Sustainable livestock development in Khulo Municipality

document is prepared by
Association of Business Consulting Organizations of Georgia

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1. Goals of objectives of Research

Following research document – ''Sustainable livestock development in Khulo municipality'' has been prepared by Association of Business Consulting Organizations of Georgia. Main aim of the research was: 1. To analyze livesctock sector in Khulo municipality, in parcicular - beef and diary production. 2. To study breeding activities in Adjara livestock sector. 3. To assess current situation in articificial insemination activities and assessment of renewal process of cattle breeding. 4. To determine level of veterinary services in the region; 5. Comparative economic analysis of dairy and beef production. 6. To assess current situation in field of environment protection and sustainable livestock development; 7. To create sustainable livestock development model for Khulo municipality. 8. To compile small handbook for interested farmers involved in beef production about design, building materials and inner and outter environment of farm (For around 20-30 head of cattle). 9. To develop recommendations for beginner farmers, who wants to build beef production cattle farm.

2. Methodology

2.1. To obtain main information

During the research process had been used different methods:

1) To obtain and analyze statistical data.

2) Individual interviews with: a) Small and medium farmers, who are employed in livestock field; b) Veterinaries; c) Articificial insemination specialists; d) Other interested and targeted stakeholders;

3) Individual interviews with a) managers of Dairy processing plant; b) managers of slaughterhouse – who are actively working in local region.

4) Individual interviews with employees of ministry of agriculture of Ajara A/R, who are responsible for development of livestock sector.

3. Results of Research

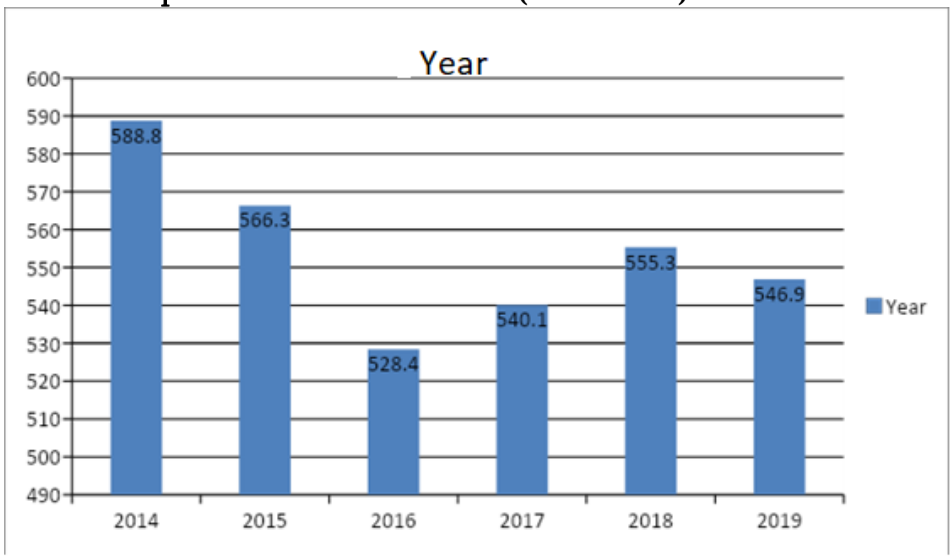
3.1. Current situation to the field

3.1.2. Review of statistical data and main indicators

Small farmers are are owning 99 % of cattles and are in dominant position in livestock sector in Georgia. Livestock sector in Georgia is not well organized. There are very few modern progressive farms in the country, who own modern technology machines (in both areas: Dairy and Beef section) and are producing according modern standards. According to Geostat (National Statistics office of Georgia) data, 99.7 of livestock farmers are having 5 or less cow. Among them, only 0.3 % is involved in organized agricultural enterprises. One cow is milking around 1500-liter milk, annually, according to the statistics. In Khulo municipality this indicator is far more less and is around 1250-liter milk. According to national statistics office of Georgia – ''Geostat'' – data, procudtion of row milk was 91.7 million liter in 2019, which is 2.7 % less than previous year. In 2019, annual production of milk was 546.9 million liters, which is 1.5 % less than results of previous year.

Row milk production dynamic in 2014-2019 is shown in diagram below:

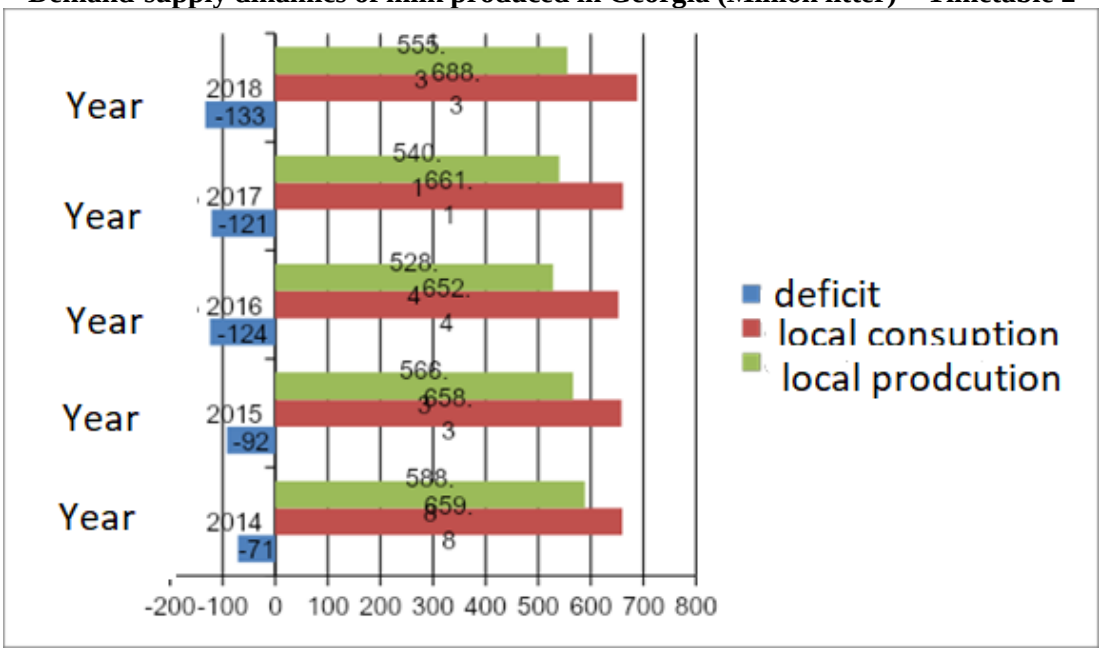
Milk production in 2014-2019 YY (Bilion Litter) – Timetable 1



Source: Geostat 2019

Milk demand - supply dynamics in Georgia is shown in table below:

Demand-supply dinamics of milk produced in Georgia (Million litter) – Timetable 2



Source: Geostat 2019

As we can see from table given above, production of milk and other dairy products in Georgia is reducing, therefore, country substitute with imported products to balance supply-demand positions. Below, in the timetable is give data about imported milk and dairy product to Georgia, with relevant year.

Imported milk and diary products (Tone) - Timetable 3

Product / Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Milk	909	961	810	1,319	1,380	1,891	2,397	2,682	3,491	4,798
Soar cream	-	-	-	180	218	241	279	340	385	481
Milk powder, skimmed	3,228	3,471	3,652	3,771	4,257	4,979	6,227	8,334	9,957	8,292
Milk powder, with fat	502	406	389	389	326	257	329	125	414	295
Condensed milk	2,799	1,973	1,969	1,974	1,845	2,054	2,238	2,160	2,187	2,254
Yogurt	155	381	561	812	1,422	1,812	2,352	2,265	2,965	3,346
Kefir	1,040	1,106	948	1,065	1,273	1,300	1,162	1,395	1,454	1,884
Milk whey	536	530	735	754	1,050	1,010	678	967	824	518
Butter	2,041	1,680	1,452	1,852	2,204	2,387	3,264	4,763	4,057	4,694
Cheese	490	782	882	1,079	1,456	1,651	1,907	2,091	2,560	2,740

Source: Trademap, 2019

Amount of exported and re-exported milk and dairy products from Georgia is very little. 42 tone cheese was exported or re-exported from Georgia, in 2018 according to ''Geostat'' data.

From timetable 3 – can be seen that most imported dairy product is – **Milk Powder** – which is consumpted by big factories to produce reconstitute a) milk, b) cottage cheese, c) soar cream, d) Yogurt and e) most importantly cheese. Part of the medium and small factories as wel are using milk powder to produce cheese. It should be admitted that cheese produced from milk powder (reconstitute milk) has low taste features, which is easy to detect for local consumers.

According to ''Geostat'' data, in 2020 Georgia has 3,716,900 residents. With same ''Geostat'' data in medium, 1 person consumes 12.4 kg cheese, yerly. Respectively, all Georgian residents, consume 46,089 tone cheese, yearly. If we add to this, the amount of cheesee counsumpted by tourists and visitors in Georgia (According to Georgian national tourism administration data – in 2019 country has around 9,457,964 visitors), we can truly say, that total consumption of cheese is 50,000 tone, yearly.

3 kind of cheese is monstly consumed, according to local market: a) Imeruli, b) Sulguni and 3) ''Georgian cheese''. These 3 species are holding around 85-90 % of consumption rate. The main types of imported cheese are a) hard types of cheese (Gauda, Parmesan, Cheddar) and b) soft types of cheese (Mozzarella, Brinza and Feta).

Local Beef (Meat) production is unable ensure domestic demand and consumption. Timetable given below, is giving data about beef import-export rate, within several year timeline.

Local production of beef and import (Thousand Tone) - Timetable 4

Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Local production	54.3	56.4	49.3	42.6	48.4	59.3	66.7	66.1	66.2	72.6	69.5
Import	61.9	61.9	71.3	77.5	75.3	78.8	71.9	84.3	84.7	82.7	89.6

Source: Geostat 2019

As we can see, from above timetable, unlike milk and dariy products, local beef production has incresead with little progeress. As well, beef import rate has been increased.

Beef export (thousand tone)- Timetable 5

Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Export	0.2	0.7	1.2	0.8	0.7	1.1	0.5	13.0	10.5	16.7	10.4

Source: Geostat 2019

Per captia of beef consumption by years - Timetable 6

Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Kg. per year	30	31	32	32	33	37	37	37	37	37	40
Self-sufficiency ratio,%	47	48	41	36	39	43	48	48	47	52	47

Source: Geostat 2019

As we see in timetable above, beef (meat) import has been incresead mainly for 2 reasons: a) Meat consumption per capita has been incresead during last years in Georgia and b) Meat export has been rised significantly in other counties as well, in last years. Export countries mainly are Azerbaijan, Armenia, Iran, Iraq, Lebanon, Saudi Arabia, Syria, Turkey, Egypt. The resulted trade deficit in the local markets is filling with imported products. Meat importer countries mainly are Argentina, Brazil, Estonia, France, Germany, Greece, Luxembourg, Netherlands, Russia, Spain, Ukraine, United States of America, and Uruguay.

3.1.3. Current situation in livestock sector in Khulo Municipality

Khulo municipality is one of the leading entity in livestock sector development in Ajara A/R.

General structure of livestock in Khulo municipality

Local breed of cattle is common in upper Ajara region, which is small in shape (200-250 KG) and has small volatility (1100-1200 Liter per year). It must be mentioned that part of the farmes have imported, (Mainly from Samtskhe-Javakheti) relatively big size cattle (400-450 KG), which are more productive and have 1400 Litte volatility per year. Improper nutrition standards and low breed quality are main reason of small productivity of local cattle. Cowbarns are as well serious problem. Cattle farmes mainly have 3-5 cows, but as well there are small contingent of farmes who owns 15-20 cows. Dairy direction is followed by most of the farmes and male calves are sold right after they are not in need of milk. There is small category of farmes who are preserving male calves for feeding in shape. These farmers are following to both category (Dairy and Beef), but more accent is put to develop dairy direction. During our visit in the region, we did not find single farmer who is following purely to beef direction. Cattle farmes mostly are oriented to produce more milk during summer period, most of the calves are born during springtime, when grass is already growing, and cattle does not need any winter nutrition. Therefore, pick of dairy production is from June till late fall. During winter and yearly spring, production of raw milk is reducing but on the other hand price is going higher, and 1 liter of milk costs from 1.20 to 1.3 GEL.

Cattle farmers, according to long period nomad tradion, from end of the May (Sometimes from beginning of June), with families and cattle, are migrating to sub-alpine pasture lands, where they are staying around 4-5 months till end of the October. Bulls, Cows, and calves which were not sold are migrating to sul-alpine pasture lands. Average weight gain of calves in natural pastures are 150-300 gram per day. After returning sub-alpine pasture, cattle on feeder nutritions.

Nutrition Problems

Improper and unbalanced nutrition process is a reason of low productivity of cattle. After meetings with a local cattle farmer had found out that, calves after are born are not getting colostrum. Colostrum is either wasting or eaten by other domestic animals. Colostrum have many useful substances, which is helping to newborn calf to strengthen immune system and its further positive development.

Most of the farmers are feeding calves with non-standard method, which means, that calf is feeding when cow is already milked. The most fatty fraction of milk is left at those time, which is causing diarrhea and weakening health of calf. Calf is losing weight and is developing slowly. With non-standart (Non-balance) feeding sustym it is uknown, how much amount of milk calf is getting – less, normal of excessive amount. Within this practice, calves are feeding wrongly from the beginning, which is causing its wrong development.

Most of the hay and straw are imported from eastern Georgia (Mainly from Samtskhe-Javakheti) by local farmers, which makes significantly expensive to keep cattle. Most of the farmers are giving less ration to the cattle to reduce costs during the wintertime. As well, above was mentioned that, farmers are feeding calfs wrongly from the beginning.

Problems with cattle barns

As was mentioned above, cattle barns are having serious problems. we monitored barns, within field research, but situation is more less same. Cattle barns are low-ceilinged buildings, with not a proper ventilation system, where cows are lacking fresh air.

According to local farmers, cattle manure is disposing from the barns 2-3 times per day, which can be considered as a true information. There is no strong urine smell in the barns, but on the other hand luck of fresh air is noticeable. Barn buildings are hugged with a small window, which mainly is closed.

There is no modern cattle farm in the region, which have been builed according to the standards, within high-ceiling, manure transport system and effective mechanics of feeding.

Breed composition of cattle

Local bread cattle are common for the region, with small shape and volatility. Part of the farmers in Khulo municipality have importend cattle, mainly from Samtskhe-Javakheti. Those cattle are relatively big in shape and are carrieng gens of ''Caucasian Tsabla'' and ''Brown Schwitz'' spicies.

75 head of ''Jersey'' breed cow had imported from Danish kingdom by agriculture ministry of Ajara A/R in 2015 to develop cattle field in frame of the program "to promote the provision of high-productive dairy cattle to farmers and agri-entrepreneurs". Cattle were transferred to local farmers according to co-finanicig system (80% Government, 20% farmer). Total price of each cow was 6,665 GEL, within 1333 GEL was co-finanicing by farmer and another amount was governmetal input. A few dozen pure blood ''Jersey'' breed cattle have been brought in Khulo municipality by above mentioned program. On the other hand must be admitted that ''Jersey'' breed cattle hardly are getting used conditions of Khulo municipality and it is not best option for the region, overally due to weak hooves, are less durable relatively with other breed (Brown Schwitz, Aberdeen Angus, Simental), are less accustomed to walk long distances, cold and hard conditions. It is worth to mention that certain part of imported cattle due to improper care and intolerance to local conditions had been died.

During the interview's farmers admitted that average weight of newborn calf is 20 KG, which is quite small indicator. Main reason is connected to low quality of local cattle genetical characteristic

Problems concerning to producing of cattle feed

Serious shortage of arable land is in the municipality but on the other hand despite the shortage, can be found lots of plots, which can be used to produce cattle feed. On the other hand, most of these plots are currently covered with weed grass (mainly with fern) and is not used by local farmers. As already mentioned above, most part of the winter nutrition (hay and straw) is imported from other region by local farmers. It is possible to organize local efficient food production for cattle if all available resources will be managed effectively. Therefore, cost of the feeding of cattles by local farmer will be reduce, siginicantly. Another serious promlematic issue is that in order to get more grass from the forest meadows, local farmers are draining spring water from the nearhood area. This method of watering is really increasing the amount of grass, but on the other hand contributes to the development of landslide processes. Unfortunately, most of the farmers do not use effective crops such as are alfalfa and sainfoin. Local farmers can get 3-4 times more hay with using of drip or rain irrigation system (which do not cause landslide processes), which has a much higher nutrition value than grass.

The current situation in the field of cattle breeding and breeding renewal in Khulo municipality

Curently, maily natural insemination practice is common in Khulo municipality. The bull with a good exterior will be selected, whose genetic data is often unknown to use for natural insemination of cows. This method is less effective due to uknown genetic potential of the bull, at the same time usage of one bull to fertilize several cows contributes to the spread of certain disease. Artificial insemination services are available in Adjara A/R and most importantly in Khulo municipality. LTD ''Caucasus Genetics'', through 3 partners, (Agri-service center, LTD ''Shervasi'' and IE Davit Solomonidze) provides high-yielding breed sperm and artificial insemination services for local farmers. 3 local artificial insemination specialists are working in Khulo municipality (Revaz Bokvadze, Jemal Mgeladze and Kakha Abuladze), who purchase sperm from LTD ''Caucasus Genetics''.

Since 2012, joint project of the Ministry of Agriculture of Ajara and UNDP has been operating in Ajara, which subsidies artificial insemination services to local farmers. In details, 30 GEL (50 %) is paid by program and other 30 GEL (50 %) is paid by farmer in lower parts of Ajara to cover fertilization fee. But for upper Ajara, 10 GEL is paid by farmer and other is covered by program. During the interviews with artificial insemination specialists have revealed that local small cows maily are fertilized with ''Jersey'' sperm, while for larger one are used ''Brown Schwitz'' and in some cases ''Simental'' sperm. ''Aberdeen Angus'' sperm can be used during artificial insemination in some cases. Before artificial insemination blood analysis is not done for cows and only cattle are inspected and palpated. According to the available statistics, only 70-80% of cows are gestates after first fertilization. 50 % of infertile cattle are getting gestates after second fertilization. According to artificial insemination specialists, local farmers do not have information about cattle breeding and they fully trust the advice of artificial insemination specialists on what breed of sperm to use to fertilize cows. Therefore, for local farmers advice of artificial insemination specialist is very important and needed. It should be admitted that local artificial insemination specialists have incomplete information about breeding characteristics of the cattle and necessary advantages. For example, local specialists advise owners of small cows to use ''Jersey'' sperm. The main argument is that the "Jersey" calf is small in size, which does not cause complications during calving process. However, it should be noted that the calf of "Aberdeen Angus" weighs an average of 20 kg at birth, has a small head, which ensures trouble-free calving in small cows. "Aberdeen Angus" is a beed breed, it grows quite well in weight and also have the average 2000 liter milk per year, which is quiete good result for upper Ajara. Despite of above mentioned still, preference is given to the "Jersey" breed, which is not well adapted to the conditions of Khulo municipality.

Veterinary services in the region

Currently, 6 veterinarians are working in Khulo municipality. Well equipped veterinary clinic is functioning with an appropriate laboratory in borough Khulo. The clinic has an operating room. As well, vet pharmacy is operating in the same building. The clinic has as well special mobile assistance vehicle (hotline number 144), which can go on call, diagnose cattle on the spot and perform simple manipulations. The construction and equipment of the clinic was funded by the Austrian Development Agency.

Diseases such as ''Foot and Mouth Disease (FMD)'', ''brucellosis'', ''tuberculosis'', ''emcar'', ''pasteurellosis'' and other parasitic diseases are still found in Khulo municipality. It should be mentioned that the Ministry of Agriculture of Adjara through the "Agroservice Center" carries out prophylactic vaccinations against tuberculosis and brucellosis, and as a result of which the number of these diseases has been sharply reduced to a minimum. As well, it is worth to mentioned that local farmers, unlike of other regions of Georgia,

rarely cleaning cattle to protect them from external parasites, which negatively affects to health. This fact is directly related to the low awareness of local farmers.

Comparative economic analysis of dairy and beef directions

Local cattle consume an average of 2,280 KG of hay (114 piece per 20 KG of bale) during the winter, in Khulo municipality, according to current practice. The average cost of home-made hay is 1.65 GEL and at least 4 GEL costs 1 bale of hay in case purchase. The table below shows the average amount of milk received from a local breed of cow and the income received from the sale of milk:

Month	Days	Daily produced milk	Amount of milk each month	Milk consumed by calf	Milk for sale	Average price of milk	Received income
I	31	0	0		0	1.2	0
II	28 (10)	0	0		0	1.2	0
III	31	3	93	93	0	1.2	0
IV	30	4	120	120	0	1	0
V	31	4	124	62	62	0.9	55.8
VI	30	6	180		180	0.8	144
VII	31	8	248		248	0.75	186
VIII	31	5	155		155	0.75	116.25
IX	30	2	60		60	0.8	48
X	31	1	31		31	0.9	27.9
XI	30				0	1	0
XII	31				0	1.2	0
Total:			1011		736		577.95

During winter, for around 150 days is necessary additional nutrition (Bran, ground corn, barley, beets, potatoes, etc.). Daily cost of complementary radion within own production is about 0.8 GEL and 1.2 GEL after purchasing. According to that information, annual cost of complementary ration by own production is 120 GEL, while 180 GEL with pruchsing. The table below shows the average income from a local breed of cow:

Revenue		
Sales of milk	578	
Sales of calf	350	
Total income:	928	
Expenses	Own production	Purcused
Cost of hay	188	455
Medications and treatment	50	50
Suplementary nutritions	120	180
Total expenses	238	685
Net Profit:	690	243

Below in table is swown similar calculations for 400-450 kg cows. Larger cows consume an average of 3,000 kg of hay (150 pieces per 20 kg of bale) during the winter. The average cost of home-made hay is 1.65 GEL and at least 4 GEL costs 1 bale of hay in case purchase. Besides that, during winter, for around 150 days is necessary additional nutrition (Bran, ground corn, barley, beets, potatoes, etc.). Daily cost of complementary radion within own production is about 0.8 GEL and 1.2 GEL after purchasing. According to that information, annual cost of complementary ration by own production is 180 GEL, while 230 GEL with pruchsing. The table below shows the income from the sale of milk from 400-450 kg cows:

Month	Days	Daily produced milk	Amount of milk each month	Milk consumed by calf	Milk for sale	Average price of milk	Received income
I	31	0	0		0	1.2	0
II	28 (10)	0	0		0	1.2	0
III	31	4	120	93	27	1.2	32.4
IV	30	5	155	120	35	1	35
V	31	7	210	62	148	0.9	133.2
VI	30	10	310		310	0.8	248
VII	31	6	186		186	0.75	139.5
VIII	31	4	120		120	0.75	90
IX	30	3	93		93	0.8	74.4
X	31	3	90		90	0.9	81
XI	30	2	62		62	1	62
XII	31	1	31		31	1.2	37.2
Total:			1346		1071		932.7

The table below shows the average income from a 400-450 kg cow:

Revenue		
Sales of Milk	933	
Sales of Calf	350	
Total revenue:	1,283	
Expences	Own production	Purchase
Cost of hay	248	600
Medications and treatment	50	50
Suplementary nutritions	180	230
Total expenses	478	880
Net profit:	805	403

As can be seen from the above calculations, having large cattle is more profitable than having a small local breed of cow.

As a result of the research, there is not modern intensive dairy or specialized beef farm in Khulo municipality.

Below is shown a comparative economic analysis of intensive dairy and beef farm operation.

Dairy Farm

Construction and equippment of dairy farm with minimum standarts for 30 head of cow and purchasing 30 cows (400-450 KG) costs 299.010 GEL

Name	Price (GEL)
Tractor 40 h. p	36,000
Building	90,000
Cows	45,000
Machines	128,010
Total	299,010

Below is shown list of required machinery and equipment with price:

Machines:	Quantity	Total cost (GEL)
Milking machine	4	9,000
Manure output system	1	49,500
Ventilation System	2	11,220
Internal arrangement of the farm (dividers, barriers)	30	9,900
Automatic waterer	2	5,610
Veterinary hooves machine	1	11,550
Automatic cow brushes	1	9,900
Transportation, Instalation		21,330
Total		**128,010**

Below in the table is shown direct costs and profits associated with keeping 1 cow:

Income	
Sales of Milk	933
Sales of Calf	350
Total revenue:	1,283
Expenses:	Own production:
Cost of hay	248
Medications and treatment	50
Suplementary nutritions	180
Milker (Employee 1)	400
Barn maid (Employee 2)	400
Total expenses:	1,278

The following costs are related to the operation of the farm:

Monthly salary for management and administration

Postition	Staff unit	Montly Salary	Total salary (GEL)
Farm manager	1	300	300
Accountant	1	150	150
Total:	**2**		**450**

Monthly fixed cost

Type of expense	Monthly Cost (GEL)
Telecomunication	50
Repair works	70
Business trip	80
Unforeseen expenses	50
Transportation	90
Total:	**340**

After considering costs mentioned above, the farm's 3-year profit-loss statement will be as follows:

3-year of profit-loss statement

Year	I	II	III
Realization			
Milk	27,990	27,990	27,990
Calf	10,500	10,500	10,500
Total realization:	38,490	38,490	38,490
Direct costs			
Milk	38,340	38,340	38,340
Total direct costs	38,340	38,340	38,340
Fixed costs:			
Farm Manager	3,600	3,600	3,600
Accountant	1,800	1,800	1,800
Telecomunication	600	600	600
Repair works	840	840	840
Bussiness trip	960	960	960
Unforeseen expenses	600	600	600
Transportation costs	1,080	1,080	1,080
Total fixed cotsts:	7,800	7,800	7,800
Depreciation	28,120	27,252	26,412
Net profit:	**(35,770)**	**(34,902)**	**(34,062)**

As can be seen from the calculations above, the construction of a new farm is unprofitable, which will have 400-450 kg cows.

Beef Farm

Managing of beef farm is much easier compared to a dairy farm. Firstly, beef farm needs much simpler type of building, which is considirebly cheaper. As well, it does not require to have expensive manure output system and milking equipments. It is worth to mentiond, that till -15-degree Celsius temprerature do not require any barn and cattle can be kept outdoors. In the table belo, is shown absolute minimum temperatures recorded for the last 10 years in Khulo municipality.

Absolute minimum air temperature °C

Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Air temperature	-10,2	-8,8	-12.8	-10,3	-9,8	-10,4	-14,3	-12,6	-5,4	-7,6

Accordingly, it is advisable to arrange a simple type of cattle barn, which is much cheaper than dairy farms, in Khulo municipality. In the table below is shown estimate expenses of barn for 30 head of cow.

Estimate expenses of barn for 30 beef cattle

#	Name of expense	Unit	Quantity	Unit cost (GEL)	Total cost (GEL)
1	To dig pits for foundation (Dotted) 15 Pit x 0,125 C³ = 1,875 C³.	Pit	15	15	225.00
2	Metal plate sewn into the foundation, Size: 200x200 x 6 MM	Piece	15	5	75.00
3	Square tube columns 15 P. 15G/M. Size: 100x100x2 MM.	Meter	48	23	1,104.00
4	Fastening belt, Square tube, Size: 100x100x2 MM.	Meter	75	23	1,725.00
5	Diagonal roof rafters, Square tube, Size: 100 x 50 x 2 MM.	Meter	60	17	1,020.00
6	Bound diagonals of outercolumns, Square tube, Size 100x50 x 2 MM.	Meter	29	17	493.00
7	Roof - Profiled painted tin - Width: 1140 MM, Length 2100 ðð	Piece	80	18	1,440.00
8	Covering 3 sides of building with profiled painted tin - Wildth: 1140 MM, Lenght 2100 MM	Piece	40	18	720.00
9	Electrode	Package	5	17	85.00
10	Cement	Bag	15	15	225.00
11	Sand	Cubic Meter	1.5	45	67.50
12	Workforce	Person/Day	25	30	750.00

13	Fencing materials: fence palling	Piece	28	15	420.00
14	Self-cutting syrups	Piece	1000	0.07	70.00
15	Tail grinder stone	Piece	10	5	50.00
16	Fencing materials: barbed wire	Package 250 M	1	50	50.00
17	Electric cable 4 mm.	Meter	400	3.5	1,400.00
18	Water pipe, 3/4 diameter	Meter	400	1.5	600.00
19	Thermal insulation of water pipe	Meter	400	1	400.00
20	Excavation of the canal, 400 meters	Person/Day	5	25	125.00
21	To pack pipes and ground it.	Person/Day	5	25	125.00
22	Power meter	Piece	1	50	50.00
23	Water mater	Piece	1	35	35.00
24	Wire 2.5 mm.	Meter	40	1.2	48.00
25	Switches	Piece	4	15	60.00
26	Electrician	Person/Day	1	30	30.00
27	Waterer	Piece	30	10	300.00
28	Unforseen expenses				500.00
	Total				**12,192.50**

Below is given the price of 40 kg calf within the direct cost, related to 9 month calf fattening cycle. According to the local practice, 3-month-old calf weighs about 40 kilograms and price is 240 GEL. Calves are bought during late of May to use summer pastures as maximum as possible. During 180-day calf will be in the highland pasture and will gain 60 kg, totally. For next 3 month (90 Days) will be used fodder feeding. Below is given costs associated with for one 3-month-old calf feeding cycle:

Direct costs associated with a 3-month fodder feeding cycle.

Expenses:				
Hay	Kg	1,800	0.10	180
Suplementary nutrition	Kg	225	0.35	79
Medications and treatment				120
Barn maid	Person			50
Total expenses:	-			429

The daily ration of the fodder feeding cycle consists of 20 kg of hay and 2.5 kg of grains. This ration does not include premixes, which ensures high quality meat. Within using this ration, the daily weight gain of cattle is 850 grams. Therefore, after end of the 90-day fattening cycle each calf will gain 76.5 kg and will become 176.5 kg. 7 GEL per kilo is price of live cattle weight according to local market, therefore from saling, income will be 1,236 GEL from each calf.

Below is given the 3-year profit-loss statement of the above mentioned business model:

Year	I	II	III
Realization:			
Calf	37,065	37,065	37,065
Total realization:	37,065	37,065	37,065

Direct costs:			
Calf (40 Kg)	7,200	7,200	7,200
Hay	5,400	5,400	5,400
Suplementary nutrition	2,363	2,363	2,363
Medications and treatment	7,200	7,200	7,200
Barn maid	1,500	1,500	1,500
Total direct expenses:	23,663	23,663	23,663
Fixed costs:			
Farm manager	3,600	3,600	3,600
Telecomunication	600	600	600
Repeair work	840	840	840
Bussiness trip	960	960	960
Transportation of sawdust	200	200	200
Unforseen expenses	200	200	200
ъTransportation expenses	1,080	1,080	1,080
Total fixed expenses:	7,480	7,480	7,480
Depreciation	452	433	415
Net income:	5,470	5,490	5,508

As can be seen calculations from the above table, this bussiness direction is profitable. It must consider that, how larger the farm is, farmer will receive more income. It is very important ‘’to use a large-scale economy model’’, in this type of business. The potential of natural pasture must be used as long as it is possible. To use rotating grazing system and improve cenosis to the existing grassland with effective grass varieties is very important. In addition, it is important to obtain genetically improved beef breeds by artificial insemination, because they have slightly more weightgain than local breeds.

Current situation in environmental protection and sustainable livestock issues

Georgian government introduced regulations that required the slaughter of cattle only in certified slaughterhouses after 2007 year. On the other hand, since 2018 change has been made in the relevant regulatory acts and in highland zones (including upper Ajara) is possible to slaughet cattle at home conditions. This changed regulation is negatively affects the ecological conditions as farmers often violate the slaughter procedures and are not properly disposing waste generated after slaughter of cattle. The simplest and most effective way to solve this problem is to re-enact the existing regulation, which will make mandatory to slaughter cattle in certified slaughetrhouses.

Proper and efficient management of livestock waste is also a problem. Awareness of local farmers is low in most cases that manure, urine, and substrate (straw, hay, sawdust) is a best organizic fertilizer after providing a proper recycling. It can be used either in own farm or can be sold, which can become an additional source of income for farmers. Farmers mostly use natural burning method. Complete combustion of manure requires 1 year, on the other hand usage of this method releases large amounts of methane into the atmospehere, which has a negative impact on climate change. 45 day needs manure to burn comlepetely, after using biogas plant. It is releasing gas (methane) which can be collected and to use for household purposes.

Recommendations:

Firstly, it is necessary to raise awareness of local farmers and introduce sustainable development models in Khulo municipality, to develop livestock sector.

The main problem related to sustainable livestock is proper nutrition of cattle, because the purchased feed is expensive and farmers trying to feed cattle with a reduced ration. Therefore, some incentives should be given to local food production for cattle.

- ✓ Despite of shortage of arable land in the municipality, it is possible to introduce an effective land management system. Firstly, it is necessary to clean the plots covered with fern. After to sow alfalfa and sainfoin there.
- ✓ It is necessary to stimulate the production of silage, specifically, to introduce appropriate baler techincs and packing machines in the municipality.
- ✓ It is necessary to stimulate the production of fodder beet, which will significantly improve the nutrition of cattle.
- ✓ Electric shepherd system must be introduced for better grazing process to improve current mismanagement of existing pastures. In this regard, to organize appropriate pilot projects is expedient.
- ✓ It is necessary to organize pilot projects to sown natural pastures and mowings.
- ✓ Local farmers do not have information about usage of artificial insemination to breed properly and they fully trust the recommendation of specialists. Unfortunately, some specialists do not have proper information, as well. Therefore, it is necessary that local specialists must be provided with relevant training in artificial insemination to receive complete information about suitable breeding for the Khulo municipality.
- ✓ To arrange pilot projects of biogas plants with leading livestock farmers is expedient. It is necessary to work with banks and other financial institutions to create relevant banking product to finance rural biogas systems.