and market evaluation of the project

The financial and market evaluation of the project, as in the previous simulation is considered in terms of static and dynamic assessment of the investment..

Static evaluation. The statistic evaluation was made for the investment, not including costs for construction and technological materials (Tab. 138). The existing amortization only applies to basic flock.

Compared to the first simulation, the analysis shows that there isn't any change in gross salaries per employee, and therefore the gross profit remains the same. The accumulation is estimated at 3,04%. Energetic intensity indicates the participation of electricity costs from 0,02% in the total costs.

Difference could be observed in the economy of production and reproductive ability. The economy of production shows a positive value larger than 1, which means that the investment is economical and efficient. The reproductive ability is 14.97%.

Table 138

Statistical assessment of the investment

Indicator	Value of the indicator
Net profit per employee	990.267
Cumulativity	3,04%
Gross salary per employee	285.600
Energetic intensiveness	0,02%
Economy of the production	1,36
Reproductive capacity	14,97%

Dynamic assessment. The results in Table 139 show the economic course of the project in six analyzed years. The difference

between inflows and outflows of funds show positive results.

Table 139

Economic course of the project

Indicator	Year						
	0	1	2	3	4	5	6
A. Inflows	0	2.970.800	3.020.100	4.398.000	5.796.600	7.968.400	7.968.400
1. Total revenue	0	2.970.800	3.020.100	4.398.000	5.796.600	7.968.400	7.968.400
2. Balance of the product value	0	0	0	0	0	0	0
B. Outflows	5.197.115	1.872.604	1.948.792	2.396.440	3.050.324	3.661.425	3.661.425
3. Investment	5.197.115	0	0	0	0	0	0
4. Operational costs	0	878.730	1.036.676	1.226.211	1.453.653	1.726.584	1.726.584
5. Salaries	0	856.800	856.800	856.800	1.101.600	1.101.600	1.101.600
6. Taxes	0	27.049	9.297	119.868	202.585	380.569	380.569
7. Part for funds	0	110.024	46.019	193.561	292.486	452.672	452.672
C. Net inflow	-5.197.115	1.098.196	1.071.308	2.001.560	2.746.276	4.306.975	4.306.975

Return of investment period. The return of the investment period analysis shows that the investment is fully paid in the fourth year and realizes additional revenues that increase in the next year (Tab. 140). The investment will be paid when the remainder between revenues and expenditures will be equal to zero, and that is exactly for **3 years and 4 months**.

Present net value. Relative present net value is calculated by discount factor of 15%. Its value is 66.53% of the total investment or 3.457.504 denars (Tab. 141).

Internal profitability rate. The internal profitability rate is 26.94%. It is calculated using two discount rates, lower and higher, ie 10% and 20% (Tab. 142).

Internal profitability rate has a positive value, higher than zero, indicating that the investment has an effective interest calculation of assets invested in the investment, or the profitability rate of the investment is positive, and the investment is efficient.

Sensitivity analysis. The sensitivity analysis shows cost-effectiveness rate of 95% (Tab. 143). The production is cost effective and has a positive financial result. The cost-effectiveness rate shows the greatest possible economic result that could be achieved with the least possible use of funds. Therefore it is used for evaluation of the production effectiveness and the utilization of production resources effectiveness.

Table 140

Return of investment period

Year	Net inflow from economic course	Cumulative of net inflows
0	-5.197.115	-5.197.115
1	1.098.196	-4.098.918
2	1.071.308	-3.027.610
3	2.001.560	-1.026.049
4	2.746.276	1.720.226
5	4.306.975	6.027.201
6	4.306.975	10.334.175

Table 141

<i>Net present value</i>						
Indicator	0	1	2	3	4	5
1. Net inflow	-5.197.115	1.098.196	1.071.308	2.001.560	2.746.276	4.306.975
2. Discount factor	1,000000	0,869565	0,756144	0,657516	0,571753	0,497177
3. Capital value	-5.197.115	954.953	810.063	1.316.058	1.570.192	2.141.328
4. Present net value	-5.197.115	-4.242.161	-3.432.098	-2.116.040	-545.848	1.595.480
5. Relative net present value						66,53%

Table 142

<i>Internal profitability rate</i>					
Year	Net inflow	Lower discount rate	Bankable net inflow	Higher discount rate	Bankable net inflow
0	-5.197.115	1,000000	-5.197.115	1,000000	-5.197.115
1	1.098.196	0,909091	998.360	0,833333	915.164
2	1.071.308	0,826446	885.379	0,694444	743.964
3	2.001.560	0,751315	1.503.802	0,578704	1.158.310
4	2.746.276	0,683013	1.875.743	0,482253	1.324.400
5	4.306.975	0,620921	2.674.292	0,401878	1.730.876
6	4.306.975	0,564474	2.431.175	0,334898	1.442.397
Capital value of the investment			5.171.637		2.117.997
Internal profitability rate					26,94%

Table 143

<i>Sensitivity analysis</i>			
Indicator	Fixed	Variable	Total
1. Tangible costs	175.746	702.984	878.730
2. Amortization	620.377	0	620.377
3. Intangible costs	68.880	275.520	344.400
4. Salaries	599.760	257.040	856.800
5. Taxes	2.705	24.344	27.049
6. Funds	83.995	83.995	167.990
Total expenses	1.551.463	1.343.884	2.895.347
Total income			2.970.800
Cover			75.453
Cost-effectiveness rate in %			95%

1.18. CONDITIONS WHICH INVESTORS OF REPRO-CENTERS IN EPR SHOULD MEET

In order to eliminate all risks of eventual unplanned events, our proposal is both repro-centers (for sheep and goats) to be built on two locations, i.e. two farms, so they will form two farm units.

Given that this is still preliminary period, in the process of repro-centers' establishment, the municipality should seek investor to realize this Study. Firstly, the investment could be realized independently by legal entity, that

from the municipality Cesinovo–Oblesevo would be relieved by exemption of certain taxes (utilities etc).

As a second option could be implemented certain public–private partnership between the municipality and the potential investor with certain benefits that would be specified by an additional agreement.

However, in both cases, in choosing the candidates for the formation of the two repro-centers, preference will be given to those legal entities that have extensive experience in sheep and goat breeding, which has also shown solid production results in the same. If decided the project to be implemented with public–private partnership as a condition would be required the company–partner to have a solid credit worthiness. To not expose himself to great expenses from the very beginning, it is preferable the investor to possess facilities.

The facilities where the sheep and goats would live should meet the following minimal requirements:

- To be sturdily constructed with adequately covered area of minimum 500 square meters, and enclosed effluent sized 150% of the covered area (special traits are presented within this Study),

- the farm to be provided with hygienic water,

- to be supplied with electricity,

- the existence of a passable road to the farm throughout the year, and acceptable distance from the paved regional road,

- The farm should have a quality labor (UQW workers) as well as a quality professional staff (1 BA. Animal husbandry Eng.), that would be able to organize the production on the farm, and also to carry out the instructions of the competent national institutions,

- to own plough surfaces (minimum 50–100 ha) and pasture area of minimum 250 ha.

1.19. SWOT ANALYSIS

(Strengths, weaknesses, opportunities and threats) of the Study for the establishment of regional repro-center in support of animal husbandry in East planning region (sheep and goat breeding)

Ord. No	Strengths	Short notes
1.	Long tradition in sheep and goat breeding	In these area, i.e. in the East Planning Region, huge part of the population since always found the sheep and goat breeding the most important source of existence
2.	Clean environment suitable for development of the livestock industries	Most of the region is located in a clean environment, thus creating an opportunity for environmentally clean production
3.	Availability of land for grazing	Most of the region is located in hilly and mountainous area, which provides an opportunity for development of sheep and goat breeding
4.	In the Republic of Macedonia there are several slaughterhouses licensed for export of lamb and kid's meat in the EU countries. One of them is within the region – Stip	The long tradition of exporting lamb from the Republic of Macedonia in some EU countries (Italy and Greece), provides reliable sale of the lamb for high prices (for Easter and Christmas holidays). The kid's meet is also exported in the last few years.
5.	One of the major livestock markets in the country that exists many years is located in this region	The livestock market in Oblesevo offers an additional opportunity to sell sheep and goats (for breeding and slaughtering)
6.	Within the region and beyond there are several dairies that purchase sheep and goat milk	Dairies in the region: Mlekara Osogovo-Milk, vill. Sokolarci, while in the region (Stip) its own purchasing center also has "Mlekara Zdravje" which is the largest in Eastern Macedonia, purchasing sheep and goat milk during the entire lactation period
7.	The sheep breed Württemberg and goat breeds Alpine and Saanen are already proven in our region as a fully acclimatized, characterized by excellent	The crossbreeds produced between Württemberg and domestic sheep populations have proven to be excellent for producing significant quantities of meat and milk. It is the

production.	same case with the crossbreeds of races and Alpine and Saanen with the domestic Balkan goat.
8. Production of several traditional dairy products from sheep and goat milk	Two main products from sheep and goat milk are white cheese salted in brine and cashkawa. Our population uses these products for centuries. At the same time, the sheep milk is quite required by most dairies, and lately it is the case with goat milk.

Ord. No	Weaknesses	Short notes
1.	Drastically reducing the number of people interested in working in these branches	Age of the people occupied with sheep and goat breeding is very high. Among young people there is low interest in working in this branch.
2.	Very small farms by sheep and goat number in EPR.	According to the conducted analysis, a very small percentage of farms in the region are market orientated. Most of them are oriented towards meeting the national needs in food (milk and meat).
3.	Disorganization of the farmers when selling lambs (without prior arrangements with registered purchasers)	In the purchasing season, it is often a case, some merchants (usually unregistered) to offer to one farmer much lower lamb price than the actual
4.	Disorganization of the farmers when selling milk, (without prior agreement with dairy)	It is often a case, the farmers before the milking season to search for dairy to sell the milk when they act individually without a representative of the Association.
5.	Farmers own low productive sheep and goat breeds (especially for milk)	The sheep breeds represented in this region can not achieve better production results, and thus higher revenues
6.	The selection in flocks is made on the basis of on oldfashioned methods and vague assessments of the animals' breeding value	In this region almost no flock where leading accounting and planned parent selection based on professional assessment performed for the breeding value of animals, based on which selection will take place in flocks

Ord no.	Opportunities	Short notes
1.	Increasing the size of flocks to a size that will provide sustainable production	Previous existence of small farms only for family needs did not provide sufficient profit, and thus sustainable production of the farms. The farms need to obtain a commercial character.
2.	Forming the both repro-centers will create an opportunity for selling breeding animals from three breeds (Merinolandschaf, Alpine and Saanen), not only in the EPR and the whole country, but also in neighbouring countries.	The need for quality breeding sheep and goats breeding (the before mentioned breeds) for a longer period is exists on the territory of RM. All this promises a cost-effective operation of the repro-centers. Sometimes the neighbouring countries (Bulgaria, the Republic of Serbia, etc.) show interest for purchasing breeding heads.
3.	Opening new facilities for milk processing which will increase demand for sheep and goat milk	By opening of new facilities, there is a possibility the price of the sheep and goat milk to rise.
4.	By using breed Merinolandschaf in commercial sheep flocks is possible to improve the growth, meat quantities and conversion at lambs for meat. The use of Alpine and Saanen breeds in the goat farms could increase the milk production.	As a combine breed Merinolandschaf will provide faster growth, with better conversion (consumption) of food. Alpine and Saanen breeds will increase the milk production already in F1 generation, which all together will maximize the profit of the farms.
5.	Continuos increase of the financial support in sheep and goat breeding	Continual increase of the subsidies in sheep and goat breeding is some relief for farmers, in terms of the cost-effective operations in these two farm sectors
6.	Reviewing the possibility of direct financial support of the repro-centers from the Programme for financial support of the agriculture in the Republic of Macedonia	The operation of the repro-centers as production facilities, is characterized by huge expenses that could threaten the profitability in the operations. Until 2007, there was a possibility the officially registered repro-centers to be directly supported by the Programme of MAFWM with

		certain funds that enabled cost-effective operation. It would be advisable to find a way for such support again.
7.	Using Merinolandschaf breed is in favor with the fulfillment of certain conditions of the Law on Quality of agricultural products, in the part concerning the quality of lamb meat	The Article 103 and 105 of the Law on Quality of Agricultural Products (Official Gazette of RM no. 140/10) state that lamb meat is classified on the slaughter line. Crossbreeding of Merinolandschaf breed, was proved as quite successful in improving the growth and the meat parties at lambs, and thus generally the quality of the lamb
8.	When projecting the financial support in the animal husbandry industry, regularly to be provided greater support for goat breeding, compared to other animal husbandry industries in the country.	Reasons for this are many, but primarily because of the Law on ban of breeding goats (moratorium) that was in force for 45 years and the damages that are caused on the sector with such a reckless act.
Ord. no.	Threats	Short notes
1.	There is a threat of reducing the grazing areas in the East Planning Region	With the action "Tree Day", which several years ago is conducted throughout the country, so in the EPR, grazing areas continuously decrease, thereby hampering the conditions for development of sheep and goat breeding
2.	There is a risk of appearing certain health problems in animals	Despite the fact that vaccination helps in overcoming the problem, the threat of brucellosis still exists. The previous experiences with the emergence of certain diseases in sheep and goats (not known in our country) showed that due to a poor knowledge, they can cause significant damages (Q-fever, coccidiosis, CAEV, etc.)
3.	Minor sales of breeding lambs and kids from the proposed breeds for breeding in the repro-centers (Merinolandschaf, Alpine and Saanen)	Experiences with other repro-centers showed that due to the high price of breeding heads from different breeds, some years the sale of these can be very small, which would directly jeopardize the cost-effective operation of the repro-centers. Therefore, bigger financial support from the state is necessary, whether to purchase such heads by the breeders (70:30) or direct financial assistance to repro-centers themselves.

1.20. CONCLUSIONS AND RECOMMENDATIONS

1.20.1. CONCLUSIONS

According to all that was stated in this Study could be presented the following conclusions:

- IPR has significant resources developing sheep and goat breeding, in terms of arable land (as a resource for the production of cereal and fodder crops) and in relation to pastures (which are used the best only by sheep and goats);

- According to the current numerical conditions of the sheep and goats, it is stated that the region a potential to increase as the

number of existing farms, and the number of heads per farm,

- In terms of average sheep number per farm, we can say that in some municipalities it is satisfactory (Probistip, Stip, Karbinci, Vinica, Zrnovci, Cesinovo–Oblesjevo), because here the number of sheep per farm is more than 100. In other municipalities (Berovo, Pehcevo, Delcevo, Macedonska Kamenica, Kocani), the number is significantly below 100 and should be worked on increasing the number, to improve the profitability of the farms.

– Analyzing the average number of goats per farm, which on average, for the region is five goats per farm, and here we can not speak of commercial goat farms. Definitely there are goats farms which are exclusively for domestic purposes. Slightly larger average for the region have Stip with 11 heads and Karbinci with 27 goats per farm.

– In terms of the breed composition of sheep, in the EPR is the most common sheep populations are Ovce Pole (53.962 heads) and the population recorded as Other (34.000). Thus, there is a solid base to work on genetic improvement of this population, both in terms of lactation and in terms of improving the population' growth and the meat parties of the lambs.

– The situation is similar with the goats, considering that from a total of 19.902 goats in the region, 8.665 heads of goats are from domestic population, and 9.695 heads belong to other populations. Both are potential base for improvement, on which should be worked in the future.

– Most indicated legal documents and acts are in the interest of development of these two strategic animal husbandry industries, not only in EPR, but in the state,

– The funds for supporting agriculture, and thus those for sheep and goat breeding sector are in constant growth (per head of sheep/goat, premium for sheep and goat milk, subsidy for female head kept for reproduction),

– Experiences (positive and negative) from the operation of the previous and part of

the current repro-centers should be seriously considered, in order not to repeat the same mistakes from the past, when operating this type of farms,

– The proposed technological solutions for operation of the both repro-centers are based on previous experiences (semi intensive system with maximal utilization of the pasture resources)

– The choice of breed (Merinolandschaf, Alpine and Saanen) is made based on the long experience with these breeds in sheep and goat breeding,

– The SWOT analysis provided the most important strengths and weaknesses in establishing repro-centers, but also general information for the both sectors in the region,

– In determining the theoretical and real needs of quality and high-quality breeding heads from the proposed breeds, it was determined that repro-centers won't have a problem with the sales of the produced stuff (breeding heads, milk),

– In terms of conditionality and the relation of the components in the development chain of the animal husbandry products from the farm to the market, has been shown that undoubtedly, the most important for developing these two areas are meat and dairy industry. Especially in the development of sheep and goat breeding, since always, the most important were the milk production facilities which have been the main driving force for development of the same.

1.20.2. SUGGESTIONS

– When establishing the repro-centers it is suggested to give them to a legal person who has extensive experience in this area ((advantage have companies that also have some processing facilities (dairies etc.), companies of mixed character with a larger volume of production, which would secure the inflow of funds throughout the year, not only in certain periods, etc.)),

– If they are formed, it must be worked on their promotion at the farmers in order to present the advantages if breeding these breeds,

– On the higher level, in the Programs for financial support should be included item on direct financial support for farms that raise quality and high-quality breeding heads from respective breeds that are important for the development of sheep and goat breeding,

– Failure to do so, it should be insisted the support of 50% of the purchasing price that has been predicted for purchasing breeding head of any breed, to be increased to 70% that would significantly help the farmers in the procurement on one side, and the other side

their interest in purchasing such heads will be raised,

- To establish a contact center within the municipality where the repro-centers would be formed, so farmers could inform about what specifically the repro-centers offer and the benefits from it,

- To bring together the farmer,s breeders of sheep and goats, because only if they are organized this branch could succeed,

- Once the association is established, farmers could explain their requirements to potential purchasers of sheep and goat milk as well as lamb and kid's meat. The cooperation would be officialized with longterm contract, which would significantly increase the disposal of the products,

- An effort should be made to bring well known brands from the milk production industry in this region in order to increase the competitiveness, and thus to increase the milk's price.

2. STUDY

**ON ASSESSMENT OF THE IMPACT
ON THE ENVIRONMENT FOR SHEEP
OR GOAT REPRO-CENTER
IN THE EAST PLANNING REGION**

LIST OF ABBREVIATIONS

EPR	East Planning Region
EIA	Assessment of the impacts on the environmental
RM	Republic Macedonia
ha	hectare
CP	Cadastre plot
WA	Water management area
LUPD	Local urban plan documentation
CBPAB	Common basic program for animal breeding
MAFWM	Ministry of Agriculture, Forestry and Water Management
GAP Good	Agricultural Practice
MAT	Most Available Technique
VOCs	Volatile organic compounds
LPG	Liquid Petroleum Gas
BOD ₅	Biological oxygen demand in 5 days
COD	Chemical oxygen demand
TSP	Solid particles (dust)
SPM	Suspended particles (dust)
PM 10	Particulate matter – particles up to 10 µ
SPL	Sound Pressure Levels

2.1. NON-TECHNICAL SUMMARY

2.1.1. OVERVIEW OF THE ALTERNATIVES DISCUSSED

After comparing several locations according to the criteria for infrastructure accessibility, traffic access, electricity supply, water supplying, reusing the waste for energy production, zootechnical norms, possibility for construction of necessary facilities, the class of the land, distance of the location from natural and artificial sources of radiation, and the sensitivity of biological and regional diversity and protection of rare species of flora and fauna, as the most favorable solution is chosen the subject location of the part from CP 576/1, near the locality called Pilavot, the municipality of Cesinovo–Obleševo, in the central confluence area of the river Bregalnica river, at the foot of mountains Osogovo and Plackovica. The selection of the technological process is in accordance with the basic objectives of the repro-center as well as the specific geo-

graphic and climatic conditions of the site, i.e. it has been chosen the combined stable and pasture breeding system. In reviewing the alternatives for managing the technological waste and waste waters are projected lagoons, while the establishment of the biogas plant is scheduled to be reviewed as a possibility in the further operation of the repro-center. It is projected the dead animals to be buried in pit-graves.

The proposed site is located in an area subjected to frequent flooding (confluence area of river Zletovica in Bregalnica, according to the Center for crisis management in the RM is the most frequently flooded place in the Republic of Macedonia), and this must be taken into account when preparing the project documentation for the objects and their location in the plot.

2.1.1.1. ZERO ALTERNATIVE

If this Project is not realized, the situation will remain unchanged, and the following consequences would appear: stagnation in the economic development of the community, life standard of the local population will remain unchanged, other potential investors will not show interest for further investment in the area, the investment cycle in the broader region will stagnate, the stagnation in the volume of the produced articles (milk, meat and other products) from sheep or goats that would continue to be placed on the domestic and foreign markets, stagnation in breeding offspring for other breeders or facilities for sheep or goat breeding, nonexistence of genetically stable and a quality offspring of the small ruminants, loss of planned revenues in the budget of R.M. and the municipality of Cesinovo–Obleševo, unchanged outflow of foreign exchange from the Republic of Mace-

donia for purchase and import of milk and meat from abroad.

The repro-center in Cesinovo–Oblesevo would develop the local economy, according to the determinations of the Spatial Plan of the Republic of Macedonia and the Programme for development of the East (Bregalnica) planning region.

At the foreseen location at a part of the CP 576/1, area of 6,4 ha, within a time period of 6 years (2013–2018), will be housed 513 to 523 heads (with the offspring), with the possibility to permanently increase the flock to 300 or more dairy heads. In order to operate the repro-center with this capacity, the heads would be housed in the following objects: reproductive center – facilities, in which the animals will be housed, and carried out the basic activities, veterinary hospital, rooms for

accommodating employees, hayloft and warehouse.

The fire protection units from Kocani would take care for the fire protection in the repro-center.

When making the final decision for the development direction of the repro-center will be decided which animal breeds will be bred on the subject location.

If it is decided at the subject location to be bred sheep, will be purchased originals from the Merinolandschaf breed.

If the final decision is goat breeding at the subject location, would be purchased heads from **Alpine and Saanen** breed.

For an annual generation of approximately 104,6 tons of waste for 523 animals at the end of the sixth year from the reprocenter's formation, that contains excreta, brood, wasted food from the feeders, it is necessary to project *lagoons or strictly specified places*

of the yard, for disposal of the manure and faecal waste waters from the animals. It can be purchased anaerob digester, which would enable the use of biogas for heat production or a minimal quantity of electricity for own use.

The operational phase, i.e. the operation of the repro-center could begin upon the testing of the installed plants' correctness within the location and the control by the competent State Inspection authorities .

If the repro-center stops with its work will be undertaken all necessary measures for restoration of the site and the environment affected by the repro-center. This includes activities of dislocating the parts of the equipment or the plants, as well as the infrastructure materials used during the operation of the repro-center, that are obstacles in the process of returning of the environment in its natural balance and condition.

2.1.2. POTENTIAL IMPACTS ON THE ENVIRONMENT

2.1.2.1. Impact on the air quality

During the *construction phase* of the economic complex will occur limited impacts on the quality of ambient air. Is expected the *fugitive emissions of dust and emissions from point sources*. Fugitive emissions and emissions from point sources are short and time limited to the completion of the construction work. Since, the location where the activities would be performed is out of the settlement and the emissions are short-term, can be expected that this impact will be insignificant. So the effects caused by these polluters on the environment in the construction phase is short-term and small.

The repro-center is located out of populated place, distanced from the village Burilcevo more than 1.000 meters, which is in accordance with the Rulebook for classification of the facilities, that by emitting harmful substances could pollute the air in the populated areas, and the establishment of zones for sanitary protection. The repro-center, according to the projected capacity in 2018 according to this Rulebook is considered as a facility of third category where the

required distance from the populated place is from 601 to 1.000 meters, which is in accordance with this Rulebook.

During the *operational phase*, with intense breeding of about 500 heads of small ruminants at the location is anticipated an unpleasant odor from the lagoons located in the circle of the repro-center and from the plough land in the period of fertilizing the agricultural area with the manure. The owners of the repro-centers should sign an agreement with local farmers for purchase of this manure or if they own plough land where the manure will be scattered, to act in accordance with the technics of the good agricultural practice (GAP) and the most available techniques (MAT).

2.1.2.2. Impact on the surface and ground water quality

Impacts on the surface and ground waters in the construction and operational phase are estimated as eventually negative impacts with unspecified action and short-

term direct and indirect consequences on other media and spheres of the environment.

In the *construction phase* it is necessary to avoid discharging of petroleum and lubricants in the surface water and the soil, that will result in penetration of the oils in the ground waters. Impact on groundwater during the construction phase is possible to occur if the groundwaters are pumped and used in technological procedures during the construction. If it comes to an excessive reduction of the water's level, this impact should be reduced by reduction of the usage of underground water for fulfilling the project's needs. Trowing additives, chemical substances, paints, varnishes, and similar solvents that are used during the construction may cause pollution on the water quality.

The constructional frame of all facilities will be performed by shallow excavations of the foundations, and according to that during the construction of the reproductive center is not expected the impact of the groundwater.

In the *operational phase* of the repro-center, the water would be used for watering the animals, maintenance of the technological purity and water for employees. The subject location is not connected to a public water supply, and the water will be provided through boreholes – hydrophores, i.e. by exhausting the droundwaters. The dynamics of the usage should be in a proportion with the request for long term exploitation. The exploitation of groundwater should be done on the basis of hydrogeological investigations.

In the operational phase would appear communal waste water as a result of the cleaning at the facility and sanitary needs, which by separate drainage system within the limits of the plan will be taken to a waterproof concrete septic pit. The pit should be cleaned by an authorized organization for handling this type of waste or to set up mini rectifier station at the location. Wastewater before they are effluentd into the recepient must be subjected to treatment process, or to have a quality according to the "Regulation on categorization of water courses, lakes, reservoirs and groundwater."

Water polution from this type of installati-
ons are usually caused by uncontrolled emis-
sions of nitrogen and phosphorus during the
storage, handling and use (throwing away) the

manure, as well as the effluent of waste water that contain phosphorus and nitrogen from the buildings, directly or indirectly in the recipient.

2.1.2.3. Impact on soils

The impact on soil which may occur during the *construction phase* of the repro-center is: mechanical pressure on the soil due to usage of heavy machinery, compacting the soil reduces the absorption of atmospheric residues, impedes gas exchange, biological activity of the soil and the growth of roots of plants reduces stability and increases the risk of erosion. Negative impacts on soil in case of inadequate management with the generated waste, wastewater, grease, oils, are assessed as local and short term. In the plan for building the same will be projected activities for proper management of wastewater and waste that generates .

On the quality of the soil in the *ope-
rational phase* of the repro-center may have a negative effect the following things: inappropriate storage of waste that will be generated as a result of breeding animals (feces and waste water) can cause contamination of the soil. Despite this waste may also occur some smaller amounts of phyto–sanitary waste, that have been characterized as hazardous waste. Improper storage/handling with this kind of waste on the location (or beyond) can also cause soil pollution. The projected combined method of animal breeding provides grazing of the small ruminants outside, can influence on the soil due to greater concentration of animals on a small space, so that it might lead to removal of vegetation, that could result with emergence of erosion processes. Depending on the manner of grazing could be estimated whether these influences will be significant. By frequently changing the location of the pasture, or with proper management of the surfaces that would be used as pastures this influence will be reduced.

2.1.2.4. Impacts caused by waste management

In the *construction phase*, according to the type and extent of construction activities, the waste that would be generated as a result of construction activities is in relation to the types of materials and equipment to be used during the construction in different stages:

earthworks, reinforcing and concreting works, masonry works, mounting and installation works etc.

Also a source of waste would also be the waste generated by the workers during their stay on the site that is municipal waste and according to its composition is similar to the waste from the households.

Additionally, it is expected creation of insignificant quantities of certain fractions of hazardous waste.

Technical maintenance of the construction equipment and other vehicles will be conducted within the site and therefore it is not expected generation of waste, such as used tires, batteries and leakage of oils and lubricants from the vehicles.

The types of waste generating in the operational phase during normal operation of the installation, belong to the following categories:

- Animal waste – feces/waste water;
- Waste from animals' cribs – straw;
- Waste from animal tissues – dead sheep or goats/tissue;
- Phytosanitary waste of vaccines, drugs and treatments;
- Municipal waste from other associated facilities.

It is considered that in the repro-center is produced approximately 150–200 kg manure per sheep/goat head. About 523 animals at the end of the sixth year of the repro-center's formation, annually will be generated approximately 104,6 tons of waste that contains excreta, straw from the brood, wasted food from the feeders. It is projected this waste to be collected in lagoons or highly specific areas of the yard where the manure and the waste waters from the animals are kept. After combusting in the lagoon, the manure will be ceded to local farmers for fertilization of arable land. The proper use and handling of this fertilizer is expected to increase the crops and to favorably influence on the other media for reduction of chemical inputs in the soil and groundwater.

The waste from the animals' dead bodies is also predicted, which according to the empirical and statistic data from the experts is between 21 and 52 corpses in the sixth year of the repro-center's operating. The dead

bodies is planned to be put in a pit/grave at the location.

The removing of the veterinary waste is determined to be near the installation, until it is given to an authorized entity. The same will be collected and stored in plastic bags and will be appropriately marked until removing.

The waste that will be made by employees at the installation during its stay at the location is a communal waste and therefore its composition is similar to the waste from the households.

2.1.2.5. Impact of noise and vibration

Increased noise is expected in the construction phase of the repro-center, adequate infrastructure and supportive facilities. If we consider that the construction site is out of the settlement and the fact that the operation of the mentioned sources is not continuous, the generation of harmful noise would be occasional and will not cause a significant impact on the environment and local population. Traffic intensification on the major roads due to construction activities would cause short-term increase of the noise levels in residential areas where these roads pass. However, due to the brevity of these impacts it is not expected overcoming of the border values of emission and irreversible harmful impacts on humans and the environment. Occurrence of vibrations during the construction phase is expected to occur from machinery to be used for carrying out the planned activities. The influence of vibration on the environment can be characterized as weak, i.e. it is not expected emission of vibration that would exceed the maximal allowable values. The exposure to vibration will be short.

During the operational phase is not expected to be exceeded border values of ambient noise, and it the serenity of the citizens will not be disrupted.

2.1.2.6. Visual aspects and landscape

The area that is projected for construction of sheep or goats repro-center will be temporarily changed during the construction phase. Construction zone and locations planned for storage of construction materials and temporary objects for the need of the construction activities shall be visually noticeable and will

cause changes in the aesthetics of the landscape. These changes will be of short-term nature, i.e. with a duration equal to the time of construction. We may think that these changes will have minimal significance.

After the completion of construction activities, in accordance with the obligations embedded in the Macedonian legislation for construction, the micro-relief and vegetation in the construction zone will be subject to restoration.

The areas of landscape diversity in the nearby environment of the repro-center for sheep or goats are not recorded as announced or proposed protected in the spatial plan of the Republic of Macedonia 2002–2020.

Given past experience, it can be concluded that the visual aspects associated with constructing this kind of facilities is not a crucial aspect for their acceptance by the locals and probably most of the population of the local community would express an acceptable opinion on the visual aspect.

2.1.2.7. Impact on natural heritage

Location that is projected for the planned center for reproduction is not located near the recorded proposed natural heritage. For this reason, there is no probability of occurrence of potential direct impacts on it.

2.1.2.8. Impact on cultural heritage

There are indications for possibility of discovering an archaeological site near the subject location, and with the repro-center's construction there is a possibility of faster discovery of those cultural goods, or delaying their discovery. If during the construction of the repro-center is determined the exact position of the cultural heritage site, should be done something for protection of the immovable cultural heritage. If during the construction works are encountered archaeological artifacts, i.e. are found some material remains that have cultural and historical value, it is necessary to act in accordance with Article 65 of the Law on Protection of Cultural Heritage (Official Gazette of RM no. 20/04, no.115/07 and no.18/11), to immediately stop the started construction activities and to notify the competent institution for the protection of cultural heritage according to Article 129 of the Law.

2.1.2.9. Impacts on tourism development

The subject location which is projected for building repro-center for small ruminants belongs to Bregalnica touristic region which specifies 9 tourism zones with 29 tourist sites.

According to the Concept' theories and the criteria for protection and sustainable economic development for smooth development of the total tourist offer of this area, are also possible some influences on the development of tourism.

2.1.2.10. Impacts of accidents and collisions

Accidents or collisions may occur in the construction phase as well as in the operational phase of the repro-center. Emerging of an accident or collision may be caused by leakage of hazardous substances, fuel or lubricant, explosions and fires, electric circuit and failures, natural disasters, animal mortality.

2.1.2.11. Impacts of war destructions

According to the Spatial Plan of Republic of Macedonia and the Law on Defence (Official Gazette of RM no.42/01, no. 05/03, no.58/06, no.110/08), Law on Protection and Rescue (Official Gazette of RM no. 36/04, no. 49/04, no.86/08 and no.124/10, 18/11) and the Law on Crisis Management (Official Gazette of RM no.29/05), the site for economic complex of the CP 576/1, CM Butilchevo, p.c. Pilavot, municipality of Ceginovo–Oblesovo is located in areas with a high degree of threat of military action. In accordance with the legislation should be applied measures for protection and rescue.

2.1.2.12. Socio-economic aspect

Positive socio-economic benefits arising from this project will be greater than the negative impacts on nature and environment.

Increasement of the employment opportunities is expected through direct engagement of local labor during the phase or in indirect form, as a result of increased commercial activity in the area.

2.1.2.13. Cumulative impacts

Despite the mentioned installation, there are no other significant commercial production activities that take place within the project area, and whose environmental impacts could cause interaction and effect of cumulative impact with the reproductive of the operator.

Because all activities in the area should comply with the guidelines of the Spatial plan of the state, it is recommended, during the future organization of economic activities to respect the criteria for protection and sustainable economic development.

2.2. PURPOSE OF THE PROJECT

Aim of the project is building a regional repro-center for intensive sheep and goat breeding, as a support of farming in Eastern Planning Region (EPR). The purpose of this EIA Study is to predict and evaluate impacts on the environmental media in all phases of implementation activities in the reproductive center and to give proposed measures to moderate or eliminate them.

The reproductive center is designed as a modern system of work adapted for intensive conventional sheep or goat breeding and producing products (milk, meat and other products) that could be placed on domestic and foreign markets. This reproduction center should also be a primary place for offspring production for other sheep or goat breeding facilities and to ensure genetically stable and quality offspring.

In accordance with the Decree on defining the projects and the criteria on the basis of which is determined the need for carrying out the procedure for environmental impacts' assessment (EIA), Official Gazette of RM, no.74/05, the subject project – construction of a regional repro-center for intensive sheep and goat breeding, belongs to Appendix 2 – projects for which is determined the need for implementing procedure for environmental impact assessment, Item – 1 Agriculture, Forestry and Water Management, subsidiary point (e) – Intensive animal husbandry installations (projects not included in Appendix 1).

The construction of repro-center for breeding small ruminants (sheep and goats) is projected at the site Burilchevo at a part of the CP 576/1, in the locality called Pilavot, municipality of Cesinovo–Oblesevo at an area

of 6,4 ha. The Commercial Complex – repro-center will help in the development of the local economy and according to the determinations of the Spatial Plan of Republic of Macedonia it will be based on the principles of environmental protection and sustainable local and national development.

In a period of 6 years from 2013–2018, the repro-center will have a total of 513 to 523 heads (with offspring), with a possibility the flock to increase permanently (to 300 or more dairy heads), by keeping the breeding material for expanded reproduction.

Within the site is projected construction of facilities where the animals will be housed, and where will be respected the zootechnical standards and ambiental conditions for housing of the animals. For smooth operation of the reproductive center is required construction of additional objects: hayloft, warehouse, veterinary hospital, rooms for accommodating employees, biodigestor, technical solution for the purification of the technological waste waters before discharging them in the recipient, etc.

Implementation of the activities in the establishment of reproductive center includes four distinct phases:

- Selection of appropriate technical and technological solution for the production process of the repro-center and making a plan, technical and other documentation for protection of the environment.
- Preparing the terrain and building of constructional objects for housing animals and all associated facilities necessary for the operation of the reproductive center. This phase covers the activities related to

the construction of infrastructure network and mounting the equipment for the smooth functioning of the repro-center.

- Operational phase in which the reproductive center is actively operating. This phase starts with the initial purchase of a basic flock, forming the flock sized up to about 500 heads of all categories and leaves a possibility for future expansion.

- Cessation of work. Predicting measures for managing the environmental impacts during the closure of the center.

From all these indicators, as possible environmental impacts that have to be analyzed are the impacts on air, soil, method of land use in the manner and extent that would endanger its natural values, quality, quantity and the surface and groundwater regime, biodiversity, natural and cultural resources, people and other possible influences.

2.3. RELEVANT LEGISLATION FOR ASSESSING THE IMPACT ON THE ENVIRONMENT

- Law on Environment (Official Gazette of RM no. 53/05, 81/05, 24/07, 159/08, 83/09, 48/10 and 124/10)

- Decree on defining the projects and the criteria that determine the need for conducting the assessment procedure of impacts on the environment (Official Gazette of RM no.74/05)

- Rulebook on information that should include the notice of intention to carry out the project and the procedure for determining the need for assessing of the environmental impact of the project (Official Gazette of RM no. 33/06)

- Rulebook for the content of the requirements to meet the Study for assessment of the impact of project on the environment (Official Gazette of RM no. 33/06)

- Rulebook for the content of the publication of noticing about the intention to implement the project, for the decision of the need for assessment of the impact on the environment, for the report on the Study's adequacy to assess the impact of project on the environment and the decision to give consent or rejects the project's implementation as well as the manner of communication with the public (Official Gazette of RM no. 33/2006)

- Rulebook on the form, content, procedure and method of preparation of a report on the adequacy of the Study to assess the impact of the project on the environment and the procedure for authorization of the persons from the Experts' list to assess the impact on

the environment that will prepare the report (Official Gazette of RM no.33/2006)

- Rulebook on the report's content about the state of the environment (Official Gazette of RM no. 35/06)

- Law on the ambient air quality (Official Gazette on RM no. 67/04 and 92/07, 35/10 and 47/11)

- Rulebook on the criteria, methods and procedures for assessing the quality of ambient air (Official Gazette of RM no. 82/06)

- Decree on border values of levels and types of pollutants in the ambient air and alert thresholds, deadlines for achieving the border values, margins of tolerance for border values, target values and long-term goals (Official Gazette of RM no. 50/05)

- Rulebook for classification of objects that with discharging of harmful substances can contaminate the air in populated areas and establishing zones for sanitary protection (Official Gazette of RM no. 13/76)

- Law on Waters (Official Gazette of RM no. 87/08, 6/09 and 161/09, 83/10 and 51/11)

- Decree on Water Classification (Official Gazette of RM no. 18/99)

- Decree on categorization of water-courses, lakes, reservoirs and groundwater (Official Gazette of RM no.18/99 and)

- Rulebook for hazardous and harmful substances and their emission standards that can be effluentd into the sewer or drainage system, into the surface or ground water

bodies and coastal lands and water habitats (Official Gazette of RM no.108/11)

- Law on Waste Management (Official Gazette of RM no. 68/04, 71/04 and 107/07, 102/08, 143/08 and 124/10, 09/11 and 51/11)
 - List of Wastes (Official Gazette of RM no. 100/05)
 - Law on noise protection in the environment (Official Gazette of RM no. 79/2007, 124/10 and 47/11)
 - Rulebook for the locations of measure stations and measure places (Official Gazette of RM no.120/08)
 - Rulebook on limit values of noise level in the environment (Official Gazette of RM no. 147/08)
 - Decision on determining in which cases and under what conditions it is considered that the serenity of the citizens is disturbed from harmful noise (Official Gazette of RM no.01/09)
 - Law on Nature Protection (Official Gazette of RM no.67/04, 14/06, 84/07, 35/10 and 148/11)
- Other relevant legislation:
- Law on Agricultural Land (Official Gazette of RM no.135/07, 18/11 and 148/11)
 - Law on Animal husbandry Breeding (Official Gazette of RM no.7/08, 116/10)
 - Law on by-products of animal origin (Official Gazette of RM no. 113/07)
 - List of categorized by-products of animal origin (Official Gazette of RM no. 53/08)
 - Rulebook on the manner of collection, transport and identification of specific categories of by-products of animal origin (Official Gazette of RM no. 21/09)
 - Rulebook on special conditions in terms of facilities, technical equipment, the procedures and conditions for conducting the appropriate activity that should meet the oleochemical objects and the facilities for biogas and compost (Official Gazette of RM no. 21/99)
 - Rulebook on the form and content of the veterinary and sanitary certificates for animal by-products that are imported or tran-

sit in or through the Republic of Macedonia (Official Gazette of RM no.28/09)

- Law on Protection of Animal Welfare (Official Gazette of RM no. 113/07 and 136/11)
- Law on Veterinary Health (Official Gazette of RM no.113/07, 24/11 and 136/11)
- Law on Protection of Cultural Heritage (Official Gazette of RM no. 20/04 and 115/07, 18/11 and 148/11)
- Law on Expropriation (Official Gazette of RM no. 33/95, 20/98, 40/99, 31/03, 46/05 and 10/08, 106/08, 156/10)
- Law on Forests (Official Gazette of RM no. 64/09 24/11, 53/11)
- Law on Construction (Official Gazette of RM no. 130/09, 124/10, 18/11, 36/11, 54/11, 59/11)
- Law on Spatial and Urban Planning (Official Gazette of RM no. 51/05, 24/08 60/11)
- Rulebook for closer content, scale and manner of graphical processing of the urban plans (Official Gazette of RM no.78/06).

Relevant international agreements:

- Law on Ratification of the Basel Convention (Official Gazette of RM no. 49/07) and Law on Ratification of the amendment to the Basel Convention (Official Gazette of RM no. 00/00 from 00.00.2004)
- Convention for the Protection of Biological Diversity (Rio de Janeiro, 1992) ratified in 1998
- Convention on Access to Information, Public Participation in Decision –making and access to justice for issues related to environment (Aarhus 1998), ratified in 1999,
- UN Framework Convention on Climate Change, New York (1992), ratified in 1997.
- European Convention for Protection of vertebral animals used for experimental and other scientific purposes (Strasbourg, 1986), ratified in 2002
- European Landscape Convention (Florence, 2000), ratified in 2003.

2.4. SUMMARY OF ALTERNATIVES REVIEWED

Sheep and goat breeding in nature are branches for which the best conditions for their development have the rural areas. East planning region that encompasses 217 settlements of which 209 are rural, give a possibility of choosing a potential location for development of these two farm fields. In this region there is a possibility of choosing different locations/sites for establishment of reproductive center for sheep or goats. When choosing the location for establishment of the repro-center should be considered the following factors:

1. Available infrastructure (traffic access, power supply).
2. Opportunities to use local sources of water supply, recipient for drainage of wastewater.
3. Possibility of utilizing the waste as a source of energy.
4. Ownership of land and geodetic bases in order to separate the cadastral parcels.
5. Possibility for construction of facilities where the animals will be housed, and at zootechnical norms will be respected to the maximum.
6. Possibility for construction of additional facilities.
7. Wind rose in order to build the reproductive center in a way that the dominant winds at the nearest inhabited place – village Burilchevo are avoided.
8. Existence of land of lower cadastre class, that will be converted in the construction land and thus will allow sustainable development of the municipality, by initiating sustainable animal husbandry production.
9. The location to be far enough from natural and artificial sources of radiation, to provide high productivity and development of organic production.

Beside the alternative locations and spatial distribution of the repro-center in EPR by using the previous criteria, it has been

determined the most favorable location for establishment of the commercial complex, the reproductive center in municipality of Cesinovo–Oblesevo. It was determined that the position of the repro-center in the municipality will influence on the development of the local economy, according to the decisions of the Spatial Plan of the Republic of Macedonia and the Programme for Development of the East (Bregalnica) Planning Region, and thus:

– Municipality Cesinovo–Obeleshevo belongs to the "south development axis" where it is expected that the development of the industry will be accomplished by construction of a small, flexible capacities and greater representation of the agro–industrial sector. The construction of a reproductive center creates a possibility for processing of meat and dairy products and improving their quality and branding.

– The percentage share of the municipality Cesinovo–Oblesevo in the total sheep and goats number in the EPR is a good basis for further development of this industry. The municipality has large areas for grazing and there is a tradition in sheep and goat breeding, as well as a livestock market used by all residents of the EPR.

– The municipality is a suitable environment with favorable conditions for organic production. The adjustability of the local animal breeds on the existing conditions of the external environment is great. Lambs and cheese produced in this municipality are of recognized quality.

Technological alternatives for the various procedures in reproductive center for small ruminants – sheep or goats are also reviewed.

Alternatives of the technological process:

- intensive system;
- extensive system
- combined system.

– According to the projected breeding technology, it was elected a combined system

of breeding (stable and pasture, semi intensive).

Alternatives of technological waste and wastewater management:

- System of lagoons;
- Setting biodigester;
- Underground pits.

– As an option for removing (storage) of animal waste and fecal waste waters from animals have been projected *lagoons or strictly defined areas of the yard for their storage*. Setting of biodigester is projected as an alternative, in the further stage of the repro-center's operation, since at the beginning of

the repro-center's formation the setting of biodigester would additionally increase the investment.

Alternatives for operating with dead animals:

- Burning;
- Composting;
- Pit-grave.

– As an alternative for operating with carcasses is building a pit – grave, which is most applicable and cheaper way constructed in accordance with the legislation on environmental protection.

2.4.1. ZERO ALTERNATIVE

In case the project is not realized,, the situation would remain unchanged and thus would appear the following consequences:

- Stagnation in the economic development of the municipality.
- Will not be created conditions for opening new jobs, thus increasing the indirect consumption in the area.
- Living standard of the local population will remain unchanged.
- There won't be interest of other potential investors for further investment in the area.
- There will be a reduced investment cycle in the wider region.

– Reduced production of products (milk, meat and other products) from sheep or goats that could still be placed on domestic and foreign markets.

– Reduced production of offspring for other breeding facilities for sheep or goats.

– Lack of genetically stable and quality offspring from small ruminants.

– Loss of planned revenues in the national Budget and municipality of Cusinovo–Oblesovo.

– Unchanged outflow of foreign currencies from the Republic of Macedonia for purchase and import of meat from abroad.

2.5. DESCRIPTION OF THE PROJECT

The lack of production of offspring for breeding facilities for sheep or goats and provision of genetically stable and quality offspring, raised the need of building a regional repro-center for intensive sheep and goat breeding in EPR. The reproductive center, conceptualized as a modern installation with a system of work for the intensive conventional sheep or goat breeding, should provide products (milk, meat and other products) that could still be placed on domestic and foreign markets.

Most favorable location for establishment of the commercial complex, for a construction of reproductive center is chosen the municipality Cusinovo–Oblesovo. It was determined that the positioning of the repro-center in the municipality will help in development of the local economy, according to the decisions of the Spatial Plan of Republic of Macedonia and the Programme for Development of the East (Bregalnica) Planning Region.

2.5.1. LOCATION OF THE REPRO-CENTER

The location for this installation is determined by analysis of alternative locations in EPR using the factors of items 1–9 in the analysis of alternative locations. Most favorable location for establishment of the commercial complex, for a construction of reproductive center that will help in development of the local economy, according to the decisions of the Spatial Plan of Republic of Macedonia and the Programme for Development of the East (Bregalnica) Planning Region is chosen the municipality Cesinovo–Oblesevo. The positioning of the repro-center in the municipality by Decision on approval of the Planning program with number 0302–05 for preparation of local urban plan documentation (LUPD) is approved by the Mayor. The exact location is defined after a Proposal of the commission for

giving opinions on the draft plans of Article 7 Item 2 of the Law on Spatial and Urban Planning, for part of the construction plot (CP 576/1) p.c. Pilavot, CM Burilchevo, given in Annex no. 1

The Figure 22 illustrates the proposed location of the repro-center by an excerpt from Google Earth – Representation of the ground in the municipality Cesinovo–Oblesevo.

It is projected the farm to be located on the following coordinates:

- 41 ° 50 '46,44 "N
- 22 ° 17 '11,36 "E

Figure 23 shows the proposed location in an excerpt from topographic map.

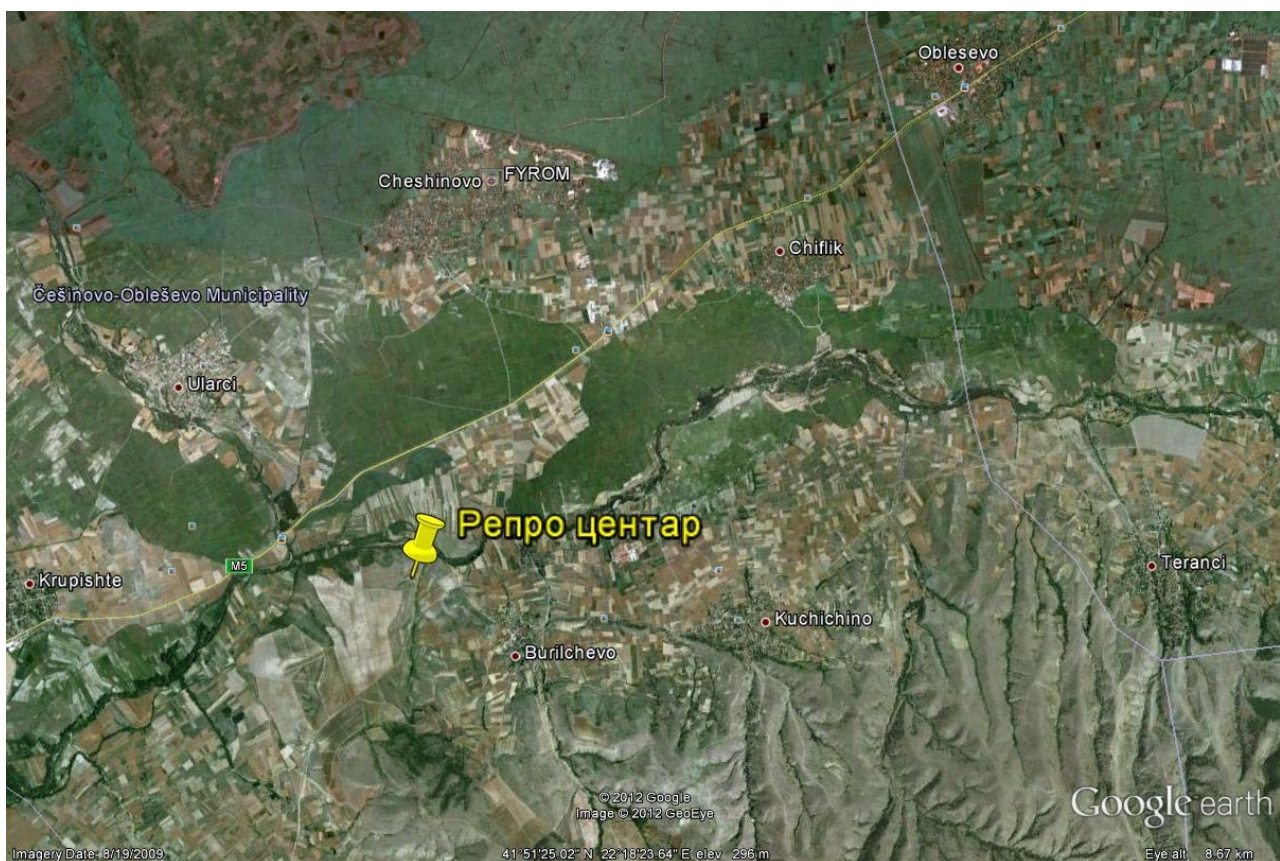


Figure 22. Google Earth excerpt of the proposed location

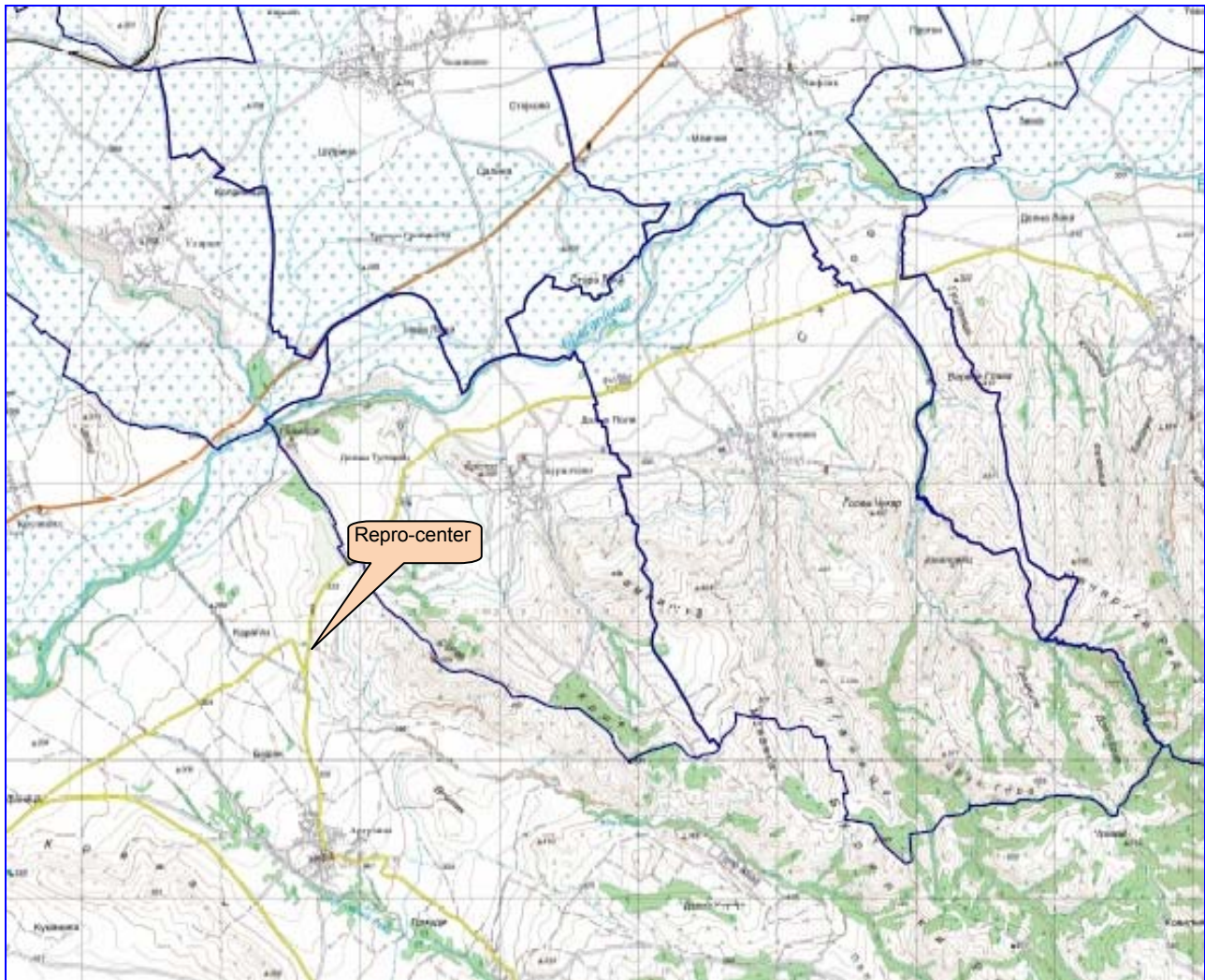


Figure 23. Topographic display of the terrain for selection possible location

In Appendix 2 is enclosed a proof of ownership – copy of Property sheet for the CP 576/1, CP Burilchevo issued by the Real Estate Cadastre of the Republic of Macedonia – Kocani under no. 1109/1933 of 27.09.2011 which proves that the proposed parcel is owned by the Republic of Macedonia and the same is managed by PE for Pasture Management. At the request of the investor has been prepared an updated geodetic base for CP 576/1, CM Burilchevo made by DPPGR GEO KARTA, “Dimitar Vlahov” str, no. 4, Kocani under the reference number 306/10–2 from 17.09.2011, certified by the Real Estate Cadastre – Department for Real Estate Cadastre under the no.1110/325 on 28.09.2011, given in Annex no. 3. The reproductive center for breeding small ruminants will be located about 310 latitude, out of settlement. The location belongs to Water

economy area (WEA) "Middle and Lower Bregalnica" which includes the confluence of the river Bregalnica from the dam "Kalimanci" to the estuary in the River Vardar. This Water Economy is poor of water. The existence and the elevation of the groundwater can't be verified. The location is spacious enough for constructing a reproductive center and providing basic zootechnical norms for housing and breeding of small ruminants. The location is connected to local road by unpaved road. The nearest populated place is the village Burilchevo, which is about 1 km air line. In the vicinity there are no other commercial objects that might be an obstacle for the operation of the reproductive center or would be in synergy with its action. Location that is projected for establishment of the Reproductive center for sheep or goats is shown in Figures 24 and 25.



Figure 24. Location of the reproductive center for sheep or goats



Figure 25. Subject's location environment

The agricultural land where the construction of the commercial complex is projected (CP 576/1, CR Burilchevo, p.c. Pilavot, municipality Cesinovo–Oblesevo) is agricultural land of seventh class.

North of the projected location for the construction of this commercial complex passes 110 KV duct Stip–Kocani and the same is not in conflict with the location.

Coordinates of the used points, from geodetic basis for locating the repro-center are given in Table 144.

Table 144

Coordinates of used points, from geodetic basis

Number of point	Y	X
358	607 862 190	634 068 680
1011	621 601 559	643 305 748
1020	618 639 700	629 758 140

Source: Updated geodetic basis for KP 576/1, KM Burilchevo, made by DPPGR Geo Karta

2.5.2. BASIC ACTIVITY

The basic activity that will be performed in the reproductive center is:

- Extensive combined with intensive breeding of small ruminants,
- production of offspring for other facilities for breeding of small ruminants,
- providing genetically stable and quality offspring and
- producing milk, meat and other products for domestic and foreign markets.

The repro-center will also be market-oriented and the programs and its operation will be adapted according to the trends of the market demand. The main activity in repro-center, i.e. breeding animals will be performed within the basic and supportive facilities for housing and breeding of animals. Facilities where the animals will be housed will be in

accordance with the zootechnical norms and ambient conditions for housing animals. In these objects the animals would be housed for protection and shelter from atmospheric conditions. In the facilities would be provided activities, such as: feeding and watering the animals, delivery of offspring, sleeping, and all other activities related to breeding and reproduction of animals.

Technical and technological concept of production of the repro-center for small ruminants will be adjusted according to the conditions in the area where the repro-center would be located, and will be implemented the most recent developments in this area as well as the recommendations of the Common basic programme for animal breeding (CBPAB).

2.5.3. PLANNING CONCEPT PLAN COVERAGE

The purpose of the project is the realization of commercial complex, reproductive center for small ruminants. Minimal requirements that should be met by the facilities that will house the small ruminants are the following:

- solidly built with enough covered area of minimum 500m² and fenced effluent with size of 150% of the covered area,
- supplying the farm with hygienic water,
- supplying with electricity, with possibility of utilizing the sun as a renewable energy source to meet part of their needs,
- existence of a passable road to the farm throughout the year, and sufficient dis-

tance from the paved regional road (maximum 3–5 km),

- minimum of 250 ha arable surfaces and pasture area, minimum of 250 ha.

At the projected location, at a part of the CP 576/1, area of 6,4 ha in a period of 6 years from 2013–2018 will be housed 513 to 523 heads of small ruminants (with offspring), with a possibility the flock to increase permanently to 300 or more dairy heads. For operation of the repro-center with this capacity, the content should be placed in the following classes and purposes:

– G–2 light and industries that don't pollute – reproduction center for small rumi-

nants, which includes all types of production that do not require a lot of energy, do not have a lot of raw materials and materials in circulation, as well as transport. The objects for housing animals and the milking area also belong to this group. When constructing the housing facilities they should be respected norms given in Tables 145 and 146.

Table 145

Norms for sheep housing

Categories	Covered area, m ²
Sheep	1,2–1,7
Rams	1,8–2,2
Offspring	0,7–1,0
Lambs	0,6–0,8

Source: Study on forming a regional repro-center for sheep and goats in EPR (Ph.D. Nikola Pacinovski)

Table 146

Norms for housing goats

Categories	Covered area, m ²
Goats	1,2–1,5
Male goats	2,5
Offspring	0,7–1,0
Kids	0,3–0,5

Source: Study on forming a regional repro-center for sheep and goats in EPR (Ph.D. Nikola Pacinovski)

The facilities should be rational, to be of half-open and closed type, depending on natural climatic conditions. Facilities should be built on dry and drained locations, protected from wind, on which the animals are very sensitive, with southern or southeastern exposure. They should also be sufficiently spacious, warm, illuminated, dry and draft free. The floor could be built of brick, clay or plank, and the slope of the floor should be up to 1%. Concrete floor is not recommended. The walls of the stable should be built of brick, and from the inner side to be plastered and painted.

– B-1 – small commercial and business units, veterinary hospital, facilities for accommodating staff, housing experts needed for the repro-center's functioning.

– G-3 – Services and G-4 – storehouses, in this case hayloft, place for silage (silo trap), warehouse space, with a total of 40% of the gross developed area.

– D2 – high protective green belts in terms of full protection of the complex.

2.5.3.1. Associated infrastructure

Milking area. Milking room, necessary for milking of sheep/goats should be built within the area for housing and breeding of animals. This part can be built as a platform with milk line and channel. Next to the milking area will be located in a room where the aggregate for milking machine, the lactofreeze and the boiler for warm water will be installed. This room communicates directly with the milking platform, through a door through which the milk in cans or through a system of pipes is collected directly into lactofreeze. The question about the boiler and the warm water should be resolved by placing the solar collectors for heating the water which is necessary for maintaining the hygiene in the milking area.

Traffic Plan. The traffic solution provides access to the subject construction parcel through a local road. The system of settlements and traffic network in the Statement of spatial plan 2002–2020 is represented in Annex no. 4, where also belongs the commercial complex – repro-center for small ruminants.

Entering and leaving the installation should be resolved through access road. It is necessary to predict internal roadway for communication between the objects in the repro-center, and parking lots for heavy and light vehicles. The required number of parking lots for cars should be defined in accordance with the Rulebook on standards and norms for urban planning (Official Gazette of RM no. 78/2006).

The objects, internal roads and parking lots for heavy and light vehicles should be set at distances in accordance with fire regulations. Width, capacity and passing on the road to allow access of fire vehicles to each object and their maneuvering during fires.

Electricity. The predicted location and the facilities have power supply point at the distribution network of EVN Macedonia. The wiring is to the local supply of electricity from

village Burilchevo through 10kV duct and local substation for the village Burilchevo. This 10kV duct is connected to the 35/10KV substation "Cesinovo" which is a regional center for supplying with electricity. This substation has installed power of 4MVA and is powered by 35kV transmission line Kocani – Cesinovo with length of 10.280m. The transmission of electricity to other settlements in the municipality is made through the same substation. For lighting of the facility will be used bulbs (100 W), placed on every four meters on the both sides of the object, which will provide the required 100 lux of 1m² floor area.

Water and sewerage network. The settlement Burilchevo where the establishment of the reproductive center for sheep or goats is projected should be owned by the Municipality Cesinovo–Oblesevo is not connected to water–supply, and the water supplying of the objects and the households in this settlement is done through boreholes – hydraphors. The municipality has prepared a project for regional water–supply which also covers village Burilchevo. The water supply is projected to be from its own well, with the possibility of joining the regional water–supply. If for provision of the necessary amounts of water for the commercial complex are used groundwaters, the dynamics of use must be consistent with the requirement of long–term exploitation. The exploitation of groundwater should be based on hydrogeological investigations. In Annex no. 5 by an extract from Spatial Plan of RM is presented the water and energy infrastructure where the location intended for establishing commercial complex belongs.

The atmospheric water from the proposed installation of the Reproductive center for sheep or goats in the village Brulichevo will be taken away out of the location in the surrounding verdure. The municipality plans building a system for taking out the atmospheric water from the streets, roofs and other surfaces, at the same time when it constructs the sewerage systems in the settlements.

In the absence of a public sewerage system to which the installation could be connected, handling with fecal (sanitary) wastewater will be resolved locally. It will be constructed separational sewerage system within the borders of the planned objects. The waste

water will be taken to waterproof concrete septic pit. The required volume of the pit for 5 employees, considering the norm of 50l/day per employee and emptying of the pit once in 50 days is $V = 12,5 \text{ m}^3$. The pit could be emptied by an authorized individual or entity. Wastewater before discharging to nearby recipient must be subjected to purification treatment, i.e. must obtain a quality according to "Regulation on the categorization of water-courses, lakes, reservoirs and groundwater".

Technological fertilization. The annual amount of manure produced per head of sheep/goat in Macedonia is approximately 150–200 kg for a period of 120–150 days when most of the day animals are in the stable and when deep mat is formed. If latticed floor is built, the amount would be smaller, because the waste would be pure without straw. Under the bars should be made concrete trench about 50cm deep, which should be regularly cleaned and the waste water disposed.

For an annual generation of approximately 104,6 tons of waste for 523 animals at the end of the sixth year from the –repro-center's formation, that contains excreta, brood, wasted food from the feeders, it is necessary to project *lagoons or strictly specified places of the yard*, for disposal of the manure and faecal waste waters from the animals. The lagoon is a simple earth basin that should be covered by impermeable foil – walls and bottom, and under to foil to be put drainage pipes connected to a control shaft, through which the accuracy (impermeability) of the lagoon. The volume of the lagoon should be in accordance with the time needed for ripening of the waste. Lagoons may be constructed as reinforced concrete objects. After some time of ripening (about 6 months) as compost, or mix with straw, can be used as fertilizer. It should be provided space of 10m³ for storage of waste in the lagoon per head of animal for a period of. Open lagoons for manure should be a distanced minimum of:

- 30 m from the objects for accomodating staff,
- 50 m from the area processing and storing food,
- 10 meters from warehouses and silos,
- 4 meters from boundaries with neighboring farm or plot.

With coverage of the lagoon the emission of ammonia and methane is reduced.

It is recommended the lagoons to be deeper and narrower because uncovered area of fertilizer per unit volume is smaller, and thus the emission of unpleasant odors is lower¹.

This fertilizer is commonly used for growing vegetables, flowers and woody species.

Faecal substances that are a result from goats and sheep breeding are an ideal substrate for anaerobe fermentation, because their composition contains populations of methanogenic bacteria. Methane derived from this type of waste has a value of 5 kcal/m³, representing 71% of the energy value of natural gas. Given that the estimates shows that annually would be generated about 104,6 tons of waste, could be purchased anaerobic digester, that would enable the use of biogas for producing heat or minimal amounts of electricity for own needs. If the biogas plant is located on a place where animals are bred and not only the manure obtained from those animals is used, the facility should be located on an adequate distance from the area where animals are kept and should have complete physical separation between the object and those animals and their fodder and mat, with fence when necessary.

Pit/grave. For handling dead corpses at the repro-center, it is decided to build a pit – grave, which is usually applicable and cheaper way.

Possible annual mortality of animals in the repro-center is 4 –10%. That means that during the first year of the repro-center's operation with a presence of 100 animals, the possible number of carcasses that should be removed would be from 4–10, while from 500 animals at the end of the 6th year at the repro-center, this figure would be 20 – 50. The dead bodies of the animals shall be removed at the initial stage in the concrete pit–grave, and they will be treated according to the principles of environmental protection:

- Pit – tomb should not be placed in a location that is susceptible to flooding or

has a high groundwater. It must not be located near the surface water too.

- At the location, the pit should be placed on the terrain with a higher elevation in order to avoid flowing of the atmospheric water into it.
- The pit should be at least 500 meters away from objects for breeding animals.
- It should be not placed in a wind blowing direction, so the unpleasant odor won't be spread towards the settlement. For the subject location, the direction of wind blowing is southwest and north.
- The space around the pit–grave in a width of at least 50 cm must be made of solid material with a slope towards the surrounding ground, to allow leakage of the atmospheric water.
- The pit must have a plate and cover made of solid material, with ventilation pipe. Construction and installation of cover should be such to prevent the spread of unpleasant odors and should lock.
- The pit should be located on the site of the repro-center, distanced from the facilities for water supplying at least 20m.

The pit should be enclosed to prevent entry of animals in its immediate vicinity².

Mobile equipment for the repro-center's needs. For local transporting at the repro-center will be used tractors and wheelbarrows. Servicing and maintenance of the tractor will be made in a service center at the local municipality, out of the location.

Fire protection. During the installation it is provided fire protection that would respond to the estimated risk of fire at the project installation. Preparation of project documentation, determining the degree of fire risk and dimensioning the fire equipment will be performed by company licensed for this problem. The fire protection units from Kocani would take care for the fire protection in the repro-center.

Installation of heating and ventilation. During the construction of the Reproductive center for breeding small ruminants – sheep or goats, it is not projected heating and

¹ NAČELA DOBRE POLJOPRIVREDNE PRAKSE, Ministarstvo poljoprivrede, ribarstva i ruralnog razvoja, Zagreb, siječanj 2009 <http://www.orgcg.org/me/images/stories/dpp/NACELADOBREPOLJOPRIVREDNEPRAKSE.pdf>

² Pravilnik o neškodljivom uklanjanju životinjskih leševa ("Sl. listu SRCG", br. 20/83) <http://www.regulativa.me/naslovi/32352-Pravilnik-o-neskodljivom-uklanjanju-zivotinjskih-leseva>

ventilation installation for the premises for breeding animals. Ventilation of the objects could be done naturally through openings – windows, through chimneys – channels for ventilation, and with fans appropriate for the spatial capacity of the facilities and the farmed animals' needs of draft during the time they spent in these facilities.

In the subject installation, due to the size and number of animals, the ventilation will be

with fans that will absorb and throw out the warm air and will bring fresh air into the space but with a maximum speed of 0,5 m/s.

For ventilation and natural lighting would be used the windows that should be 1/20 from the floor surface. Usually the windows are with dimensions 60x50cm and placed at 1,4 m from the floor, so that light falls on the backs of animals and the cribs.

2.5.4. TECHNICAL AND TECHNOLOGICAL CONCEPT TO PRODUCTION IN THE REPRO-CENTER

The Commercial Complex – repro-center, constructed on an area of 6,4 ha will be based on the principles for environmental protection and sustainable local and national development.

In a period of 6 years, starting from 2013, the repro-center will have a total of 513 to 523 heads, with a possibility the flock to increase permanently (to 700 heads—at the goats), by keeping the breeding material for expanded reproduction.

In order to eliminate all risks of eventual unwanted events, it is necessary to establish two repro-centers for sheep and goats that will be placed at two locations i.e. two farms, which will form two farming units.

During the initial formation of the farm at the subject location will be purchased 100 sheep and 4 rams originals of Merinolandschaf breed. Priority will be given to pregnant sheep for a first time. If such material is unavailable or expensive, will be purchased offspring aged 6 to 8 months, that come from selected parental couples. When procuring rams, special attention will be paid to be progen tested. It is planned the farm repro-center itself to be established with 500 heads of all categories, of which about 220 dairy sheep.

If the final decision projects breeding goats on the subject location, will be purchased heads from selected parental pairs. It is projected a purchase of 100 goats (50 goats of Alpine breed and 50 goats from Saanen breed), and 6 male goats originals (3 of each breed). According to the projected dynamics of formation of the flock, it is planned each of two flocks of goats from two breeds (Alpine

and Saanen) to reach the number of 300 heads of all categories, of which 130 heads would be dairy goats. That total number of goats in the repro-center would be 700 heads, of which 260 would be dairy goats.

In the repro-center it is projected a combined method of breeding animals. The first year in the repro-center, the animals will be bred in an intensive way. Intensive breeding system means optimal housing conditions, animal care and healthcare, as well as balanced and continuous nutrition throughout the year. The process of improving the production of small ruminants depends on the technological process, which has three basic directions:

- keeping and breeding;
- nutrition;
- health care system that should be put on a higher level.

Keeping and breeding

Repro-center for small ruminants projects housing of the animals in the facilities for animals' breeding that should be built according to the appropriate agronomic, seismic and construction standards, and to have a minimal covered area of 500 m², as well as an enclosed effluent with a size of 150% of the covered surface, i.e. 750 m². For each head should be provided an effluent with a surface of 3 – 5 m². Effluent is important when the method of breeding is stable or when the animals are taken to pasture. Effluents during the summer should be protected from the influence of the sun by planted trees or eaves.

For small ruminants, which will be housed in facilities that meet the zootechnical norms

will be provided the following ambient conditions (Tab. 147 and 148).

The animals will be occasionally taken to pasture when weather conditions are optimal and will get used to combined food (by hand and pasture). This will combine the intensive and extensive way animal breeding.

Table 147
Ambient conditions for goats

Optimal temperature	10–25 °C
Optimal temperature for kids	12–20 °C
Optimal humidity	60–80%
Nutrition area	Length
–goats	40 cm
–offspring	30 cm
–kids	20 cm
Air circulation	0,5 m/s.,max
Ventilation per head	20 m ³ /hour
Necessary air per goat	5–6 m ³
Natural lighting	1/20 of the floor surface
Intensity of illumination	100 lux
Effluents	Min 150% of covered area

Source: Study on establishment of a regional repro-center for sheep and goat in EPR (Ph.D. Nikola Pacinovski)

Table 148
Ambient conditions for sheep

Optimal temperature	10–18 °C
Optimal humidity	75–80%
Nutrition area	Length,
–sheep	40 sm
–offspring	30 sm
–lambs	20 sm
Natural lighting	1/20 of the floor surface
Effluents	Min 150% of covered area

Source: Study on establishment of a regional repro-center for sheep and goat in EPR (Ph.D. Nikola Pacinovski)

Taking into account the specific ambient conditions of the location, it is projected the stable nutrition period to last 5 months and the pasture period 7 months. In years characterized by intense and longer winters, the length

of the stable and pasture period should be adjusted to the weather conditions. During the stable period, the animals spend their time in the objects. They are usually pregnant and give birth in that period, and after that take care for the kids until they are weaned. Thus, in the stable period happen many important processes in the life of ruminants, both to adults and to young ones, which only in optimal zootechnical conditions can grow and develop normally, and become healthy and highly productive animals. Within the constructed facility for animal breeding will be provided separate areas for housing certain categories of animals, respectively of their age, gender, health, etc.

The appropriate object where the animal are bred has a straw mat on the floor. The stable should be provided with mat, especially at a places where pregnant animals are housed. It must be dry and be replacement every day.

When organized animal breeding, they are divided into groups and placed in stalls. Several groups are formed:

- goats/sheep in lactation,
- dried goats/sheep,
- goats/sheep about to deliver and
- special group of kids/lambs.

Stalls are built of planks with a height of 1,2 to 1,35 cm and 7cm between the planks. Housing the young ones requires an area of 0.33 m² for every kid by age of 8 – 10 weeks.

The male goats/rams are bred in a separate facility in individual stalls, but it should be allowed to them to see each other.

Technology of reproduction of the animals. With the development of the repro-center and increasing the number of heads is provided a breeding system that includes technology of reproduction of the animals throughout the year, excluding the milking of the animals. Regarding the reproduction, in the repro-center it is projected dividing the flock in two groups that will reproduce alternately three times in two years. Flock will be increased every four months³.

The reproduction and the quality of the obtained semen material, needed for refine-

³ Source: Студија за формирање на регионален репроцентар за овци и кози во ИПР. Д-р Никола Пачиновски

ment of the traits of the animals bred are particularly important in the operation of repro-center. The intensity of reproduction depends on the type of animal that is bred, as well as the breeding conditions, where the most important are the housing conditions, nutrition, and professional conducting of the insemination process. When breeding animals, special attention should be paid to their biological needs so their physiological functions and behavior are not undermined.

In accordance with the Common basic program for animal breeding (CBPAB), the methods of breeding and selection of the selected breeds that will be bred in the repro-center will be specified in the Breeding program, which will be developed by the

breeder himself (a private company, public-private partnership, etc.). Breeding of highly productive breeds is always an advantage in terms of indigenous, more primitive and low productive breeds, but in order to maintain indigenous breeds of small ruminants and to preserve biological diversity, the MAFWM projects additional financial support/head for those owners who breed some of the indigenous breeds and types of sheep and goats. Figure no. 5 shows an indigenous breed of sheep. During the repro-center's operation, the breeds will be occasionally refreshed with heads purchased from the native breeding areas, as a method of maintaining racial performances.



Figure 26. Indigenous sheep breed (Ovcepolian sheep)

To achieve the basic goal of the repro-center—production of quality breeding material from selected breeds of small ruminants, will be applied the method of breeding pure breed that are not related. This way of working of the repro-center provide opportunities for maintaining and enhancing the quality of the racial traits for a long time. Furthermore, the Breeding program of the repro-center will project the

controlling of the kinship coefficient within the allowable limits.

The insemination of the animals will be done only with the "jump out of hand" and artificial insemination. Due to the repro-center's function itself which is determined by the goal to maintain the genetic stability and improving the production traits of animals, it is important to keep accurate records of animals referred

to the their origin. For this purpose, the insemination of the female heads in the flocks is controlled.

The repro-center's operational program will also predict the selection purpose, methods of control, evaluation of the individual breeding value and utilization of the breeding heads.

The assessment of breeding value is necessary for determining the real genetic potential of heads and expectations associated with the use of heads in selection purposes.

In the repro-center will be introduced a unique system of identification, keeping records, and home registry and monitoring of the production results.

Breeding the offspring of animals. As all other processes, the process of breeding and selection of animals' offspring in the repro-center will be controlled in order to obtain maximal results in achieving the basic objectives and functions of the repro-center, production of healthy, genetically stable and highly productive offspring, in accordance with the established selection goals. The animals' sucklings will be separated from their mothers, taking care to achieve maximum results in their development. After birth the young animals will receive breast milk, including colostrum milk. Disabled offspring (born with defect of the jaws, lack of palate, abnormal hoofs and legs, visible defects of the genitals, etc.) will be removed. Normal young animals are marked with temporal individual number (ear or neck tag), and are registered by the date of birth, number of mother, sex, brood size, live birth weight and the assigned number. After reaching the age when the food quantities for the offspring must be increased, the nurturing will be done through buckets with nipples or feeding system, and later by transferring to dry and concentrated food. The separation of young animals from their mothers is done gradually, according to the maturity of the young animals.

Based on the production characteristics of the parents and their morphological traits, is performed selection and classification of the offspring intended for reproduction.

Maintaining hygiene in the facilities.

The operation of the repro-center also needs purchasing disinfectants, i.e. maintaining the hygiene in the objects and on the location itself due to everyday maintenance of the sanitary conditions for the animals and people involved in the operation of the repro-center. Disinfectants should not be kept in the facilities where the animals are housed. They should be kept in the storage where any unauthorized person or animal could not enter. Animals will have regular veterinary checks and the situation with parasites and other possible harmful occurrences of diseases, parasites, etc. that appear during their breeding will be controlled.

Nutrition. Given that food gives quick effects, it is necessary, when improving the production of small ruminants to start with it, considering the following:

- rational use of existing pastures;
- improving the biocenosis of the pasture areas;
- production and introducing silage, cereals and legumes in the animals' nutrition.

Should be chosen methods of food applicable to genetic structure of the populations, or to animals' needs. The concept will be changed depending on the change in the genetic basis. For nourishing small ruminants is used nutrition corridor where the portable feeders will be set.

The nutrition of animals bred in the repro-center means providing a herbage, concentrate, salt and other necessary additives and types of foods required for proper breeding and development of the animals. In the animals' nutrition process will be respected the norms of diet in certain development stages of the animals. Herbage needed for feeding animals is provided by pastures throughout the year, while during autumn, winter, spring could be used hay, as well as concentrate and salt used for improving the nutritional value.

The annual needs for feed in the sheep repro-center in 2018, when the maximal capacity of the repro-center will be reached are presented in Table 149.

Table 149

Annual needs for food during a maximal capacity of the repro-centers

Cathegory	Number	Herbage (tons)	Hay (tons)	Concentrate (tons)	Salt (g)	Milk (kg)
2018, sheep						
Breeding goats (pregnant goats + goats in lactation)	217	420	85	33,20	974	/
Male goats	10	20,65	3,03	2,19	52	/
Offspring for replacement (ewesand weaned lambs)	149	344	25	27	540	2235
Kids for selling (m. and f.)	137	0	2,47	3,29	6,17	4110
Total	513	785	115,5	65,68	1572	6345
2018, goats						
Breeding goats (pregnant goats + goats in lactation)	262	532	91,7	29,87	883	/
Male goats	20	39	2,4	2,91	104	/
Offspring for replacement (ewesand weaned lambs)	230	214	17,25	19,32	394	6900
Kids for selling (m. and f.)	234	/	4,21	5,62	11	17550
Total	746	785	115,56	57,72	1392	24450

Source: Study on establishment of a regional repro-center for sheep and goat in EPR (Ph.D. Nikola Pacinovski)

The quantity, quality and availability of water are important elements for health and nutrition of small ruminants in the repro-center. Given that the water consuming is associated with consumption of food, and the food consumption is related to the animals' productivity, a general recommendation is the animals to have free access to water, so that the water consumption would be maximal, which would not limitate the consumption of forage food. It should be emphasized that small ruminants are more sensitive than other kinds of animals in terms of water quality, and refuse to drink water contaminated with faeces and urine. It is same with unclean food, therefore, these facts should be taken into account.

Watering can be in many ways, the power installation will be done automatically with waterholes and troughs in power who are moving are transmitted in the facility and effluent depending on weather conditions. These animals depending on time of year, mode of nutrition and productivity, daily need 3–8 liters of water. The water should generally be clear and clean. Cold water is harmful, because they act unfavorably on the red microflorus the animal. The water temperature

must never be below 10°C. In winter, you need water to be heated to 18°C.

The animals should be provided with permanent and free access to clean and fresh water. The quantity and frequency of water drinking varies depending on the animal's breed, lactation and meal. Based on methabolic body mass, can generally be said that goats consume less water quantities comparing to sheep and animal. But the food can significantly influence on it. Namely, when eating wheat straw, goats consume less water than sheep, but they consume more water when oaten straw in added in the food, since it contains large amounts of proteins and is easily digestible.

Besides the previous factors, water quantity used can be influenced by: water content in plants, salt consumption, temperature of the external environment, water temperature and concentration of electrolytes in water.

Water content in various foods has a significant impact on the water consumption. For example, one kg of silage with 25% dry substances, provides 750g of water, 1 kg hay with 85% dry substances provides only 150g of water.

Animals which during the day consume 3 kg hay and certain quantities of concentrate, can drink up to 13 liters of water.

Maintaining the animals' health.

Animals' health is essential for preserving the health of humans, making profit of the repro-center and environmental protection. Animal healthcare is a legal obligation provided by the Law on protection of animal welfare and Law on Veterinary Health. In order to be bred healthy animals at the repro-center should be applied the practices of prescribed DZP during the purchase and entry into the center:

- purchasing animals for the repro-center should be from well-known places and well-known health condition of each head
- it is allowed purchasing only of marked animals in accordance with statutory obligations,
- When entering new animals in the repro-center, they should spend some time away from other heads in the flock,

In the process of breeding animals it is necessary to be appreciated the following zoosanitary/ biosecurity measures in the repro-center:

- controlled entry and exit of animals and people,
- regular cleaning and maintaining the hygiene in accordance with the technological procedures,
- disinfection with lime the area where the animals are housed twice a year,
- proper management of waste from faeces, sewage and dead bodies of the animals,
- to breed separately the animals of different age category,
- the appearance of first signs of disease or unusual behavior of animals should be reported to a veterinary service,
- only professional veterinary services should treat the animals,

- every moving and selling the animals from the repro-center should be recorded⁴.

Possible annual mortality of animals in the reproduction center is 4–10%. There are three alternatives for disposing dead bodies of animals:

- with composting (Article 14, paragraph 10 of the by-products of animal origin, or under the Rulebook on special conditions regarding the facilities for production of biogas and compost).
- dead bodies to be safely disposed as waste by burying them in a landfill, approved under regulations on environment. This is in accordance with Article 6 of the Law on by-products of animal origin, i.e. the Rulebook on the manner of collection and safe removal of by-products of animal origin, category 2.
- treatment of animal by-products in biodigester for producing biogas, in accordance with relevant legislation of the Republic of Macedonia.

To deal with the dead bodies of the animals, it is projected construction of concrete impermeable pit/grave, which will be regularly disinfected with lime. Before putting the dead animal bodies in the pit, they are poured with lime, chlorine products or other disinfectants.

The pit will be used until it was filled to a height of one meter under the cover. When the pit is full, it will be closed, marked and put out of use. The pit can be used again after 10 years from the date of putting out of use, by previously disinfecting and repairing it.

Workers who handle dead bodies after the procedure of removing the bodies would be provided with equipment for disinfection of the transport means, equipment used during the entire procedure and items for personal washing and disinfection.

⁴ *NAČELA DOBRE POLJOPRIVREDNE PRAKSE, Ministarstvo poljoprivrede, ribarstva i ruralnog razvoja, Zagreb sijecanj 2009*
<http://www.orgcg.org/me/images/stories/dpp/NACELADOBREPOLJOPRIVREDNEPRAKSE.pdf>

Professional health and specialist staffing of the repro-center. The repro-centers fall into a specific category of commercial complexes for breeding animals. Because of the specific tasks performed in them, and the importance of their proper operation for the general animal population living in the country, it is projected in the repro-center to be employed highly specialized staff in the relevant field of reproduction. This profile of people should carry out the management of the farm, management of the expert procedures in the repro-center work and many other tasks that will occur during the operation, and require high qualifications for their solving. For operation of the reproduction center in the first year are provided two jobs. This installation requires employment of doctors of veterinary, specialized in the field of reproduction, as envisaged by the Law on Veterinary Health and the relevant regulations in this area.

Outsourcing needs. During the operation of repro-center would be necessary to engage external consultants. These needs will occur in several areas of operation of repro-center. The accounting services, services in

the field of veterinary, professional and scientific consultation services in order to improve the work of repro-center, the need for hiring additional labor for doing physical jobs in busier periods, etc.

Commencing/Starting with work. Operational phase or starting with work of the repro-center could start after the checks of the accuracy of the installed facilities within the location, and the control by the Authorized inspectional state authorities. The checks and controls would ensure the safe operation of the repro-center, the compliance with the requirements of Environmental protection.

Termination of work or replacement of equipment. If enforced a situation in which the repro-center stops working, would be undertaken all necessary measures for restoration of the location and the environment affected by the repro-center. This includes activities of displacement of parts of equipment or facilities and infrastructure materials that were used during the operation of the repro-center, and which impede the process of restoring the environment to its natural balance and condition.

1.6. DESCRIPTION OF THE LOCATION AND THE ENVIRONMENT OF THE REGION

2.6.1. GEOGRAPHICAL LOCATION OF THE SITE

A location for setting the repro-center in EPR is chosen after the analysis of the key factors for sustainable operation of this type of installation. The location for setting up the commercial reproduction complex center is the site Burilchevo at a part of the CP 576/1, in the place called Pilavot, municipality of Cesinovo–Oblesevo at an area of 6,4 ha.

Municipality Cesinovo–Oblesevo is a rural municipality located in the eastern part of the Republic of Macedonia, in the lowest flat part of Kocani Field. The municipality covers the area in the central confluence area of river

Bregalnica at the foot of the mountains Oso-govo and Plackovica. Municipality to the northwest borders with municipality of Probistip, to the eastern and northeastern part with municipality of Kocani, to the south–eastern part with municipality of Zrnovci, and to the southwest with the municipality of Karbinci. Through the main road artery Stip – Kocani – Delcevo, the municipality connects with Republic of Bulgaria. The positioning of the Municipality Cesinovo–Oblesevo is shown in Figure 27.

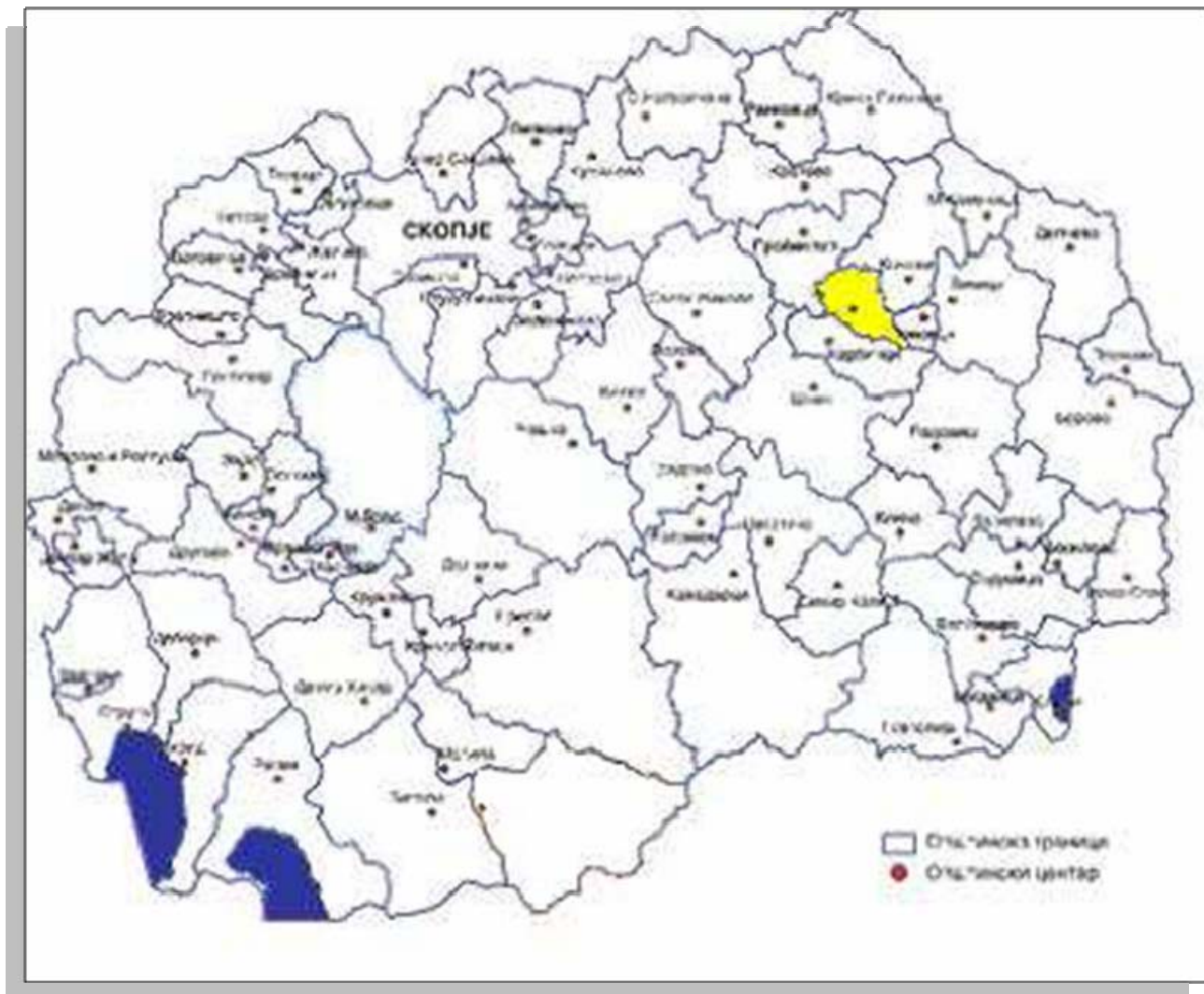


Figure 27. Borders of the Municipality Cesinovo–Oblesevo

Municipality of Cesinovo–Oblesevo covers an area of 133,5 m², which includes the following settlements: Cesinovo, Oblesevo, Sokolarci, Spanchevo, Teranci, Chiflik, Kuchichino, Burilchevo, Ularci, Zhiganci, Banja, Vrbica, Novoselani and Lepopelci. The

administrative center of the municipality is located in Oblesevo.

The entire region of the municipality is divided into flatland part – 6618 ha and mountainous part of 1045.3 ha. The average altitude is 338 m.

2.6.2. CLIMATIC CONDITIONS

Municipality of Cesinovo–Oblesevo is exposed to influences of continental – submediterranean climate. For the climate of the municipality of great importance is the position of both mountainous massifs – Osogovo Mountains and Plachkovica as well

as the configuration of Kocani valley, which is widely open to the west. With this position of the mountains, the subject location is protected from the direct influences of the northern and southern air masses.

Winds are common in this region. The winds blow from all 8 directions, with predominance of winds from the southwest, north and northeast direction. Southwestern wind has an average frequency of 155%, the average speed is 2,2 m/s and maximum speed of 8 Bofors. Figure 28 illustrates the wind rose in this region.

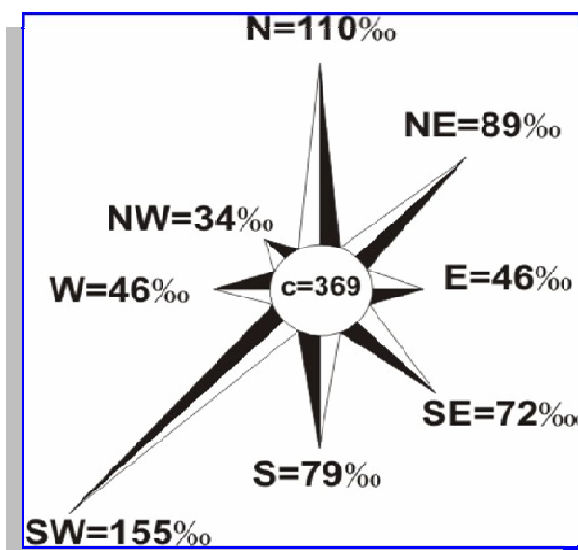


Figure 28. Wind rose on the subject location

These winds come from Ovce Pole so among population it is known as Ovchepolec. They are generally warm and mild winds that usually blow in spring and autumn. Second most frequent wind is the northern wind with

an average frequency of 110% and speed of 2,1 m/s and maximum speed of 8 bofors. The wind comes through the valley of the river Bregalnica and usually blows in winter.

The average rainfalls in the municipality Cesinovo–Oblesevo amount 516,1 mm. The least rain quantity is noted in September, 32,1 mm and the maximal in November, 60,2 mm. Icing period lasts 148 days. The last spring icy day was on March 30th, and the final spring frost was observed on 28 April, 1984. The first autumn frost usually occurs on 3 November, and the absolute beginning of the icing period was observed on 7 October 1971.

The average number of days with snow throughout the year is 18 days. There are only 5 days throughout the year in this area. The average number of days with hail is 19. The average number of bright days during the year is 80, 150 cloudy, and 135 hazy days.

The average relative humidity is 70%. It is the lowest in July (60%) and highest in December (81%). Average annual air temperature is 13 °C, while the annual amplitude is 25,4 °C. Average annual minimal temperature is 6,5 °C. January is the coldest (–3,2 °C). Annual average maximum is measured in July, 29,9 °C. The absolute maximum of 41,2 °C is observed on 8 July 1988, while the absolute minimum of – 22,6 °C is observed on January 26, 1963.

2.6.3. GEOLOGICAL TRAITS OF THE AREA

Municipality Cesinovo–Oblesevo owns land with high quality soils that extend along the river Bregalnica, Masalnica, Kocanska Reka and Zletovska Reka. The hilly and mountainous part is mainly covered with diluvial soils. These two types of soils, alluvial and diluvial, cover about 90% of the total flat area of the valley. Other types of soils, such as red soily, clay soil, and other types cover around 10%.

Alluvial soils have good chemical, physical and hydopedological traits and as such are listed among the quality soil types. These are young soils that create and renew

constantly with new quantities of river sediment. They contain humus, organo-minerals, clays and biogenic elements. Most suitable for processing those who have deep physiological active layer with groundwater on 1 –2 m. The biggest problem are the floodings since with the application of clean gravel and sand on fertile alluvial soils are created arid areas.

At the estuary of Zletovska Reka in the river Bregalnica, the alluvial soils transform into sandy– clayish. They are easily processed and give high crops of rice and other cereal crops.

The diluvial soils are widespread at the edge of the field. They occur in the form of drifts of cones between flat bottom and high hills and mountain slopes. Depending on the mechanical structure they can be sandy and clayish. They contain a small quantity of organic material and humus. The corn, opium poppy, melons, may succeed on them, and if irrigated, the land is suitable for orchards and vineyards.

Clay soils in form of belts occur in the area of the villages of Banja, Spanchevo Lepopelci. They formed on the lake tertiary clays and volcanic tuffs. When irrigated they swell, but are not permeable. They are heavy for processing, but contain enough quantities of humus and are fertile. They are suitable for growing cereal crops, especially wheat. Some

industrial crops like sugar beet, cotton, opium poppy and tobacco may succeed on them too.

The hydrogen black clays mostly contain –over 30% and humus, and because of that quite resemble to the clay soils. Cereal crops are grown on them, especially rice (s.Kuchichino).

East of the Zletovska Reka, around the Ularci Swamp occur marshy and clayish soils, but only in small areas.

Mountainous parts of the valley are mainly covered with brown forest soils. They are covered with forest vegetation, especially beech and coniferous forests. Agricultural crops that grow there are the rye and potatoes, while from the fruits the most common are the apple trees.

2.6.4. PURPOSE OF THE LAND USE

The use of land in the municipality is determined by the morphology of the terrain, geological traits, exposure and national strategy for land management. The land in municipality Cesinovo–Obleshevo regarding the quality and purpose has the following structure: flat part – 6618 ha of arable land, mountainous part – 1045 ha of forests and 4295 ha of pastures. Location on which is projected the establishment of the repro-center in CR Buričhevo, on the CP 576/1, p.c. Pilavot, is located in the Mediterranean or Povardarie region divided in the South Mediterranean with 2 microregions and Central Mediterranean with 10 microregions.

For optimal utilization of environmental and other conditions, in accordance with regionalization according to which Republic of Macedonia is divided into 6 agro-economic regions and 54 microregions, the commercial complex is projected to be constructed on agricultural land (plough land) 7 class. In Annex no. 6 through a certificate from Spatial Plan of RM is presented an overview of land use in the area at the subject location. From the given values is evident that the participation of pastures in the municipality is approximately 36%, indicating the opportunities for development of animal husbandry, including breeding of small ruminants. The arable land participates with 55.4% in the total

agricultural area of the municipality's vicinity, while forests are represented with 8,6%. The area where the projected repro-center will be located, i.e. CM Buričhevo has the following structure of agricultural land: 43% pastures, 55.42% agricultural land and 1.5% forests, i.e. 224 ha pastures, 286 ha arable land and 6 ha forests. The purpose of the land use in the Municipality of Cesinovo–Obleshevo according to the populated places is shown in Table 150.

The areas under cereal crops, as well as the area under industrial crops in the municipality are shown in Tables 151 and 152.

In the Municipality of Cesinovo–Obleshevo there is a large livestock market. Most represented by animal husbandry numbers are the sheep, while the number of goats is significantly lower. This is due to the long-time ban on breeding goats in Macedonia. This ban is lifted and the number of goats gradually increases.

On the municipality's territory could be seen the presence of bee breeders. It indicates that the environment is clean and balanced, because the bees are very sensitive to environmental pollution and survive only in clean environments. The number of animal husbandry by type bred in the municipality is shown in Tables 153 and 154.

Table 150

Purpose of land use

Settlement	Altitude (m)	Surface in the vicinity (km ²)	Agricultural structure of the vicinity in ha			
			Total agricultural area	Arable land	Pastures	Forests
Oblesevo	305	6,3	587	579	8	0,6
Banja	370	10,4	865	401	461	3
Burilchevo	330	5,6	516	286	224	6
Kuchichino	320	10,2	936	422	509	5
Novoselani	330	2,1	183	162	21	0,2
Spanchevo	350	17,6	1289	484	785	20
Teranci	340–400	21,6	2012	614	445	953
Ularci	305	5,3	439	408	18	13
Chiflik	295	5,7	513	435	65	13
Cheshinovo	335	7,0	634	619	15	–
Vrbica	430	11,5	1100	430	650	20
Ziganci	320	7,2	641	577	60	4
Lepopelci	330	4,0	352	308	44	0,5
Sokolarci	340	19,0	1890	893	990	7
Total		133,5	11957	6618	4295	1045,3

Source: LEAP of Municipality Cesinovo–Oblesevo

Table 151

Types of cereal crops in the municipality (ha)

	Total area under cereal crops	Wheat	Maize	Barley	Rice	Other cereals
Cesinovo–Oblesevo	3477,63	955,80	304,99	672,23	1452,46	92,14

Source: LEAP of Municipality Cesinovo–Oblesevo

Table 152

Types of industrial crops in the municipality, ha

	Total area under industrial crops	Soy	Sunflower	Rape	Tobacco	Sugar beet	Other industrial crops
Cesinovo–Oblesevo	11,98	2,24	0.20	–	2.51	1.10	5.93

Source: LEAP of Municipality Cesinovo–Oblesevo

Table 153

Horses, cattle, sheep and goats in the municipality of Cesinovo–Oblesevo

Horses	Total cattle number	Bullocks	Heifers	Milking cows	Total sheep number	Female sheep heads for breeding	Total goats number	Female goats heads for breeding
251	2117	131	159	1085	10385	6908	1237	875

Source: LEAP of Municipality Cesinovo–Oblesevo

2.6.5. HYDROGRAPHY AND QUALITY OF SURFACE WATERS IN THE AREA

The area where is projected the construction of commercial complex – repro-center for breeding small ruminants, the p.c. Pilavot, CM Burilchevo, municipality Cesinovo –Oblesevo belongs to water management area (WMA) "Middle and Lower Bregalnica" which covers the confluence of the river Bregalnica, from the dam "Kalimanci" to the flow in the river Vardar. This water management area encompasses the following rivers: Orizarska, Zletovska, Sv. Nikolska, Osojnica, Zrnovka, Kozjachka and Lakavica. It should also be mentioned that to the "Lower and Middle Bregalnica" belong five reservoirs "Kalimanci" on the river Bregalnica, "Gradce" on the river Kocanska, "Pishica" on the river Pishica, "Mantovo" on the river Lakavica and "Mavrovica" on the river. Mavrovica. It is projected construction of four new reservoirs in the future: "Jagmurlar" on the river Bregalnica, "Rechane" on the river Orizarska, "Knezhino" on the river Zletovska and "Bargala" on the river Kozjachka.

Bregalnica is the main water flow and takes the water from all water flows in this area. Despite the larger rivers that flow into Bregalnica, it accepts the water from other smaller watercourses that do not have formed river beds. Its normal flow is often obstructed by sediments of the tributaries as well as waste of vegetal origin such as branches and straw, so the shallow bed of Bregalnica often overflows and floods the surrounding land and populated places.

The most flooded places are the confluences of the rivers Kocanska, Orizarska, Osojnica and Zletovica. The estuary of the River Zletovica is a place with largest number of floods. Figure 29 shows a map of the most critical areas in the Republic of Macedonia in terms of rapid thawing of the snow and intense rainfalls according to the Center for Crisis Management of the Republic of Macedonia.

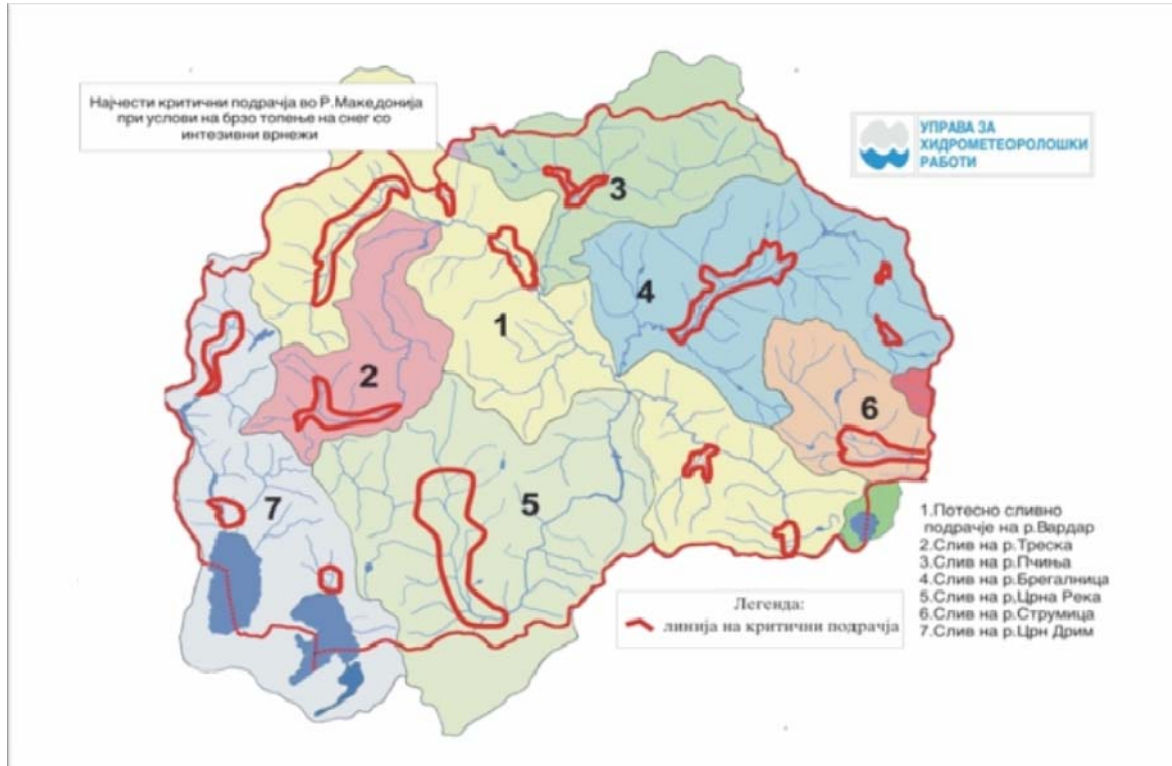


Figure 29. The most critical areas in the Republic of Macedonia in terms of rapid thawing of the snow with intense rainfall

Source: Center for Crisis Management of the Republic of Macedonia

The municipality of Cesinovo–Oblesevo irrigates with water from the artificial lake Kalimanci. This accumulation is located in Ovci Pala–Istibanja gorge and accumulates 127 m³ of water. From the reservoir "Kalimanci" are irrigated the Kocani valley and part of the areas in Ovci Pala. Water channel that conveys the water from the reservoir "Kalimanci" in Kocani valley has two prongs: right main channel with a capacity of 10m³/s and left main channel with a capacity of 5 m³/s.

The state of water channels is bad, i.e. the left water supply branch is not in function. The bad condition is due to irregular maintenance of the inlet and drainage channels due to lack of finances of the municipality and the indifference of the local population.

Pursuant to the Law on waters, it is projected the management of river basins, for which is necessary to be prepared a Programme for managing the confluence which will include all aspects of water management. All waters on the territory of the Republic of Macedonia pursuant to Law on waters are property of the RM.

The water quantity which possesses certain area is expressed by specific leakage expressed in l/s/km². For the confluence area of the river Bregalnica, the specific leakage measured in the water meter station "Berovo" is 11,8 l/s/km², while the at the stations "Ochi Pale" is 5,9 l/s/km² while at w.s. "Stip" is 4,1 l/s/km². These values for specific leakage along the river Bregalnica indicate that this water management area is poor with water.

It should be mentioned the presence of groundwater and geothermal sources. The municipality is located in the belt where it is registered the occurrence of geothermal waters, i.e. the area between Istibanja – Kocani – Stip. Groundwater is not sufficiently explored in terms of their quality and yield. In the municipality, huge part of the population supplies with water through boreholes, or by pumping the groundwater. Location where the repro-center would be constructed supplies with water by these groundwater through tap placed at the location.

2.6.5.1. Quality of surface and groundwater

The Republic of Macedonia through the authorized institutions continually monitor the

organoleptic, mineralized, oxygen and indicators of acidity, eutrophic determinants, as well as the harmful and dangerous substances at the locations that are determined as measuring points, shown in the following table (Tab. 155).

Table 155

Location of the measuring points for monitoring the quality of the surface waters in the Republic of Macedonia

Station	River
Sveta Bogorodica	Treska
Granica, confluence Lepenec	Lepenec
Taor, Nogaevci, Demir Kapija, Gevgelija, Bashino Selo	Vardar
Pelince, Katlanovska Banja	Pcinja
Trnovec	Kriva Reka
Balvan, Ubogo	Bregalnica
Brod	Eleska
Skocivar, Vozarci (Palikura)	Crna Reka
Novo Selo	Strumica
HPP Shpilje	Crni Drim
Boskov Most	Radika

Figure 30 illustrates the location of the measuring stations for the water quality of the rivers in Republic of Macedonia.

The data presented in Tables 156 and 157, according to a report on the environmental quality of MEPP for 2010, we concluded that the concentration of the following indicators of water quality is within the prescribed limits for categorization of waters. Comparable border limits for water quality are shown in tables 158 and 159.

According to the biological elements of water quality noted at the monitoring stations on the river Bregalnica, the water from this river belongs 100% in the second category of quality. The concentration of hazardous and harmful substances, followed by the concentrations of iron, cadmium, zinc, lead, copper, nickel, chromium and manganese, shows no major deviations from the values of the measurements in 2009, when the concentrations of these indicators were within prescribed concentrations for classification of waters.

On the river Bregalnica was set measuring station that performs continuous monitoring of water quality in the river, relatively close to the project site.

monitoring of water quality in the river, relatively close to the project site.

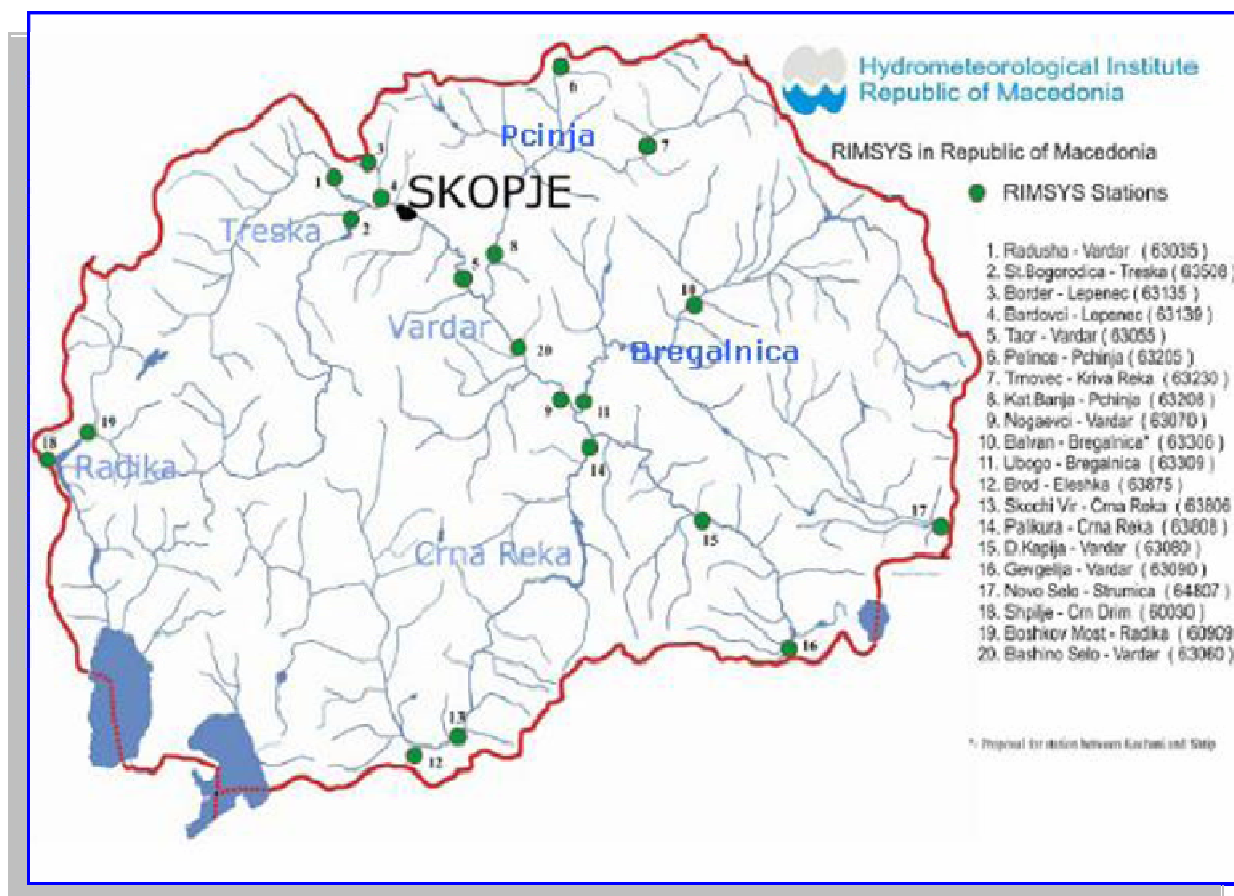


Figure 30. Network of measuring stations for monitoring the quality of surface waters
Source: Hydrometeorological Institute of RM

Table 156

Measured values of oxygen indicators at the measuring point Balvan (river Bregalnica for 2010.)

Station	Oxygen indicator	Value (mg/l O ₂)
Balvan–river Bregalnica	Dissolved oxygen	>8
	BCO ₅ (Biological consumption of oxygen)	2,01 – 4
	CCO (Chemical consumption of oxygen)	2,6 – 5

Source: Annual report from elaborated data for the environmental quality for 2010, by MEPP

Table 157

Measured values of nutrients at the measuring point Balvan (river Bregalnica for 2010.)

Station	Nutrients	Value
Balvan	Nitrates (µg/l)	<10,000
	Nitrates (µg/l)	<10

Source: Annual report from elaborated data for the environmental quality for 2010, by MEPP

Table 158

Border values/maximal approved values or concentrations/of the oxygen regime indicators

Indicators	Class I	Class II	Class III	Class IV	Class V
Dissolved oxygen mg/l O ₂	>8	7,99 – 6,00	5,99 – 4,00	3,99 – 2,00	<3
Biochemical consumption of oxygen for 5days mg/l O ₂ (BCO ₅)	<2	2,01 – 4,00	4,01–7,00	7,01–15,00	>15
Chemical consumption of oxygen–permanganate mg/l O ₂ (CCO)	<2,50	2,51–5,00	5,01 –10,00	10,0–20,00	>20

Source: Decree on water classification

Table 159

Border values/maximal approved values or concentrations/of hazardous and harmful substances

Indicators	I and II class	III and IV class	V class
Nitrates µg/l N	10000	15000	>15000
Nitrates µg/l N	10	500	>500

Source: Decree on water classification

2.6.6. AIR QUALITY IN THE AREA

Ambient air pollution comes from emission of pollutants during industrial production, the combustion of fuels, heating of individual homes and administrative facilities, as well as the traffic.

When analyzing the state of air quality, it is necessary to monitor pollutants and the same to be identified qualitatively and quantitatively. Monitoring has an essential task in environmental management. Namely, it is the basis for taking measures of protection against pollution and improving the quality of the air.

In Republic of Macedonia the monitoring of air quality is carried out by the Ministry of Environment and Physical Planning (MEPP), which manages the State automatic system for air quality, as well as the Hydrometeorological Directorate (HMD) and the Institute for Public Health (IPH) with the Centers for Public Health in Skopje and Veles.

Ministry of Environment and Physical Planning manages the State automatic system for monitoring air quality, which consists of 15 monitoring stations.

The automatic monitoring stations for air quality monitoring monitor the following polluting substances:

- Sulfur dioxide;
- Nitrogen dioxide;
- Carbon monoxide;
- Ozone;
- Suspended particles with size up to 10 micrometers (PM₁₀).

Municipality Cusinovo–Oblesovo do not participate in the monitoring of air quality within the monitoring programs at a national level. The nearest measurement station is the one located in Kocani, but data obtained can not be applied for assessing the air quality in the municipality. Within the national network, the quality of the ambient air in the municipality Cusinovo–Oblesovo is monitored by the monitoring stations installed in the territory of the municipality of Kocani.

The location of settlements in the municipality, their position and influence of the altered continental climate, as well as the absence of major industrial polluting facilities are indicators that suggest that the air pollution in the municipality Cusinovo–Oblesovo is insignificant.

In accordance with the statistical division of the municipalities in 8 statistical regions (territorial units), the Municipality of Cusinovo–Oblesovo belongs in the East region.

The main economic sectors and human activities that cause air pollution can be divided into two major groups in terms of source of pollution:

- Stationary sources;
- Mobile sources.

2.6.6.1. Emissions from stationary sources

In this group of sources belong the Industrial facilities, objects for fossil fuels in industry, households and administrative buildings.

The cumulative emission of pollutants from stationary sources of pollution (businesses) in the eastern region is shown in the following table (Tab. 160).

Table 160

Emission of pollutants from stationary sources in the eastern region –Cadastre of polluters

	Pollutant (t/annually)			
	SO ₂	CO	NO _x	TSP
Statutory sources	959	482	242	71

Source: LEAP of Municipality Cesinovo–Oblesevo

The emission of polluting substances from stationary sources in the whole East region, in average is lower than the emissions in other regions due to the small number of active businesses.

Based on the performed analysis by visiting industrial facilities, it was concluded that air emissions in the municipality Cesinovo–Oblesevo are in the form of dust generated by excavation installations for processing of mineral materials, and the mills for processing rice and cereals.

The individual heating of the homes and facilities (stationary sources of pollution) which as fuel usually use wood and coal, as well as the traffic (mobile sources) to a lesser extent contribute to air pollution.

Domestic heating boxes belong to the collective group of stationary sources of air pollution from which emission of pollutants in the air is as a result of the use of wood and coal for heating. As a product of combustion of these fuels, in the air are emitted SO₂, CO, NO_x, TSP – solid particles (dust).

Burning of the stubbles is still a practice in this municipality. This phenomenon in except causing adverse effects on the environment as air pollution by releasing dioxins and furans, destruction of beneficial fauna (bees and microorganisms), reducing the quality of the soil, increasing the risk of fires, is also an irrational practice, because this treatment destroys the exploitable biomass, which can be used in the field of energy resources.

2.6.6.2. Emissions from mobile sources

The traffic has a huge share in the production of air emissions. Relevant regional road to the subject location under the Spatial Plan of Republic of Macedonia (2002 – 2020) is:

– R–601 – (Stip–connection with R–526–Plachkovica)

Based on the Decision on categorizing the state roads (Official Gazette number 113/11) this regional road belongs to a group of regional roads "P2" and it is renamed with the label:

– R2334 – (Stip – connection with R1204 – Karbinci–Argulica–Teranci–Zrnovci

– Vinica – connection with 1304 – Jaki-movo–Kalimanci – connection with R2345)

Traffic that is realized in the vicinity of the subject location, i.e. municipality is of a local character. This regional route is connected by roadway and national roadway network east–west: M–5 (Bulgaria–Delchevo–Kocani–Stip–Veles–Prilep–Bitola–Resen–Ohrid–Trebenish-ta – M4 (branch Bitola– border with Greece).

During the combustion of fuels that are used are emitted: nitrogen oxides (NO_x), sulphur dioxide (SO₂), carbon monoxide (CO), carbon dioxide (CO₂), suspended dust particles (SPM), aldehydes, lead (Pb) and organic acids. The level of air emissions from mobile sources depends not only on the level of activity, but also there is a direct relationship with quality of fuel used and the age structure of the vehicles.

In order to determine the emission of pollutants from fuel consumption in the traffic, calculations are carried out. They are based on: consumption of gasoline and diesel fuel, as well as the number of registered vehicles in the municipality Cesinovo–Oblesevo.

Table 161 shows the values of air emissions from mobile sources of pollution in Cesinovo–Obleshevo.

Table 161

Total annual amount of pollutants from the use of fuels from petroleum derivatives in municipality Cesinovo–Obleshevo (t/year)

Parameter	Gasoline combustion	Diesel combustion	Total
SO ₂	0,84	2,24	3,08
NO _x	7,48	6,09	13,93
CO	37,70	6,55	44,25
CO ₂	2672,21	1757,84	4430,05

Source: LEAP of Municipality Cesinovo–Obleshevo

The analysis shows that in the pollution with SO₂ and VOCs, the share of gasoline motors is significantly lower compared to diesel engines. Gasoline engines pollute the air mostly with carbon monoxide CO. The use of liquid petroleum gas – LPG, as fuel in the traffic has the smallest impact on the emission of polluting substances in the air, which leads to the conclusion that this fuel is a small pollutant in terms of air quality.

2.6.6.3. Fugitive emissions

As sources of fugitive emissions may occur propulsion activities (during transport, handling, loading, unloading, open storage areas, gas stations, etc.). As sources of these emissions could be leaks of polluting substances in solid, liquid and gaseous state, steaming from equipment and so on. Fugitive emissions can cause smaller or bigger air pollution.

The border values for levels and types of polluting substances in ambient air are given in the following tables (Tab. 162 and 163).

Table 162

Border values for protection of ecosystems and vegetation

Pollutants	Protection	Average period	Border value
Sulphurus dioxide – SO ₂	Ecosystems	Year or winter period	20 µg/m ³
Nitrogen oxides (NO, NO ₂)	Vegetation	Year	30 µg/m ³

Source: Annual report from elaborated data for the environmental quality for 2010, by MEPP

Table 163

Border values for protection of human health

Pollutants	Average period	2010 (µg/m ³)	2012 (µg/m ³)
Sulphurus dioxide – SO ₂	1 hour	410	350
	24 hours	125 µg/m ³	125 µg/m ³
Nitrogen oxides	1 hour	240 µg/m ³	200 µg/m ³
	1 year	48 µg/m ³	40 µg/m ³
PM 10	24 hours	50 µg/m ³	50 µg/m ³
	1 year	40 µg/m ³	40 µg/m ³

Source: Annual report from elaborated data for the environmental quality for 2010, by MEPP

The air quality in the municipality Cesinovo–Obleshevo is not monitored and there are no data for air quality on the basis on which can be made a conclusion. In the absence of industrial installations and intense traffic, as well as the fact that the area around the immediate location of the project has a rural character, it can be concluded that the ambient air in the area is quality without any significant presence of pollutants and harmful substances.

2.6.7. NOISE

The noise takes a significant place among the negative consequences on the en-

vironment as a result of technological development. Noise is usually caused by the vehi-

cles, machinery and appliances used in production processes.

The emission of noise can lead to the emergence of anxiety caused by long and frequent emissions into the air, created a particular time and place. Anxiety caused by the emission of noise can cause interference of normal activity and work, rest and sleep of the humans. The disturbance from noise can be defined by the degree of anxiety of the population from noise by usage of field measured or insights.

When performing actions that produce noise that exceeds the border values of noise

levels, it is considered that violate the peace of citizens is violated.

Republic of Macedonia has not established mechanisms for strategic planning and monitoring of the levels of ambient noise in the environment, and the data for these indicators are scarce on the whole territory of the country including the subject location.

Location projected for the repro-center is located out of populated area, in a rural area which indicates the absence of large generators of noise. Hence, we conclude that the noise is within the maximum allowable limits.

2.6.8. WASTE MANAGEMENT

According to certain calculations the Republic of Macedonia annually generates about 12 tons of total waste per capita, or about 350 kg municipal waste per capita. The efficiency of utilizing the resources of waste in Macedonia is several times smaller in terms of efficiency of using the resource in some countries of the European Union (EU-15) that results with a strong pressure environment.

2.6.8.1. Municipal waste and other types of harmless waste

In Republic of Macedonia, the average values of waste production per capita annually amount to 140 kg in rural areas and 240 kg in urban areas. There is a tendency for a slight increase in the production of municipal waste in proportion to population growth. These values amount to approximately 1390 tonnes of waste per year.

Considering the fact that it is a rural municipality, mostly occurs the biodegradable waste, garden waste and waste paper and cardboard which together consist 68% of total waste generated in the municipality. The other part of the waste is a waste of metal, glass, textiles and other wastes. This structure reflects relatively ecologically balanced condition, i.e. within the municipality are not generated very large amounts of environmentally hazardous waste. Although the quantities

produced are relatively limited, the proper treatment of waste is still unresolved issue in the municipality. The everyday problem of the municipality is improper storage of waste, i.e. occurrence of a large number of illegal landfills, that not only disturb the visual appearance of the landscape, but could also cause pollution and disruption of the environmental balance or indirectly endanger the wildlife.

The organized collection of municipal waste in the municipality covers a small number of settlements and is mainly performed by PCE in cooperation with the local population, and in some parts of the municipality the collection is performed in an improvised manner. The maintenance of the landfills by the municipality is irregular, while the populated places have coverage between 20% and 50%.

Figure 31 shows the quantities of collected and disposed municipal waste and other harmless waste in the municipalities in the Eastern region, including the municipality Cesinovo–Oblesevo.

The National Plan for Solid Waste Management projects operation of one landfill for the whole East planning region. Municipality Cesinovo–Oblesevo has a temporary location for a municipal landfill that has not been activated in the locality Bukeski Dol, near the village Chiflik.

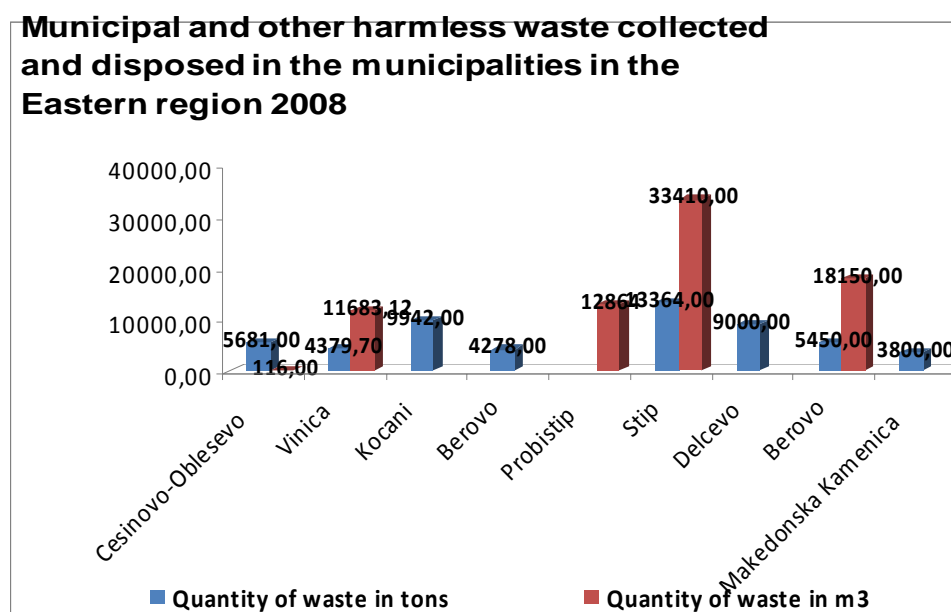


Figure 31. Quantity of collected and disposed municipal waste and other harmless waste in the municipalities in the Eastern Region

2.6.8.2. INDUSTRIAL AND HAZARDOUS WASTE

The management of industrial, inert and hazardous waste in Macedonia is still a challenge for decision-making, both in legal terms, and in operational terms. In Macedonia there is no landfill for hazardous waste management, while the management of the industrial wastes is improperly performed throughout the country. This kind of waste is mainly deposited locally, close to the processing facilities, which in many cases is permanently improper disposal of the same, which may cumulatively cause unforeseen environmental impacts. Municipality Cesinovo-

Oblesevo is facing the same problem in terms of managing these wastes.

We should also mention the fact that treatment of some types of hazardous waste, such as waste oil from vehicles, electrical and electronic waste (batteries, accumulators, etc.), medical waste and other waste that is classified as hazardous is often inadequate. Although the quantity is small compared to other types of waste generated, qualitatively are far riskier in terms of environmental pollution and impact on wildlife.

2.6.9. BIODIVERSITY AND LANDSCAPE TRAITS IN THE AREA

Richness and heterogeneity of species and ecosystems are essential traits of biological diversity in Macedonia. This situation is due to specific geographical position, climatic, geological, geomorphologic, hydrographic, pedological and other traits as well as the changes that have occurred in past geological periods. It all left a deep imprint on soil flora and fauna, for which speak the numerous

relict species and ecosystems. That wealth, according to findings that are currently available, can be shown through an impressive figure of over 18.000 taxa of flora and fauna, of which over 900 taxa are Macedonian endemics, as well as a great diversity of ecosystems within which are registered over 260 plant communities.

The territory of the Republic of Macedonia despite the small area, is characterized by with a wealth of relief forms, heterogeneous geological substrate, with complex pedological composition and combined climate impact. During the long geological history has been created an extensive network of various relict and recent ecosystems – aquatic, wetland, meadow, halophilic, steppe, hilly pastures, forests, mountains and anthropogenously conditioned: weed and ruderal, along with cultural ecosystems.

By its meaning, defined primarily by territorial representation, richness of species and genetic diversity, ecological functionality, economic value, etc., as key ecosystems are separated forest, mountain, dry grassland and wetland ecosystems:

Forest ecosystems: extend on the large part of the territory of the Republic of Macedonia, from 150 – 2200 m. Dominated by deciduous forests, while and coniferous and the mixed are represented on a smaller areas. Due to the high exploitation in lowland belt, they are very degraded while certain places completely destroyed.

Mountain Ecosystems: Present on most mountains in Macedonia, but the optimal conditions for development they find on the mountains with height over 2000 m.

Dry grassland ecosystems: can be found in the lowland area (60–1200 m) on diverse geological substrate (silica, limestone, dolomite and others) and cover a larger number of meadow, halophytic, steppe and hilly pastures. Climate largely coincide with the climate of the oak forest region.

Water ecosystems: crucial among various aquatic ecosystemic in the Republic of Macedonia are *lake and river*, especially the one on the river Vardar. The three natural lakes provide suitable conditions for development of aquatic macrophyte and boggy coastal vegetation. *Inland water ecosystems*

include running, stagnant, temporal and groundwater. From the water ecosystems, the stagnant are the most sensitive to anthropogenic influence, and their revitalisation is hardly viable. For these reasons, it is necessary to pay particular attention to their full protection. *River ecosystems* as the main recipients of wastewater are under intense anthropogenic pressure. Most alarming is the situation of the rivers Vardar, Bregalnica, Crna Reka and Pcinja. Some reservoirs are under great pressure of various pollutants, while the reservoirs that provide drinking or industrial water, due to inappropriate use, have worsened water quality.

On the territory of the Republic of Macedonia are growing very rare, relict and endemic communities from almost all vegetation types. Especially important are those that are characterized by very limited prevalence. In addition, some of them are critically endangered, while at others are reduced their populations, as well as their biological vitality reduced. The range of factors that threaten the ecosystem diversity is quite wide. It should be noted that the threateners mostly act complex. The nature and intensity of their impact vary and they are specific at each ecosystem separately.

The space of the near environment of the project location is a rural area surrounded by pastures. Biological and landscape diversity in the area of project's location does not include characteristic and rare species of flora and fauna, nor endangered species under international and national strategic documents in the field of nature protection. At the site where is projected the establishment of the installation repro-center is not registered natural heritage.

Thus the analysis of impacts of the project on biological and landscape diversity in chapter 4 of this Study for assessment of the environmental impact does not include aspects of this type.

2.6.10. POPULATION AND DEMOGRAPHIC CHARACTERISTICS IN THE AREA

According to the census of 2002, on the territory of the municipality Cusinovo–Obleshevo live total 7490 population (Tab. 164). The total number of households is 2423

or 2960 apartments for living. Average number of members per household is 3.1. According to the nationality on the territory of the municipality live 7455 Macedonian people,

30 people declared themselves as Vlachs, 4 Serbs and 1 is stated as the rest.

Table 164

*Number of inhabitants in the municipality
Cesinovo–Oblesevo*

Populated place	2002
Banja	436
Burilcevo	149
Cesinovo	1056
Ciflik	688
Kucicino	591
Lepopelci	17
Novoselani	71
Oblesevo	1098
Sokolarci	946
Spancevo	996
Teranci	710
Ularci	356
Vrbica	18
Ziganci	358
Total	7490

According to socio-economic indicators, there are 45.6% active population in the municipality. The population density is 56,6 people on 1 km². It is positive that the migration village –city is quite fallen in the last few years, and the young people stay in the community, choosing subsistence in the agriculture. The age groups at the territory of the municipality are shown in the following table (Tab. 165).

Table 165

*Age groups in the territory of the municipality
Cesinovo –Oblesevo*

Age groups	Total	Men	Woman
0	56	34	22
1–2	113	58	55
3–4	117	64	53
5–6	125	69	56
7–9	224	111	113
10–14	413	208	205
15–19	494	245	249
20–24	525	278	247
25–27	308	167	141
28–29	179	92	87
30–34	521	305	216
35–39	481	266	215
40–44	507	262	245
45–49	558	308	250
50–54	566	309	257
55–59	540	296	244
60–64	414	203	211
65–69	348	170	178
70–74	365	159	206
75–79	248	97	151
80+	214	86	128
Total	7319	3789	3530

Note: The age groups condition is to 30.06.2008 inclusive (data from SSO) – information from LEAP of municipality Cesinovo–Oblesevo

2.6.11. CULTURAL HERITAGE

At the territory of the Municipality of Cesinovo–Oblesevo are recorded many sites that are part of the Inventory of immovable cultural property, i.e. archeological sites, churches, monasteries and other monuments of culture.

Large Roman pitosi are found on many localities, including "Turkish cemetery" in the village Banja where were found whole ancient buildings and "Gradiste" near the village

Spanchevo. Ancient sculptures and tombstones were discovered at a locality in the village Teranci (horse racing in action). That monument is now located in the lapidarium of the Museum in Stip. At a 7km from the village Teranci was found a locality with remains of several buildings. By its location and form particularly interesting is the locality called "Pilavo" near the village Burilchevo. There were found tbreeds of fortification that covered

larger flattened space where could be found large quantity of building materials and ceramics. Here are unearthed several Roman pitosi. Interesting to mention is the construction site near the village Sokolarci.

At the territory of the municipality Cesinovo–Obleshevo there are several churches, as well as the church “St. Arhangel Mihail” in Spancevo that is registered as cultural and historical monument. From ancient fresco paintings in the sanctuary are saved the saints from the "Great Entrance" and "Virgin Mary of all heavens." Stylistic analysis of preserved paintings indicates the time of the XVI – XVII century. In XIX century the church was enlarged and corrected, when most of the old painting were destroyed. From older churches is also significant the church "Manastirishteto" near the village Sokolarci.

At the territory of CM Burlichevo have been recorded the following cultural properties:

Piles, settlement from Roman times located above the left bank of Bregalnica;

Monastery, settlement from Late Antique times, located 2,5km south of the village Burilchevo;

Monastery, settlement from Roman times, located approximately 150–200 meters north of Mogila I at the locality Mogila;

Molila, necropolis–mound since Roman times;

Nova Cesma, settlement and necropolis from Roman times, located at the entrance of the village Burilchevo;

Pilavo, settlement from the Neolithic Age, located 2 km west of the village.

2.6.12. TOURISM AND ORGANIZATION OF TOURISTIC AREAS

At the territory of the Republic of Macedonia, as separate entities can be distinguished the following types of tourist potentials: surface water, mountains, spas, the wholes and goods with natural and cultural heritage, tourist transit routes, urban areas, hunting areas and villages. According to the basic long-term goals, the concept and criteria for

development and organization of the touristic offer, in the country are defined a total of 10 touristic regions with 54 touristic zones.

The subject location belongs to Bregalnica touristic area with 9 touristic zones and 29 touristic localities. The locality belongs to the touristic areas of regional importance.

2.7. POTENTIAL IMPACTS ON THE ENVIRONMENT

2.7.1. IMPACT ON AIR QUALITY

During the construction of Commercial Complex – reproduction center for small ruminants in the Municipality Cesinovo–Obleshevo are not expect significant emissions in the air.

During the *construction phase* of the economic complex will occur limited impacts on the quality of ambient air. Is expected the *fugitive emissions of dust and emissions from point sources*.

Occurrence of *fugitive dust emissions* are expected when performing earth, concrete and asphalt work in carrying out excavation and handling of construction materials during the construction of the objects for housing animals and the ancillary facilities, communal and traffic infrastructure.

The exhaust systems of the heavy construction machinery and trucks active on site location – pollutants that make *emission from point source*. The intensity of these emissions depends on the correctness of the vehicles and the quality of fuel they use.

These emissions, given that they are air emissions can be expected to be shifted from the location with the winds blow. It is expected part of these emissions to be blown by wind into closer settlements and to another location. Negative impact of construction dust is on the productivity of plants, closing their leaves and reducing the process of photosynthesis.

Fugitive emissions and emissions from point sources are short-term and time-limited until the completion of construction. Because the location where activities are carried out is out of a settlement and emissions are short, could be expected that this impact will be negligible. Hence the effects caused by these pollutants on the environment during the construction phase are short and small.

During the *operational phase*, potential fugitive emissions are generated when:

- delivery, storage and transportation of food – concentrate,
- from the ventilation system,
- delivery, storage and transportation of food – concentrate,
- from the ventilation system,
- moving and transporting animals,
- collection, storage and transportation of dead animal bodies,
- emissions from the site for disposal of animal waste (feces) or the lagoon.

Intensive animal husbandry in the agricultural sector is the branch that creates the most unpleasant odors. Unpleasant odors from intensive animal husbandry production can not completely be eliminated, but can only be reduced by application of best available technology – BAT and good agricultural practice – BAP, as well as with implementation of appropriate control. The emission of unpleasant odors is from the amount of emitted methane, which depend on the quantity of stored waste, and the manner of storage. With intense breeding of about 500 heads of small ruminants at the location is anticipated an unpleasant odor from the lagoons located in the circle of the repro-center and from the plough land in the period of fertilizing the agricultural area with the manure (Tab. 166).

Odor could be generated from the silage too– i.e. conservation of fodder in silos. If in the later stages of operation of the repro-center arises a need for setting a silos for

silage, should be undertaken measures for proper management of the silage.

T a b l e 166

Amount of nitrogen, phosphorus and potassium in the manure

Type of fertilizer	N %	P ₂ O ₅ %	K ₂ O %
Sheep	0,8	0,5	0,8

Source: Načela dobre poljoprivredne prakse, Ministarstvo poljoprivrede, ribarstva i ruralnog razvoja, Zagreb, sijecanj, 2009

Source of odor represents its dispersal on farm land. Owners of the reproduction center will have to make a contract with local farmers for purchase of this fertilizer or if they own land where the fertilizer will be trown, to act in accordance with the techniques of good agricultural practice (GAP) and best available techniques (BAT). GAP entails examining the amount of nitrogen and phosphorus in the soil which is projected for fertilization.

The repro-center is located out of the populated place, from the village Burilchevo a distance greater than 1,000 meters that comply with the Regulation on classification of objects that with discharging harmful substances could contaminate the air in the populated places and establishing zones for sanitary protection. The repro-center, according to the projected capacity in 2018 under this Rulebook, belongs to the objects from third category where the required distance from the settlement is from 601 to 1.000 m, which is in accordance with this Rulebook.

Emissions of odor are from fugitive character and the distance of the repro-center is in accordance with the prescribed legislation, therefore the installation will not cause a significant impact on air quality in the operational phase of the existence of the facility.

2.7.2. IMPACT ON SURFACE AND GROUNDWATER QUALITY

Water management area (WMA) "Middle and Lower Bregalnica" to which belongs the subject location is poor in water. But near cadastre parcel where the setting of the

repro-center is projected, there are variable surface flows and the riverbed of the river Bregalnica is close, which met the basic requirements for setting up the installation.

The existence of groundwater, their quantity and quality of the site is not sufficiently ex-

explored. The Figure 32 shows a water supplying in the vicinity of the site.



Figure 32. Tap for fresh water near the location of the repro-center
Source: Photos made in the vicinity of the subject location – private archive

Within the reproductive center for small ruminants in case of improper effluent of wastewater that will be generated at the location may occur influences on the quality of surface and groundwater. Wastewater that will occur will be sanitary water from the presence of staff and technological wastewater.

In the *construction phase* it is necessary to avoid discharging of petroleum and lubricants in the surface water and the soil, that will result in penetration of the oils in the ground waters. Releases of these substances can have serious impact on the quality of surface and groundwater and the aquatic flora and fauna.

Impact on groundwater during the construction phase is possible to occur if the groundwaters are pumped and used in technological procedures during the construction..

Trowing additives, chemical substances, paints, varnishes, and similar solvents that are used during the construction may cause pollution on the water quality.. The constructional frame of all facilities will be performed by shallow excavations of the foundations, and according to that during the construction of the

reproductive center is not expected the impact of the groundwater.

It is also possible appearance of influence of sewage pollution by sewage workers present on the site.

In the *operational phase* of the repro-center, the water would be used for watering the animals, maintenance of the technological purity and water for employees. The needs of water for watering of animal husbandry range between 3 to 5l daily per head, and the initial number of flock sheep or goats in the initial phase is 100 with a projected increase to 500 heads in the sixth year of operation, considering the needs of water for watering animal husbandry will range between 350–500l/day for the first year and 1500 –2500l/day in the sixth year according to the projected development of the reproductive center. The subject location is not connected to a public water supply, and the water will be provided through boreholes – hydrophores, i.e. by exhausting the droundwaters. The dynamics of the usage should be in a proportion with the request for long term exploitation

In the operational phase would appear communal waste water as a result of the cleaning at the facility and sanitary needs (50 l/man/daily) which by separate drainage system within the limits of the plan will be taken to a waterproof concrete septic pit. Communal water that for sanitary needs as a pollutant has the following characteristics (Tab. 167).

Table 167

Trait of the communal water (mg/l)

Type of substance	Mineral	Organic	Total	BPK5
Suspended particles	230	590	820	385
– Sedimentary	135	360	495	180
– Not sedimentary	95	230	325	205
Dissolved particles	725	725	1450	110
Total	955	1315	2270	495

Atmospheric water from the roof area of the buildings and from the inner surface would be channeled to the location in the surrounding foliage.

Water pollution from this type of installations are usually caused by uncontrolled emissions of nitrogen and phosphorus during the storage, handling and use (throwing away) the manure, as well as the effluent of waste water that contain phosphorus and nitrogen from the buildings, directly or indirectly in the recipient. The intensity of pollution will depend on the manner the fertilizers are used, the time chosen for the dispersal of fertilizers, methods of soil cultivation and quantities that would be thrown.

The pollution of the groundwater and surface water can also be a result of leakages

and waste water, oils and other pollutants from platforms that are used for cleaning and maintenance of the mobile machinery owned by the operator of the repro-center. The use of phosphate cleaning equipment causes emissions of phosphate. These emissions can reach up to 35% of the total emission of phosphate on farms.

The animals' food from the silos, which if it comes to its expiration, can cause high concentrations of nitrogen and phosphorus in the soil. As a result of its leakage could occur substances that bind oxygen and cause increased biological oxygen demand BOD in the water.

Because the technology of breeding animals projects a combined system of farming that includes bringing animals to pasture, an additional problem/impact on the surface and groundwater is a waste from animals in open fields, where they graze. If in a relatively small area are concentrated a huge number of heads for grazing, at that area would be reduced the vegetation cover and would be encouraged processes of erosion, that would adversely affect the quality of surface waters to which gravitates the erosive deposited material that would be transported through the heavy rains. Secretes from the animals may come into contact with surface waters at the areas where they come closer to the waterways for drinking water.

Impacts on surface and groundwater during the construction phase and operation phase are assessed as possible adverse impacts with unspecified action and short direct and indirect effects on the other media and environmental areas.

2.7.3. IMPACT ON SOIL

Impact on soil which may occur during the *construction phase* of the repro-center is:

- Mechanical pressure on the soil, due to the use of heavy machinery will cause compaction of the surface layer of the soil, especially if the soil is damp. Compacting the soil reduces the absorption of atmospheric residues, impedes gas exchange, biological activity of the soil and the growth of roots of plants. The mechanical pres-

sure on the soil, reduces stability and increases the risk of erosion. Indirect negative impact on the quality of the soil can cause air emissions from vehicles and machinery during construction, although the short period of performing the construction work is not very significant.

- Construction of new objects includes removal of existing vegetation types and disturbance of habitat of existing fauna, as

well as excavation and removal of larger quantities of soil.

- Negative impacts on soil in case of inadequate management of generated waste, wastewater, grease, oils, are assessed as local and long-term. In the plan for constructing the same they will provide measures and activities for proper management of wastewater and the waste that will be generated.
- On the quality of the soil in the *operational phase* of the repro-center may have a negative effect.
- The emissions from vehicles used during the maintenance of facilities. The impacts of emissions in the operational phase are not expected to impair the quality of the soil, because the traffic will be relatively limited. Increased frequency of vehicles is expected when delivering raw materials and transportation/placing of the farm's products. Projected protection zone of greenery around the repro-center reduces this impact, which can be considered as not very significant.
- Improper storage of waste will be generated as a result of breeding animals (feces and urea) can cause contamination of soil.

Despite this waste may occur and some smaller amounts of phyto-sanitary waste, which have been characterized as hazardous waste. Improper storage / handling this kind of waste on the site (or beyond) can also cause soil pollution.

- The projected combined method of animal breeding provides grazing of the small ruminants outside, can influence on the soil due to greater concentration of animals on a small space, so that it might lead to removal of vegetation, that could result with emergence of erosion processes. The faeces and the waste water that would be liberated during the grazing as a natural fertilizer, will help the vegetation to recover. A key factor in determining the significance of this impact on the quality of soil is the number of small ruminants per unit area and the frequency of grazing. Depending on the manner of grazing could be estimated whether these influences will be significant. By frequently changing the location of the pasture, or with proper management of the surfaces that would be used as pastures this influence will be reduced.

2.7.4. IMPACTS OF WASTE MANAGEMENT

In the *construction phase*, according to the type and extent of construction activities, the waste that would be generated as a result of construction activities is in relation to the types of materials and equipment to be used during the construction in different stages: earthworks, reinforcing and concreting works, masonry works, mounting and installation works etc.

Also a source of waste would also be the waste generated by the workers during their stay on the site that is municipal waste and according to its composition is similar to the waste from the households.

Additionally, it is expected creation of insignificant quantities of certain fractions of hazardous waste.

Technical maintenance of the construction equipment and other vehicles will be conducted within the site and therefore it is

not expected generation of waste, such as used tires, batteries and leakage of oils and lubricants from the vehicles.

Table 168 gives an overview of the expected types of waste during the construction phase, systematized according to the classification in the List of types of wastes.

The types of waste generating in the operational phase during normal operation of the installation, belong to the following categories: (Tab. 169):

- Animal waste – feces/waste water
- Waste from animals' cribs – straw
- Waste from animal tissues – dead sheep or goats/tissue
- Phytosanitary waste of vaccines, drugs and treatments
- Municipal waste from other associated facilities

Table 168

List of waste in the construction phase

Ordinal number	Number from the List of wastes (Off.Gazette 100/2005)	Type of waste/material
Generation of constructional and communal waste in the construction phase of the object		
Group 15 – Waste from packing		
1.	15 01	Waste from packing (form paper and cardboard, plastic, wood, metal, composite packing, glass, etc.
2.	15 01 04	Packing in the form of mixed packing of paint
Group 17 – construction and demolition waste		
3.	17 01	Waste from concrete, bricks and roof tiles
4.	17 02	Waste from wood, glass and plastic
5.	17 03	Waste from bituminosis mixtures, pitch and products from pitch
6.	17 04	Waste from metals
7.	17 05 04	Excavated technical land and humus when sinking a foundations
8.	17 06 04	Isolation materials (that do not contain asbestos and hazardous substances)
9.	17 09 04	Other constructional waste (mixed waste)
10.	11 01 09	Waste in a form of congealed particles of paint
Group 20 – Communal waste (similar waste with industrial value), including fractions of selected waste		
11.	20 01	Separately collected fractions (solvents, paints, glues, etc)*.
12.	20 03 01	Mixed communal waste

*) Depending on the composition they could be classified as hazardous waste

Table 169

Waste generated in the operational phase

Ordinal number	Number from the List of wastes (Off.Gazette 100/2005)	Type of waste/material
Generation of waste in the operational pase of the repro-center		
Group 2 – Waste from agriculture, horticulture, aquaculture, forestry, hunting and fishing, preparing and processing of food		
1.	02 01 02	Waste from animal origin
2.	02 01 06	Animal excrement, urine and fertilizer (pus) (mixed with straw), wastewater separately collected and treated out of the place of generation
Group 15 – Waste from packing		
3.	15 01	Waste from packing form paper and cardboard, plasitic, wood, metal, composite packing, glass, etc.
Group 18 – Waste generated during protection of people and animal's health and similar investigations		
4.	18 02 01	Sharp things
5.	18 02 03	Waste whose collection and removoval is not a subject of special requests for protection from infection
Group 20 – Communal waste (similar waste with industrial value), including fractions of selected waste		
6.	20 03 01	Mixed communal waste

It is considered that in the repro-center is produced approximately 150–200 kg manure per sheep/goat head. About 523 animals at the end of the sixth year of the repro-center's formation, annually will be generated approximately 104,6 tons of waste that contains excreta, straw from the brood, wasted food from the feeders. It is projected this waste to be collected in lagoons or highly specific areas of the yard where the manure and the waste waters from the animals are kept. Waste from animal droppings/waste water can be collected together with the straw from the broods, or to be collected separately, depending on the chosen method of goat breeding and the project design of the stalls.

If waste is not collected separately, the brood of straw will have a high concentration of organic substances that can attract flies and vermin. It will aggravate the hygiene conditions for breeding animals and can potentially lead to infections. On the other hand, if the straw/brood is regularly replaced, will be generated larger quantities of waste for storage or disposal. It is required 0,5 kg straw/head, or 75 kg straw/head for 150 days housing in the barn. It could also be used materials with greater absorption that will enable the brood to be used longer, while minimizing the quantities of waste for storage and disposal at the same time.

After combusting in the lagoon, the manure will be ceded to local farmers for fertilization of arable land. The proper use and handling of this fertilizer is expected to increase the crops and to favorably influence on the other media for reduction of chemical inputs in the soil and groundwater.

Waste generated from animal tissues, calculated on the basis of projected mortality

in certain production phases is shown in the following table (Tab. 170).

Table 170

Waste from animal tissues

Year of establishment of the repro-center	% mortality	Total number of animals in the repro-center	Dead animals
First year	4–10	100	4–10
Sixth year	4–10	523	21–52

From the data shown in this table can be seen that the possible occurrence of annual waste from the bodies of dead animals is between 4 and 10 corpses in the first year and between 21 and 52 corpses in the sixth year of the repro-center's operating. The dead bodies is planned to be put in a pit/grave at the location.

The removing of the veterinary waste is determined so it will be taken from authorized persons for handling such waste. The same will be collected and stored in plastic bags to his taking of legal or physical person authorized for receiving, transport and storage of this type of waste.

The waste that will be made by employees at the installation during its stay at the location is a communal waste and therefore its composition is similar to the waste from the households.

The listed impacts will have significant negative and lasting effects on the environment if during the designing of the objects and implementation methods of GAP for breeding animals.

2.7.5. IMPACT OF NOISE AND VIBRATION

Increased noise is expected in the construction phase of the repro-center, adequate infrastructure and supporting facilities. It is expected from the operation of trucks that will carry out the excavation, supply of construction materials, as well as taking the materials from the excavations, to occur emission of noise during the construction phase.

The intensity of the maximal values of noise are expected to emit from the construction machinery is estimated the following values:

- Heavy vehicles (truck) – 82 to 96 dB,
- bulldozer – 79 to 97 dB,
- Excavator – 79 to 93 dB.

Expected noise at this stage is:

- Average sound pressure levels (SPL) to be in the range of 65 and 70dB.

- At short intervals it may happen to have elevated level to 90 dB.

Because the volume of construction provides use of construction machinery and equipment, it is possible the construction machinery and transport means to cause noise intensity from 85– 90 dB at the source.

If we consider that the construction site is out of the settlement and the fact that the operation of the mentioned sources is not continuous, the generation of harmful noise would be occasional and will not cause a significant impact on the environment and local population.

Traffic intensification on the major roads due to construction activities would cause short-term increase of the noise levels in residential areas where these roads pass due to the brevity of these impacts, it is not expected irreversible harmful effect on humans and the environment.

Occurrence of vibrations during the construction phase is expected to occur from machinery to be used for carrying out the planned activities. To the impact of vibration will be exposed the workers, while these effects will not feel the residents of nearby settlements because the distance of the location of them. The influence of vibration on the environment can be characterized as weak, i.e. it is not expected emission of vibration that would exceed the maximal allowable values. The exposure to vibration will be short.

Source of occasional increased noise in the operational phase may represent the transport means, which will receive/transport the products from the repro-center, as well as the vehicles for transporting employees. Given that commercial complex is located out of a populated area, and as such do not endanger the sensitive receptors (housing zones, hospitals, schools, recreation areas, etc.), it is assumed that the influence of noise will be with a local character and as such will not cause a significant disruption on the environmental quality.

2.7.6. LANDSCAPE AND VISUAL ASPECTS

During the *construction phase*, the area that is projected for construction of sheep or goats repro-center will be temporarily changed. and locations planned for storage of construction materials and temporary objects for the need of the construction activities shall be visually noticeable. These changes will be of short-term nature, i.e. with a duration equal to the time of construction. Because of that, these changes will have minimal significance.

After the completion of construction activities, it is necessary to arrange and plant a greenery on the location, with native species that are characteristic for the area and will allow proper fit of objects in the visual appearance of the landscape.

During the *operational phase* is not expected any impact on the visual aspect and scenery.

2.7.7. IMPACT ON NATURAL HERITAGE

When building a repro-center it is expected impact on flora and fauna from the implementation through a loss of natural habitat – pasture, an area of approximately 6,4 h. This area is relatively small and therefore it is estimated that this impact is not significant.

There will be impact on the flora if the sheep or goats are grazing outside. In case of higher concentration of animals on a smaller

area, it is possible to remove vegetation in the area, such as the grass, bushes, and trees that are within a reach of the sheep, but this is especially characteristic for goats. Positive influence from the presence of small ruminants for grazing is that it will fertilize the soil, which can positively affect the development of the vegetation. In order to maintain a balance between these positive and negative effects,

should be performed controlled grazing of animal husbandry and combined food. We can conclude that the impacts that will cause the operation of the repro-center on flora and fauna will be lasting, reversible and relatively small.

Location which is projected for the planned reproduction center is not located near the proposed natural heritage. For this reason, there is no probability of occurrence of potential direct impacts on it.

2.7.8. IMPACT ON CULTURAL HERITAGE

For the subject location there are indications for possibility of discovering an archaeological site near the subject location, and with the repro-center's construction there is a possibility of faster discovery of those cultural goods, or delaying their discovery. If during the construction of the repro-center is determined the exact position of the cultural heritage site, should be done something for protection of the immovable cultural heritage. If during the construction works are encountered archaeo-

logical artifacts, i.e. are found some material remains that have cultural and historical value, it is necessary to act in accordance with Article 65 of the Law on Protection of Cultural Heritage (Official Gazette of RM no. 20/04, no.115/07 and no.18/11), to immediately stop the started construction activities and to notify the competent institution for the protection of cultural heritage according to Article 129 of the Law.

2.7.9. IMPACTS ON TOURISM DEVELOPMENT

All activities in the space should comply with the guidelines of the Spatial Plan of the state, especially significant and the ones referring to the planning and construction of:

- state infrastructure systems (roads, railways, air transport, telecommunications);
- energy systems, energy line and larger water management systems;
- buildings important for the state;
- capacities of the touristic offer;
- commercial complexes and those relating to larger concentrations (free economic zones);

- capacities for utilization of natural resources

The subject location which is projected for building repro-center for small ruminants belongs to Bregalnica touristic region which specifies 9 tourism zones with 29 tourist sites. According to the Concept' theories and the criteria for protection and sustainable economic development for smooth development of the total tourist offer of this area, are also possible some influences on the development of tourism

2.07.10. IMPACTS OF ACCIDENTS AND CRASHES

Accidents or collisions may occur in the construction phase as well as in the operational phase of the repro-center. Emerging of an accident or collision may be caused by:

- leakage of hazardous substances, fuel or lubricant;
- explosions and fires,
- electric circuit and failures,
- natural disasters and
- animal mortality.

2.7.10.1. Leakage of hazardous substances, fuel and lubricant

Accidents and disasters in the form of flooding during the *construction phase of the reproductive center* may occur in buildings and transport vehicles from spills of fuel, oils and lubricants, as well as leakage of the materials being transported. Accidents can be caused by materials that are transported without appropriate measures undertaken to

protect from the negative impact of high summer temperatures. To overcome this situation it is necessary to note that it is not projected the loading with oil and servicing of machinery in the construction phase to take place at the location of the route, but in the mechanical workshops of the contractor.

In the *operational phase*, the overflow can occur when the packages of cleaners and disinfectants are damaged, flooding as a result of the silage space damage, damage of the lagoon for collecting the waste water or overflowing of the installation for watering of animals. In the operational phase can occur overflowing of waste oil or fuel from the tractor which is planned to be used on the site. Any overflowing of liquid waste must be removed by absorption with wood shavings, sand or similar material, and removed with the communal waste.

Preventing pollution from leakage of hazardous substances, fuel and similar, during the activities at the site is of particular importance. Monitoring of the accuracy of all facilities and installations at the repro-center is of a huge importance. Servicing the tractor and filling it's reservoir with oil will be done out of the repro-center in authorized services. Incidents of mechanical character, if they arise will be resolved by engaging experts from the installation or directly through contract with outsource individuals for faster removal of the existing issues.

2.7.10.2. Explosions and fires

To protect from a possible outbreak of fire on the location of the repro-center would be used a fire service from Kocani. But within the whole project documentation for establishment of the repro-center must be prepared a project for fire protection, which must provide regular inspection and maintenance of fire protection appliances, every 6 months.

In the preparation of the project documentation for fire protection must be observed measures and activities from normative, operational, organizational, technical, educational and propaganda character that are regulated by the Law on Protection and Rescue (Official Gazette of RM no.36/04, no. 49/04, no. 86/08 and no. 124/10, 18/11) which is in accordance with the directives of the European Union and the Regulation on the

implementation of protection and rescue from fires.

2.7.10.3. Contact and defects

During the *operational phase* of the complex may occur a contact in the installation of the facility for housing animals, in the installation of ventilation, in the milking area, or similar mechanical defects of the installation for water supply. For fast and timely intervention will be necessary to seek help from external persons who would be engaged to fix these defects, as well as for maintenance of all installations and pipelines in the reproduction center in good condition.

2.7.10.4. Natural disasters

As natural disasters can occur floods and earthquakes. The proposed location is situated in an area subjected to frequent flooding (estuary of the Zletovska Reka in the river Bregalnica, according to the Center for Crisis Management in RM is the most frequently flooded site in the Republic of Macedonia), and this must be considered with great caution when preparing the project documentation for the objects and their location on the plot. Besides construction precaution measures and construction standards in terms of hydro-isolation and the aseismics, it is good to consider the possibility of using prefabricated objects for construction in the parts of the facilities intended for animal housing and the administration. Prefabricated buildings can provide equivalent standards of operation as the lasting traditionally constructed buildings, and thus will minimize the possibility of damage caused by ruining and flooding, and rapid sanitation of the same with repair or replacement with new structures depending on the estimated damage, in case of a natural disaster of major proportions.

In case of any natural disasters (earthquakes, torrents, strong winds, etc.), it is necessary to immediately start with evacuation of the working staff. Then it is necessary to protect the objects, especially those parts of the installation with a possibility of environmental contamination.

2.7.10.5. Mortality of sheep and goats

During the *operational phase* of the sheep and goat repro-center, if there is a dise-

ase or mortality among sheep or goats, which according to the assessment of experts ranges from 4–10%, it should be handled in accordance with the Law on Veterinary Health (Official Gazette of RM no.113/07). The waste

as a result of a death, i.e. the carcasses of the animals should be handled in accordance with the by-products of animal origin (Official Gazette of RM no.113/07).

2.7.11. IMPACTS OF WAR DESTRUCTION

According to the Spatial Plan of Republic of Macedonia and the Law on Defence (Official Gazette of RM no.42/01, no.05/03, no.58/06, no.110/08), Law on Protection and Rescue (Official Gazette of RM no.36/04, no.49/04, no.86/08 and no.124/10, 18/11) and the Law on Crisis Management (Official

Gazette of RM no.29 / 05), the site for economic complex of the CP 576/1, CM Buričhevo, p.c. Pilavot, municipality of Celinovo–Oblesovo is located in areas with a high degree of threat of military action. In accordance with the legislation should be applied measures for protection and rescue.

2.7.12. SOCIO-ECONOMIC ASPECT

Fundamental contribution to the EPR from the establishment of the reproductive center for sheep or goats are the opportunities for stimulate and intensifying of the local economy and providing employment opportunities. Benefits from the repro-center for breeding small ruminants (sheep and goats) in the EPR will be in function of encouragement of the development of processing industries, and in accordance with the determinations of the Spatial Plan of the Republic of Macedonia. The impacts of repro-center for sheep or goats include employment opportunities for local people, increase of the living standard and possible changes in the social structure of the area.

In the *construction phase* of the complex, huge number of untrained workers can be hired to implement the overall construction work. These workers will be on the construction site only during the implementation of construction activities, so it is not require construction of any temporary barracks for the accommodation of workers.

Positive socio – economic benefits arising from this project will be greater than the negative impacts on nature and environment. Increase of the employment opportunities is expected through direct engagement of local labor during the phase or in indirect form, as a result of increased commercial activity in the area.

2.7.13. CUMULATIVE IMPACTS

Cumulative impacts are the combined effects of two or more projects that are on a close locations or same area, and whose types of impacts have similar nature and potential for mutual influence. Thus, in a relation to the proposed center for reproduction of sheep or goats, cumulative effects may arise as a result of interaction with other existing or future projects of this type planned in the project area.

Despite the mentioned installation, there are no other significant commercial production

activities that take place within the project area, and whose environmental impacts could cause interaction and effect of cumulative impact with the reproductive of the operator.

Because all activities in the area should comply with the guidelines of the Spatial plan of the state, it is recommended, during the future organization of economic activities to respect the criteria for protection and sustainable economic development.

2.7.14. MATRIX OF ENVIRONMENTAL IMPACTS

Description of impact parameters according to their importance, probability of occurrence,

duration, intensiveness and reversibility is given in the following table (Tab. 171).

Table 171

Parameters of influences according to their importance

Criteria		Assessment of the value	
Importance of influence	Local	Regional	Global/ overboard
Character of the influence	Neutral/no such	Negative	positive
Probability of occurrence of the impact	No probability to occur	May occur	Will occur for sure
Duration of the impact	Short-term	Medium-term	Long-term
Intensiveness of the impact	Small	Medium	Big
Reversibility of influence	Reversible influence after which the environment could return to its original condition	Irreversible influence after which the environment could not return to its original condition	

Matrix of influences on environment

Functional phase of the installation	Impact	Location	Importance of impact	Character of the impact	Probability of occurrence of the influence	Reversibility of the impact	Duration of the impact	Intensiveness of the impact
Impact on the air quality								
Constructional phase	Fugitive dust from the construction works	Objects in construction and infrastructure installations	Local	Negative	Will occur for sure	Reversible–re-turning	Short–term	Small
	Emissions of exhaust gases from a point source	Objects in construction and infrastructure installations	Local	Negative	Will occur for sure	Reversible–re-turning	Short–term	Small
Operational phase	Fugitive emissions of dust	Warehouse when delivering food	Local	Negative	Will occur for sure	Reversible–re-turning	Short–term	Small
	Emmissions from a ventilation system	Object for housing animals	Local	Negative	Will occur for sure	Reversible–re-turning	Long–term	Small
	Emission during housing and transport of the animals	Object for housing animals	Local	Negative	Will occur for sure	Reversible–re-turning	Short–term	Small
	Emission of odors	Lagoone, pit/grave, silage, fertilized agricultural areas	Local	Negative	Will occur for sure	Reversible–re-turning	Long–term	Medium
Impact on the surface and groundwater quality								
Constructional phase	Leakage of petroleum, oils and lubricants	Constructional range and the local assess roads	Local	Negative	May occur	Reversible–re-turning	Long–term	Medium
	Throwing additives, chemical substances	Constructional range	Local	Negative	May occur	Reversible–re-turning	Long–term	Medium

Operational phase	Uncontrolled pumping of the groundwater	Constructional range	Local	Negative	May occur	Reversible–re-turning	Long–term	Medium
	Uncontrolled exploitation of the groundwater	Commercial complex	Local	Negative	May occur	Reversible–re-turning	Long–term	Medium
	Sanitary wastewater	Commercial complex	Local	Negative	Will occur for sure	Reversible–re-turning	Long–term	Medium
	Technological wastewater	Silage, Grazing terrains for the animals, Fertilized areas.	Local	Negative	May occur	Reversible–re-turning	Long–term	Medium
Impacts on the soil quality								
Constructional phase	Mechanical pressure due to usage of heavy equipment	Location of the constructional range	Local	Negative	Will occur for sure	Reversible–re-turning	Short–term	Medium
	Removing great area of land	Location of the constructional range	Local	Negative	Will occur for sure	Reversible–re-turning	Short–term	Medium
	Inadequate management of waste and waste oils and lubricants	Location of the constructional range	Local	Negative	May occur	Reversible–re-turning	Long–term	Medium
Operational phase	Inadequate waste management – animals' excrement	The lagoon	Local	Negative	May occur	Reversible–re-turning	Long–term	Medium
	Inadequate management with phytosanitary waste and animals' car-sasses	Repro-centre Pit/grave	Local	Negative	May occur	Reversible–re-turning	Long–term	Medium
	Uncontrolled grazing of the animals	Surrounding pastures	Local	Negative	May occur	Reversible–re-turning	Medium–term	Medium

Impacts caused by waste management

Construc- tional phase	Inadequate management of constructional and communal waste	Constructional range	Local	Negative	Will occur for sure	Reversible–re- turning	Medium– term	Medium
Operationa l phase	Waste from the animals–excrement, veterinary waste, car- casses, communal waste	Reproductive center	Local	Negative	Will occur for sure	Reversible–re- turning	Long–term	Medium

Impact of noise and vibrations

Construc- tional phase	Trucks and heavy equipment	Constructional range	Local	Negative	Will occur for sure	Reversible–re- turning	Short–term	Small
Operationa l phase	Transport means for reception of raw– materials and selling animals	Reproductive center	Local	Negative	Will occur for sure	Reversible–re- turning	Short–term	Small

Visual aspects and landscape

Construc- tional phase	Construction of temporary objects and storage of construction materials	Constructional range	Local	Negative	Will occur for sure	Reversible–re- turning	Short–term	Small
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Impact on natural heritage

Opera- tional phase	Removing the vegetation from large areas	Surrounding pastures	Local	Negative	Will occur for sure	Reversible–re- turning	Long–term	Medium
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Impact on cultural heritage

Constructional phase	Destroying or damaging monuments	Constructional range	Local	Negative	May occur	Irreversible–non–returnable	Long–term	Medium
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Impact on tourism development

Operational phase	Disproportion with the Spacial plan	Location of the repro-center	Local	Negative	May occur	Irreversible–non–returnable	Long–term	Medium
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Impacts of accidents and crushes

Constructional/ operational phase	Leakage hazardous substances, oil or lubricant; Explosions and fires; Contact and defects; Natural disasters Mortality at animals	Location of the repro-center	Local	Negative	May occur	Reversible–re–turning	Long–term	Medium
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Impacts of war destructions

Constructional/ operational phase	Causing war destructions	Covered area	Regional	Negative	May occur	Irreversible–non–returnable	Long–term	Medium
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Socio-economic aspect

Constructional/ operational phase	Employment	Location of the repro-center and wider EPR	Regional	Negative	Will occur for sure	Reversible–re–turning	Long–term	Big
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2.8. MEASURES FOR REDUCING THE POTENTIAL IMPACT ON THE ENVIRONMENT

2.8.1. MEASURES FOR REDUCING THE IMPACTS ON AIR QUALITY

In order to reduce impacts in the construction phase of the complex caused by emissions of dust in the air, should be included procedures on good construction practice:

- If necessary to be used water to spray the location in order to reduce dust;
- Termination with work if there is an intense emission of dust, in order to be determined the reason for the creation of dust and to take measures for its elimination;
- Controlled procedures of filling materials during the performance of earthworks (excavation, spreading);

The use of quality fuel is a measure that would allow reduction of exhaust gases, and thus the impacts caused by exhaust gases generated by the construction mechanization.

In the *operational phase*, there are no regulations for setting a border limits for the emissions of odors. The application of DZP and every measure that contributes to its reduction can be considered BAT.

In the operational phase of this reproductive center, the potential for increased air emissions from facilities is substantial. In the immediate vicinity of the reproductive center there is not populated area that will be directly exposed to the negative impacts of the emissions that occur in the operation of the repro-center, which represents a mitigating circumstance.

Nitrogen is the most important volatile element of faeces from sheep or goats and its amount will depends on the category, while its volatility in the form of ammonia will depend on many factors. Removing the waste at the facilities contributes to minimizing air emissions. The dynamics of removing can be determined on the basis on the number of animals per unit area and the method of their housing. The quantity of volatile substances will depend on the temperature in the buildings, climatic conditions, surface of the water mirror of the lagoons, the dynamics of removing. One measure that would signifi-

cantly reduce the unpleasant odors and air emissions is the appropriate storage of the sheep and goat manure. Besides proper storage as a measure for reducing of ammonia emissions is covering the lagoons with plastic foil. It is also necessary in the operational phase of the repro-center to perform proper maintenance of the watering places. In case they are not regularly maintained, may occur leakage of water that would result with greater water consumption, and also to faster decomposition of feces and increased emission of ammonia. Frequent movement of water in drainage channels allows releasing of unpleasant odors. Preventive measure to prevent this occurrence is not allowing the movement (waving) of the water. The occurrence of odor may also be as a result of the fertilization of arable farmland. In order to reduce the emission of odor during the fertilization, is important to respect certain conditions:

- The best time for fertilization with manure is in the late winter and spring. If fertilized in autumn or winter, the losses of nitrogen in the water are increased. If fertilized in summer, the loss of nitrogen is greater, and thus the intensity of odor .
- Fertilization of land subjected to high risk of contamination is prohibited.
- Prohibited fertilization of land saturated with water.
- Prohibited fertilization of land covered with snow, frozen and flooded land.
- If identified diseases in animals in which the causes of disease are resistant to the conditions in lagoons where the manure is placed, it is not allowed dispersal of the same on the land.

In the operational phase of installation it is projected heating of facilities where the animals are housed. Heating will be done in the supporting facilities for accommodating workers. If there is a need for heating the rooms in the future, it should be done by using renewable energy – biogas, biomass or other alternative energy source. It is desirable sup-

porting facilities for accommodation of workers and the veterinary clinic to be built as energy

efficient buildings.

2.8.2. MEASURES FOR REDUCING THE IMPACTS ON WATER QUALITY

In the *constructional phase* it is necessary to avoid effluent of water polluted with chemicals, additives, paints and varnishes as well as spills of oil and oils for lubrication of vehicles on surface water and soil in order to prevent penetration of the oils to the groundwater flows. Repair and maintenance of vehicles should be performed in the mechanical workrooms of the contractor, while filling the reservoirs with fuel at the gas stations and specific locations for that purpose on concrete platform. It is required careful and professional handling of all materials of this type, and use of materials that are biodegradable.

Regarding uncontrolled pumping of groundwater, the same should rationally be used to avoid lowering of underground water. In case of excessive lowering of water, this impact should be reduced by reduced groundwater extraction for meeting the project needs.

To control pollution from sewage waste water, it is necessary during construction of the site to be placed mobile toilets for the workers that will be promptly cleaned and maintained.

In the *operational phase* of the repro-center, the exploitation of groundwater should be based on hydrogeological investigations carried out. We should not allow excessive exploitation of groundwater because that might lead to disruption of their regime.

The communal waste water from maintaining communal hygiene and sanitation at the facility, which is taken to impermeable concrete septic pit should be cleaned by an authorized organization for handling this kind of waste or to set up a mini treatment plant on the site. Wastewater before discharging to the

recipient must be subjected to treatment, i.e. to obtain a quality according to "Regulation on the categorization of watercourses, lakes, reservoirs and groundwater."

To prevent such an impact on waters from oils and lubricants for maintaining tractors and other mobile vehicles that gravitate on the subject location, it is necessary to maintain the mobile machinery which would be done by authorized mechanical services. Using no phosphate cleaning equipment will contribute to reducing the quantity of phosphorus emissions from these type of installations.

Measure that will prevent leakage of silage areas is the same be collected in a separate container due to high protein content, and thus the nitrogen in it. Its dispersal is possible only on surfaces that will not be processed for a long time in order to dissolve.

Measure that would prevent occurrence of erosion and reduction of vegetation due to uncontrolled use of the same area for grazing is regularly and systematically changing the paths of movement of animals and changing pastures. This would reduce the concentration of animal husbandry for long periods in the same place and would allow regeneration of vegetation. In this way, while creating an opportunity for revegetation would be prevented the leakage of secretions (feces, waste water) in deeper earth layers, i.e. groundwater. Systematic changing of places of watering of the animals is needed, which will enable better selfpurification of the river flows.

In the repro-center will be applied practice of storing the manure in lagoons until maturity, which will allow dispersal on the arable land provided for fertilization.

2.8.3. MEASURES TO REDUCE IMPACTS ON THE QUALITY OF SOILS

In the *constructional phase* of the complex must be provided measures to protect soil that match with the measures for water management. Additives, as well as

paints, varnishes, solvents and similar chemical agents used in construction work should be properly stored out of the possible influences that could activate their toxic

flammable properties. There is a possibility of leaking hazardous substances, to which must be paid special attention, especially in areas with high water level and areas characterized by particularly sensitive soils.

In case of contamination of soil with these materials to be introduced the procedure of removing contaminated soil from the location and its proper disposal as excavated earth containing dangerous substances declared under the List of waste 17 05 05* (Official Gazette of RM no. 100/05).

After completion of construction works should be returned the fertile soil in the condition as before construction. In the construction phase should be used the excavated earth material used for making embankments. Reuse of humus should be made using the best available procedures and techniques.

In the *operational phase*, for prevention from exhaust gases from transport vehicles it is necessary to be provided a protective zone of greenery around the repro-center, which would reduce this impact, that can be considered as not very significant.

Before fertilizing the agricultural land, is necessary to make regular pedological analyzes that will determine the amount of nitrogen and phosphorus in the soil which is scheduled for fertilization. We should also pay special attention when defining the plan for dispersal of the faeces from animals (the dynamics of fertilization and use of proper equipment) and thereby use a the matured fertilizer. During the fertilization we should be careful not to exceed the amount of 30t/ha or the amount of nitrogen during one year will not exceed 250 kg/ha. Agricultural land that is fertilized should not be drained and recultivated for at least three months after fertilizing.

To protect the soil and reduce the removal of vegetation that may lead to the emergence of processes of erosion when uncontrolled grazing, the pasture should be frequently changed, i.e. this impact will be reduced with proper management of the areas that will be used as pastures.

2.8.4. Measures for sustainable waste management

Pursuant to Law on Waste Management (Official Gazette of RM 68/2004, 71/2004, 107/2007, 102/2008, 143/2008 and 9/2011),

Chapter III Handling with waste, the waste creators should to the greatest possible extent, avoid creation of waste and reduce the harmful effects of waste on the environment and people's life and health. During the waste management after prior selection, the waste should be processed by recycling, re-used in the same or other process for the extraction of secondary raw materials, or used as a source of energy. After appropriate treatment it is recommended compulsory disposal of waste materials in the landfill.

Measures for reducing the impacts of waste management relate to the consistent fulfillment of legal obligations for managing it.

Waste to be generated on the discussed location in the *constructional phase* of the installation will not cause adverse environmental impacts on the environment, if the following measures for reducing the impact on the environment are respected:

- In the constructional phase of the repro-center, the generated construction waste should be regularly removed from the construction site,
- The excavated technical soil and humus from the excavation of foundations should be given to legal or physical persons to be used for covering terrains for grasslands,
- Maintenance of the mobile machinery and fuel supply during construction on the location not to be done on the site, but in mechanical workrooms and services of the construction works' contractors,
- Giving the waste of packaging to licensed firm for managing that kind of waste,
- Mixed containers of paints and varnishes used in the construction of the facility along with curdled particles of paint to be removed with the communal waste from the site.

If during the constructional phase on the location appears hazardous waste, the same should be separated from the non-hazardous and inert waste. Keeping this kind of waste is required to be in separate containers, and for its removal from the site and construction area should be engaged authorized firm, pursuant to the Law on Waste Management and the relevant sublaws.

After completion of construction activities it is required to assess the possibility of reuse of the removed soil from the field, in order to

avoid additional economic expenses due to the necessity of its dislocation. After completion of the activities, the waste should be properly delayed in the landfill.

Based on the identified expected types of waste, the management with different fractions of waste at this stage is given in the following table (Tab. 172).

Table 172

Waste management during the construction phase

Type/ fraction of waste	Selection/ Future recycling/ reuse	Treatment Other fractions	Transport/ processing/ removal	note
Communal waste	Selection of fractions for which an interest exists	Mixed waste	Licensed service provider (s)	Fractions of hazardous waste would be separated
Construction waste	Reuse for the needs of the construction/	Mixed waste	Licensed service provider(s) – disposal for landfill of construction waste (intern fraction)	Fractions of hazardous waste would be separated
Other waste from constructional and other activities	Selection of fractions for which an interest exists			
Waste from packaging	Selection of fractions	Mixed waste	Licensed service provider(s) – disposal for landfill of construction waste (intern fraction)	Fractions of hazardous waste would be separated

From the operation of repro-center, the annual waste of 104,6 tonnes will be collected in lagoons or special places of the commercial yard for delaying the manure and waste waters from animals. By constructing the lattice floor, the amount of waste from the animals' feces would be smaller, because the trash would be fine without straw.

When improper storage of this waste occurs methane emissions. Technically properly built and covered lagoon is in accordance with the rules on waste management and thereby reduces the emissions of ammonia and methane.

Pursuant to the Law on by-products of animal origin, and the Law on Veterinary Public Health, dealing with the animal carcasses

ses is the responsibility of the Ministry of Agriculture, Forestry and Water Management, i.e. a responsibility of Agency for Food and Veterinary. Removing of the carcasses is planned to be done in pit/grave on the location and will be undertaken by a legal or physical person who holds a license for managing with this kind of waste.

Veterinary waste as a fraction of medical waste should be taken by an authorized legal entity who is obliged to deal with the same, according to legal provisions in this area.

The municipal waste would be collected in containers for that purpose. Disposal of this waste will be performed by PCE or person authorized to manage this kind of waste.

2.8.5. MEASURES FOR REDUCING THE IMPACTS FROM NOISE

Because of the work of construction machinery occurs emission of noise during the *constructional phase*. In order to minimize noise during construction is recommended to use modern machinery, its maintenance in good condition, handling the machinery in order to keep the allowable noise levels in the environment. However, to avoid increases in allowable limits need to be implemented:

- Careful planning of the construction works to minimize the acoustic pollution, with occasional inclusion of a certain number of machines in operation with favorable maintenance of noise within the limits allowed,
- avoiding the use of equipment that emits noise greater than 90dB,
- control of the construction methods and equipment used.

Generally, to reduce the impact of noise, we recommend placing protective sound walls-barriers, planting of appropriate protective greenery and landscaping of sites with rich horticultural crops.2.8.6. Measures for reducing the impacts on the region

Location where the construction of the repro-center is projected has no recorded

specific values of the region. Due to this fact only what could be predicted in that case is a measure that includes horticultural arranging of the area within the reproductive center. This will contribute towards the integration of objects in the visual appearance of the landscape in the area.

2.8.7. MEASURES FOR REDUCING THE IMPACTS ON NATURAL HERITAGE

Because the location projected for the planned reproduction center is not located near the recorded natural heritage, there is no probability of occurrence of potential direct impacts on it and do not involve measures to

reduce the impact. Impact on flora will occur if the sheep or goats are uncontrollably grazed outside, so in order to maintain a balance should be conducted controlled grazing of the animal husbandry and food combining.

2.8.8. MEASURES FOR REDUCING THE IMPACTS ON CULTURAL HERITAGE

If during the construction works are encountered archaeological artifacts, i.e. cones to disclosure of material remains of cultural and historical value, it is necessary to act in accordance with Article 65 of the Law on Protection of Cultural Heritage (Official Gazette of RM no. 20/04, no.115/07 and no.18/11), or im-

mediately to stop the started construction activities and notify the competent institution for the protection of cultural heritage pursuant to the Article 129 of the Law.

Also, the location will be secured and fenced to avoid any negative impacts.

2.8.9. MEASURES FOR REDUCING THE IMPACTS ON TOURISM DEVELOPMENT

To reduce the impact on tourism development in accordance with the Concept and criteria for development and organization of touristic activity, for undisturbed development

of the overall touristic offer of this area, the organization of economic activities should respect the criteria for protection and sustainable economic growth.

2.8.10. MEASURES FOR REDUCING THE IMPACTS OF ACCIDENTS AND CRASHES

- Preventing the pollution from leakage of hazardous substances, fuel, etc. during the activities at the site is of particular importance. It is necessary to monitor the accuracy of all facilities and installations in the repro-center. Servicing of the tractor and filling the reservoirs with fuel will be done out of the repro-center, in the authorized services. In case to occur incidents of mechanical character, will be resolved by engaging experts from the installation or directly through contract with external indi-

viduals for faster solving of emerged issues,

- Application of measures for protection against fire at the location. In the preparation of project documentation for fire protection must be respected the measures and activities from normative, operational, organizational, technical, educational and propaganda character that are regulated by the Law on Protection and Rescue (Official Gazette of RM no.36/04, no.49/04, no.86/08 and no.124/10, 18/11), which is in accordance with the directives of the

European Union and the Regulation on the implementation of protection and rescue from fires

- The space that is subject of analyzes is located in zone of VIII⁰ degrees by Mercalli scale of expected earthquakes, which

suggests satisfying the conditions and requirements for achieving technically consistent and economically sustainable level of seismic protection in the construction of new facilities.

2.8.11. MEASURES FOR REDUCING THE IMPACTS FROM MILITARY DESTRUCTION

Subject area is located in areas with a high degree of threat of military action, which also imposes mandatory implementation of

protection measures and rescue during the planning and arranging.

2.8.12. SUMMARY OF MEASURES TO REDUCE THE IMPACT ON THE ENVIRONMENT AND PLAN FOR MANAGING AND MONITORING OF THE ENVIRONMENT

Table 173

Summary of measures to reduce the impact on the environment and plan for managing and monitoring of the environment

Functional phase of the installation	Impact	Location	Precaution for minimizing the impact	Responsibility	Starting time	Finishing time	Implementation cost	Responsible for monitoring	Frequency of monitoring
Impact on surface and groundwater quality									
Constructional phase	Leakage of petroleum, oils and lubricants	Constructional range and the local access roads	Keeping the vehicles out of the location's range	Investor/contractor of construction works	Start of the operational phase	End of construction	/	Investor/contractor / municipality Cesinovo–Oblessevo	Occasionally
	Throwing additives, chemical substances	Constructional range	Providing container and platform for taking and removing	Investor/contractor of construction works	Start of the operational phase	End of construction	/	Investor/contractor / municipality Cesinovo–Oblessevo	Occasionally
	Uncontrolled pumping of the groundwater	Constructional range	Consent of exploitation the groundwater	Investor/contractor of construction works	Start of the operational phase	End of duration of the complex	/	Investor/contractor / MEPP/ municipality Cesinovo–Oblessevo	Occasionally
Operational phase	Uncontrolled exploitation of the groundwater	Commercial complex	Consent of exploitation the groundwater	Operator of repro-center	Start of the operational phase	End of duration of the complex	2000 €	Operator/ MEPP municipality Cesinovo–Oblessevo	continuously
	Sanitary wastewater	Commercial complex	Providing a system for taking away and treating	Operator of repro-center	Start of the construction	End of duration of the complex	2000 €	Operator/ MEPP / municipality Cesinovo–Oblessevo	Occasionally

2. Study on assessment of the impact on the environment for sheep or goat repro-center in the East Planning Region

	Technological wastewater	Silage, Grazing terrains for the animals, Fertilized areas.	Providing a system for taking away and treating	Operator of repro-center	Start of the operational phase	End of duration of the complex	2000 €	Operator/ MEPP / municipality Cesinovo–Oblesevo	occasionally
	Impacts on the soil quality								
Constructional phase	Mechanical pressure due to usage of heavy equipment	Location of the constructional range	Correct choice of weather conditions for working with heavy machinery	Investor/ contractor of construction works	Start of the construction	End of construction	/	Investor/constructor / performer/ MEPP / municipality Cesinovo–Oblesevo	Occasionally
	Removing great area of land	Location of the constructional range	Dumping and another valorization of the soil	Investor/ contractor of construction works	Start of the construction	End of construction	/	Investor/MEPP / municipality Cesinovo–Oblesevo	Occasionally
	Inadequate management of waste and waste oils and lubricants	Location of the constructional range	Selection and waste management	Investor/ contractor of construction works	Start of the construction	End of construction	/	Investor/cMEPP / municipality Cesinovo–Oblesevo	occasionally
Operational phase	Inadequate waste management – animals' excrement	Lagoon	Maintaining the lagoon and waste management	Operator of repro-center	Start of the operational phase	End of duration of the complex	1000 €	Operator/ MEPP / municipality Cesinovo–Oblesevo	Occasionally
	Inadequate management with phytosanitary waste and animals' carcasses	Repro-centre Pit/grave	Appropriate removing in specified objects	Operator of repro-center / veterinary	Start of the operational phase	End of duration of the complex	/	Operator/ MEPP / municipality Cesinovo–Oblesevo	Occasionally
	Inadequate waste management – animals' excrement	Surrounding pastures	Planned utilization of the pastures	Operator of repro-center	Start of the operational phase	End of duration of the complex	/	Operator/ MEPP / municipality Cesinovo–Oblesevo	occasionally

Impacts caused by waste management									
Constructional phase	Inadequate management with phytosanitary waste and animals' carcasses	Constructional range	Prompt removing by PCE	Investor/contractor of construction works	Start of the construction	End of duration of the complex	/	Investor/MEPP / municipality Cesinovo–Oblesevo	continuously
Operational phase	Uncontrolled grazing of the animals	Reproductive center	Maintaining the pit and handling with carcasses and tissues	Operator of repro-center	Start of the operational phase	End of duration of the complex	/	Operator/MEPP / municipality Cesinovo–Oblesevo	continuously
Impact of noise and vibrations									
Constructional phase	Trucks and heavy equipment	Constructional range	Maintaining the mechanization and appropriate handling	Investor/contractor of construction works	Start of the construction	End of duration of the complex	/	Operator / municipality Cesinovo–Oblesevo	continuously
Operational phase	Transport means for reception of raw-materials and selling animals	Reproductive center	Maintaining the mechanization and appropriate handling	Operator of repro-center	Start of the operational phase	End of duration of the complex	/	Operator / municipality Cesinovo–Oblesevo	continuously
Visual aspects and landscape									
Constructional phase	Construction of temporary objects and storing construction materials	Constructional range	Maintaining the warehouses for construction material	Investor/contractor of construction works	Start of the construction	End of duration of the complex	/	Operator / municipality Cesinovo–Oblesevo	continuously
Impact on natural heritage									
Operational phase	Removing the vegetation from large areas	Surrounding pastures	Planned utilization of the pastures	Operator of repro-center	Start of the operational phase	End of duration of the complex	/	Operator / municipality Cesinovo–Oblesevo	continuously
Impact on cultural heritage									
Constructional phase	Impact on tourism development	Impact on tourism development	Termination with construction and to notify the authorized in-	Investor/contractor of construction works	Start of the construction	End of duration of the complex	/	Investor/constructor / MEPP / municipality	occasionally

2. Study on assessment of the impact on the environment for sheep or goat repro-center in the East Planning Region

stitution for protection of the cultural heritage								Cesinovo–Oblesevo	
Impact on tourism development									
Operational phase	Disproportion with Spatial plan	Location of the repro-center	To observe the criteria for protection and sustainable economic development	Architect/urban planner/Investor/ LS/PR	Start of plan documentation	End of duration of the complex	/	Investor/constructor / MEPP / municipality Cesinovo–Oblesevo	
Impacts of accidents and crushes									
Constructional phase / Operational phase	Leakage hazardous substances, oil or lubricant; Explosions and fires; Contact and defects; Natural disasters Mortality at animals	Location of the repro-center	To respect the criteria for protection of disasters, fires and explosions	Investor/constructor/operator	Start of plan documentation	End of duration of the complex	/	Investor/constructor/ MEPP / municipality Cesinovo–Oblesevo	continuously
Impacts of war destructions									
Constructional phase / Operational phase	Causing war destructions	Constructional range	Implementing precaution measures for war destructions	Investor/constructor/operator	Start of plan documentation	End of duration of the complex	/	Investor/constructor/ MEPP / municipality Cesinovo–Oblesevo	continuously
Socio-economic aspect									
Constructional phase / Operational phase	Employment	Location of the repro-center and wider EPR	Implementing measures for economic growth	Investor/constructor/operator	Start of plan documentation	End of duration of the complex	/	Investor/constructor/ MEPP / municipality Cesinovo–Oblesevo	continuously

**The responsibilities of the constructor will be specified in the technical documentation for constructional works*

2.9. MANAGEMENT AND MONITORING OF THE ENVIRONMENT

2.9.1. REPORTING ON ENVIRONMENTAL CONDITIONS

Monitoring the state of the environment confirms the validity and application of proposed measures for mitigating the impacts and their functionality, that is a major benefit in terms of environmental protection.

Reporting on the situation of the environment is a key tool that provides relevant information for eventual undertaking of necessary measures to improve the environmental performance of the reproductive center.

The basic objectives and benefits from the monitoring on the effects on the environment are:

- monitoring the implementation of the activities projected with the documentation;
- monitoring the implementation of measures for control of the impacts;
- to provide data for future monitoring of environmental conditions;
- monitoring the situation in the environment and timely consideration;
- the unforeseen effects of the implementation of the plan documentation and managing the same;
- to verify that the application of mitigation measures increase the benefits in terms of environmental protection;
- determining which activities should be undertaken to reduce the impact on the environment.

2.9.2. TERMINATION OF WORK

In case of closure of the complex reproductive center should be undertaken activities for revitalization, return to the site condition before starting the activities.

The equipment can be quickly removed and the site returned in satisfactory condition. All relevant measures and monitoring activities related to the environment will be implemented until the completion of activities for termination with work and full restoration of the site.

In case of closure, the operator will be obliged to prepare a Plan for closure and rehabilitation of the installation which will include:

- Steps that will be taken for closure and stabilization of the plant and timelines for their implementation,
- Implementation of monitoring practices on eventual level as during the operational phase,
- Forms of notice of local residents for activities associated with closing the farm.

2.10. JUSTIFICATION OF THE PROJECT AND CONCLUSION

This chapter is an assessment of how the project for establishment of a reproductive center of the operator contributes to the efforts of the Republic of Macedonia for increased economic growth and achieving the objectives of sustainable development. An overview of project data and information that support and

justify the implementation of the project is given.

The main benefits of the project can be summarized as follows:

- The project is an implementation initiative that will enable significant socio-economic

benefits for the local community and wider area of the EPR in the form of short and long term employment and increasing the indirect spending in the area,

- The project will enable rapid economic development of the municipality and revenues in the municipal budget,
- The project will increase the living standard of the local population,

- The project will contribute to increased interest in further investment in the area, with an effect of increased investment cycle in the wider region,
- In the national context, the project will contribute in reducing the import of products from sheep and goat milk and products from sheep and goat meat, as well as reducing the outflow of foreign currency abroad.

2.10.1. SUSTAINABLE DEVELOPMENT

The basic principles of the concept of sustainable development include:

- "Precautionary Principle", according to which if there is reasonable suspicion that a particular activity can cause harmful effects on the environment, the necessary measures for protection would be undertaken before the scientific evidence that such adverse consequences could arise becomes available,
- Conservation of natural resources and ecological integrity and
- Economic efficiency.

The causes that determine the justification of the project regarding the principles of sustainable development are given below.

2.10.1.1. Principle of precaution

The operator has adopted the precautionary principle, through the process of designing the reproductive center and proposed measures for reducing the potential environmental impacts. The operator will conduct monitoring of environmental impacts, and in case of occurrence and recording of deviations in terms of expected conditions, they will investigate the same and will implement

appropriate measures to prevent adverse effects on the environment.

The proposed reproduction center will use proven modern technology with known impacts and effects on the environment, which in turn allow known and effective measures and procedures for management and control.

2.10.1.2. Conservation of natural resources and ecological integrity

During the implementation of various project phases will be implemented measures to reduce the impacts on natural and environmental resources in the project area.

Accordingly, the proposed project will not cause significant impacts on ecological integrity of the area.

2.10.1.3. Economic efficiency

The proposed repro-center represents a significant investment in the area. Because the initiative is a private investment and there is no need of direct subsidy or investment by the Government of the Republic of Macedonia, the various benefits of this project will be provided without direct costs of the public budget.

2.10.2. CONCLUSION

The reproductive center of the operator is a significant investment initiative that will provide significant socio-economic benefits for the local community and wider area of the EPR.

Taking into account the results of the Study on assessment of the impact on the

environment and the principles of sustainable development, the construction and operation of the reproductive center for sheep or goats is justified because:

- Environmental aspects associated with all stages of the life cycle of the farm are fully identified and taken into account,

- The assessment of environmental impacts is based on best available information and consideration of cumulative impacts,
- The identified probable impacts can be eliminated or reduced, and therefore the proposed reproductive center for sheep or goats is not a threat for serious or irreversible environmental damage,
- The proposed form will not cause impacts on natural resources and ecological integrity of the area.

Environmental impacts associated with the proposed project are identified and addressed in this Study according to the

requirements of the Macedonian legislation on EIA and the best international practices.

The operator will implement the proposed measures to reduce environmental impacts in order to ensure that impacts are kept within an acceptable level during the entire life cycle of the reproductive center in the municipality Cusinovo–Oblesevo.

During the preparation of this Study were not identified significant irreversible adverse impacts on the environment and human health. The identified impacts are standard effects and can be avoided or reduced by implementation of appropriate measures and controls.

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ANNEXES

ANNEX NO. 1

**Defining the precise location on the Proposal of the
commission for giving opinions on draft plans**



ОПШТИНА ЧЕШИНОВО – ОБЛЕШЕВО

Адреса: "Маршал Тито" 66, 2301 Облешево, Ж.с/ка: 772014046063012; ЕДБ: 4013005120852;
Телефони/факс: (033) 351-770, 351-930
web: www.cesinovo-oblesevo.gov.mk; e-mail: cesinovo-oblesevo@mt.net.mk

РЕПУБЛИКА МАКЕДОНИЈА
ОПШТИНА ЧЕШИНОВО-ОБЛЕШЕВО

БР 08-1514/1
26.09.2011 год.
ОБЛЕШЕВО

Врз основа на член 15-а став 3 од Законот за просторно и урбанистичко планирање (Сл. весник на РМ. 51/05, 137/07, 91/09, 124/2010 и 60/2011), Градоначалникот на општина Чешиново-Облешево донесе

О Д Л У К А за одобрување на Планска програма

1. Се одобрува Планска програма со број 0302-05 за изработка на Локална Урбанистичка Планска Документација за ДЕЛ ОД ГРАДЕЖНА ПАРЦЕЛА (КП 576/1), м.в. ПИЛАВОТ, КО БУРИЛЧЕВО со НАМЕНА РЕПРО ЦЕНТАР ЗА ОДГЛЕДУВАЊЕ НА СИТНИ ПРЕЖИВАРИ (овци и кози), по Предлог на Комисијата за давање мислење по нацрт плановите од членот 7 точка 2 од Законот за просторно и урбанистичко планирање, и давање предлог до Градоначалникот за одобрување на Локална урбанистичка планска документација (ЛУПД) број 0302-05 од 07.02.2011.
2. Планската програма е изработена од „ПЛАНЕРИС“ – Куманово.

Изработил: ВА



ГРАДОНАЧАЛНИК

Јорданчо Лефков

ANNEX NO. 2

Proof of ownership – Property list

РЕПУБЛИКА МАКЕДОНИЈА
АГЕНЦИЈА ЗА КАТАСТАР НА НЕДВИЖНОСТИ
-Центар/одде.за катастар на недвижности-

ИМОТЕН ЛИСТ број _____

бр. _____ 20 _____ год.
1102/1966 27-9-2011

ПРЕПИС

КАТАСТАРСКА ОПШТИ

ЛИСТ А

Матичен број на граѓанинот	Носител на правото на недвижностите: за граѓанинот-презиме, татково име и име; за правното лице-точен назив на организацијата	Место на живеење	Улица
	1. РЕПУБЛИКА МАКЕДОНИЈА		

ЛИСТ Б

Број на					ВИКАНО МЕСТО (улица)	КАТАСТАРСКА КУЛТУРА	бон класа	кат класа	површина			П/НЕД
парцела	дел	згр.	пл.	сл.					ха	ари	м ²	
576	1		021	018	ПИЛАЗОД	11000			7	15	93 54	
576	1	1	021	018	ПИЛАЗОД	50000					60	
576	1	2	021	018	ПИЛАЗОД	60000					13 16	
576	1	3	021	018	ПИЛАЗОД	60000					3 95	
576	1	4	021	018	ПИЛАЗОД	60000					52	
					ВКУПНО						16 11 77	

ЛИСТ В

Број на						намена на зградата	ВИКАНО МЕСТО (улица)	објект	материјал на градеа	површина		П/НЕД
парцела	дел	згр.	вл.	кат	стан					а	м ²	

ЛИСТ Г

Број на						ТОВАРИ	пр - службен
парцела	дел	згр.	вл.	кат	стан		
41			0		0		
			0		0		
			0		0		
			0		0		
			0		0		
			0		0		
			0		0		
			0		0		
			0		0		
			0		0		

Ј.П. ЗА С/Т
СТОПАНИСУВА СО
ПАСИШТЕ ВО СОНС
МАКЕДОНИЈА.

ANNEX NO. 3

Geodetic basis for C.P. 576/1 CR Burilchevo

ANNEX NO. 4

Settlement system and traffic network

ИЗВОД ОД ПРОСТОРЕН ПЛАН НА РЕПУБЛИКА МАКЕДОНИЈА 2002 - 2020



МИНИСТЕРСТВО ЗА ЖИВОТНА СРЕДИНА И ПРОСТОРНО ПЛАНИРАЊЕ



АГЕНЦИЈА ЗА ПЛАНИРАЊЕ НА ПРОСТОРОТ

Сектор:

Синтезни карти

Тема:

Просторно-функционална организација

Систем на населби и сообраќајна мрежа

Карта бр. 22

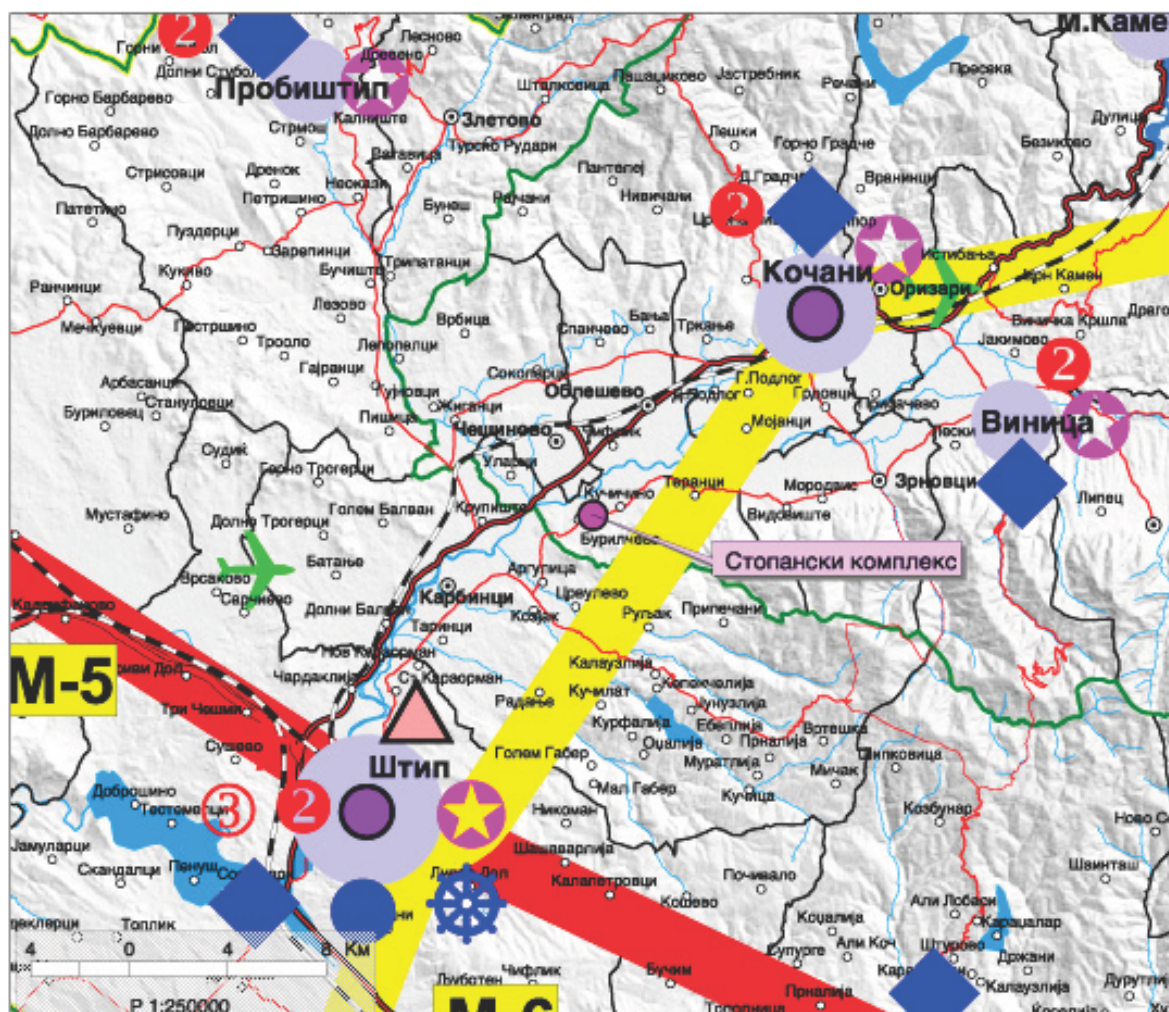
Легенда:

- Центар на макрорегион
- Центар на микрорегион
- Центри на просторно-функционални единици

- Управа
- Просторно-функц. единици
- Граници на влијанија на макрорегионални центри
- Општински центар

- Образование
 - Средно
 - Вишо
 - Високо
- Здравствена заштита
 - Секундарна
 - Терцијална
- Оси на развој
 - источна
 - север-југ
 - западна
 - јужна
 - северна

- Слободна економска зона
- Автопат
- Магистрален пат
- Регионален пат
- Железничка мрежа
- Воздухопловен пристан
- Стопански аеродром
- Спортски аеродром



ANNEX NO. 5

Water management and energetic infrastructure

ИЗВОД ОД ПРОСТОРЕН ПЛАН НА РЕПУБЛИКА МАКЕДОНИЈА 2002 - 2020



МИНИСТЕРСТВО ЗА ЖИВОТНА СРЕДИНА И ПРОСТОРНО ПЛАНИРАЊЕ

АГЕНЦИЈА ЗА ПЛАНИРАЊЕ НА ПРОСТОРОТ

Сектор:

Синтезни карти

Тема:

Техничка инфраструктура

Водостопанска и енергетска инфраструктура

Карта бр. 23

Легенда:

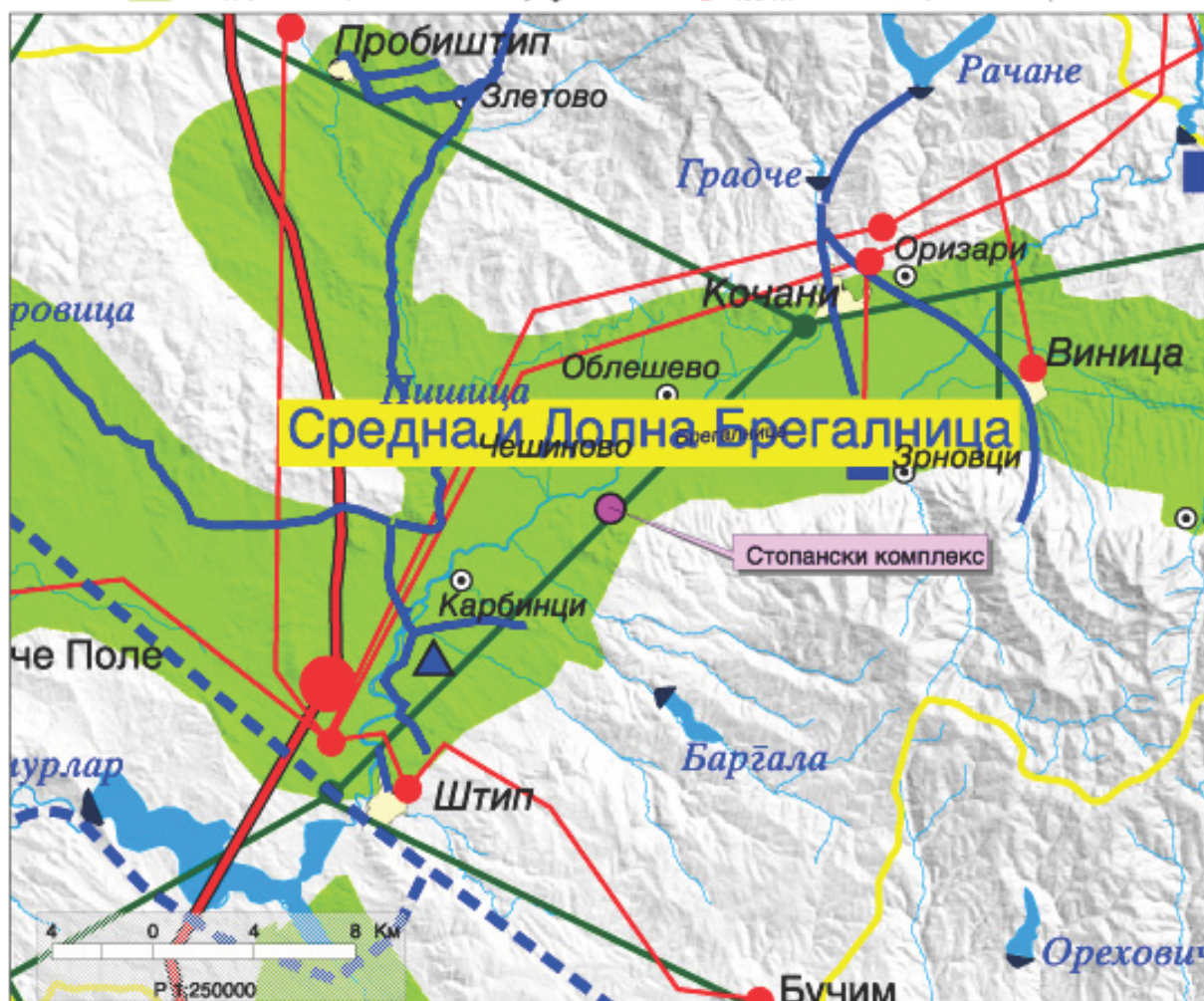
- Изворишта
- Водоводен систем
- Регионален водостопански систем
- Акумулации
- Акумулации по 2020г.
- Природни езера
- Наводнувани површини

Водостопански подрачја

- Термоелектрани
- Хидроелектрани

- | | |
|-----------|--------------|
| Далноводи | Трафостаници |
| 110 kV | 110 KV |
| 220 kV | 220 KV |
| 400 kV | 400 KV |

- Рафинерија
- Нафтовод
- Индустриски топлани
- Рудник на јаглен
- Брикетара
- Гасовод
- Регулациони станици
- Канализационен систем



ANNEX NO. 6

Review on land use in the region of the subject location

ИЗВОД ОД ПРОСТОРЕН ПЛАН НА РЕПУБЛИКА МАКЕДОНИЈА 2002 - 2020



МИНИСТЕРСТВО ЗА ЖИВОТНА СРЕДИНА И ПРОСТОРНО ПЛАНИРАЊЕ



АГЕНЦИЈА ЗА ПЛАНИРАЊЕ НА ПРОСТОРОТ

Сектор:

Синтезни карти

Тема:

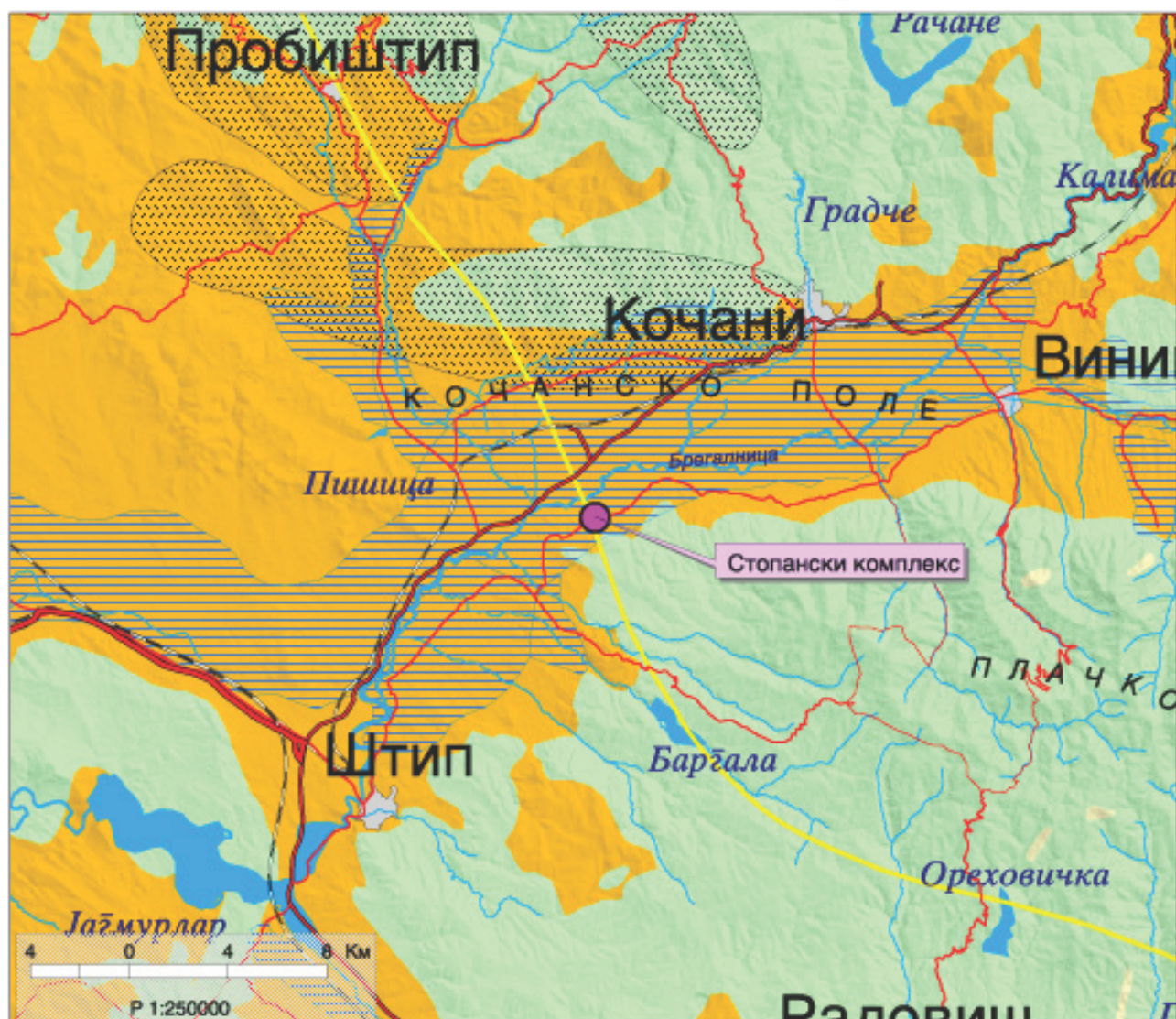
Биланс на намена на површините

Користење на земјиштето

Карта бр. 20

Легенда:

- | | | |
|-------------------------|-------------------------------|---------------------------|
| шуми и шумско земјиште | зони за експлоат. на минерали | автопат |
| земјоделско земјиште | туристички простори | магистрален пат |
| наводнувани површини | транзитни коридори | регионален пат |
| високопланински пасишта | туристички центри | железничка мрежа |
| акумулации | | воздухопловно пристаниште |



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in the east planing region. – Stip ; Centre for development of the East
planing region, 2012. – 258 стр. ; илустр. ; 21 см

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