



GOAT FARM FEASIBILITY STUDY

Sustainable Business and Inclusive Markets

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Economics of Goat Farming, Subsidies for Goat Sector, Loans, SWOT Analyses, Market of Goat Products, Financial Model, Pricing List and Total Entry Costs for Goat Industry, Goat Breeds, Technology of Goat Farming, Feeding of Goats, Reproduction, Lactation, Goat products, Concept of The Projects

Contents

1. INTRODUCTION	4
1.1. Purpose of the study.....	5
2. EXECUTIVE SUMMARY	6
3. ECONOMICS OF GOAT FARMING WITH ORIENTATION ON MILK PRODUCTION	8
4. SUBSIDIES AND PREMIUMS FOR GOAT FARMING IN BiH	10
4.1. Subsidies in Federation of Bosnia and Herzegovina.....	10
4.2. Subsidies in Republika Srpska	11
5. FINANCIAL MARKET IN BIH AND LOANS FOR AGRICULTURE	13
5.1. Financial market of Federation of Bosnia and Herzegovina	13
5.1.1. Loans for agriculture production.....	13
5.1.2. Loans for employment from Federal Agency for Employment.....	13
5.2. Financial market of Republika Srpska	13
5.2.1. Financing of micro business in agriculture.....	13
5.2.2. Loans for agriculture.....	14
GOAT SECTOR SWOT ANALYSES IN BiH	15
6. CURRENT SITUATION WITHIN GOAT SECTOR IN BIH	16
7. GOAT MARKET	19
7.1. Market of live animals.....	19
7.2. Goat meat market.....	20
7.3. Goat milk market	21
7.3.1. Processors' interest in goat milk	22
7.4. Cheese production.....	23
8. FINANCIAL MODEL.....	26
8.1. Basic model	26
8.2. Model that could be applied in BiH	32
8.3. Development of the model	32
8.3.1. First year.....	32
8.3.2. Second year	34
8.3.3. Third year	35
8.3.4. Fourth year.....	36
9. PRICING LIST, AVAILABILITY OF INPUTS, TOTAL ENTRY COSTS FOR GOAT DAIRY INDUSTRY....	38
10. CONCLUSIONS	40
11. RECOMMENDATION	41

BACKGROUND.....	42
13. GOAT BREEDS.....	43
13.1. Balkan Goat.....	43
13.2. Alpine Goat	43
13.3. Saanen goats	43
13.4. Toggenburg goat	43
13.5. Boer (meat production)	43
14. TECHNOLOGY OF GOAT FARMING	45
14.1. Location for goat farms	45
14.2. Design of farms	45
14.3. Housing.....	45
14.4. Flooring	46
14.7. Light.....	47
14.8. Construction material for goat barns.....	47
15. FEEDING GOATS	48
15.1. Feed for goats	48
15.1.1. Pasture and browse	48
15.1.2. Hay.....	48
15.1.3. Silage and haylage	49
15.1.4. Concentrates (grains).....	49
15.2. Vitamins and minerals	50
15.3. Water.....	50
16. FEEDING VARIOUS CATEGORIES OF ANIMALS.....	51
16.1. Feeding does	51
16.1.1. Dry period	51
16.1.2. Lactation.....	52
16.2. Feeding bucks.....	52
16.3. Feeding kids	53
17. REPRODUCTION OF GOATS	54
17.1. Age to Breed Does	54
17.2. Signs of Estrus	54
17.3. Gestation Period	54
18. LACTACION (MILK PRODUCTION)	55
19. GOAT’S MILK	56

19.1.	Appearance and Flavor	56
19.2.	About goat milk	56
19.3.	Therapeutic properties of goat milk	57
19.4.	Whey	57
20.	MEAT	59
20.1.	Production of goat meat.....	59
21.	VERMICOMPOST	61
22.	DESIGN OF THE PROJECT	62
22.1.	Location	62
22.2.	Concept	62
22.3.	Resources	63
22.4.	Selection of beneficiaries	64
22.5.	Stakeholders	65
22.6.	Environmental and Social Aspect	65
22.7.	Employment and genders issues	65
ANNEXES.....		67
ANNEX 1.	LIST OF INTERVIEWED PROCESSORS	67
ANNEX 2.	Possible feeding rations for different production levels.....	68
ANNEX 3.	LIST OF CONTACTS	69
ANNEX 4.	PICTURES	71

1. INTRODUCTION

Goat farming as serious business venture and the sector which can generate a significant number of working posts and income for poor rural population is almost forgotten in BiH.

Statistical data from the Austrian records show that in 1895 in Bosnia and Herzegovina goat population was 1 447 049 heads while this population was only 95 000 goats in 1991. In addition to the social and economic factors that influenced decline in goat number, the main reason for the practical elimination of goat breeding from livestock practices in the country was ban on goat keeping on open pastures imposed in the mid 50' of the last century. According to the official records this resulted in decline from 1,8 million of goats to 218 thousands in the first couple of years afterwards.

In the past, there were no significant efforts to improve goat breeding. The original Balkan goat has survived, perhaps with some influence of the imported Saanen, Togenburg and Alpine breeds. This breed can be found in the southeastern parts of country.

Bosnia and Herzegovina have many preconditions for the development of goat industry. Nevertheless, many preconditions are missing or still need to be created if this is to happen.

Some of the constrains for development of goat industry are similar to the constrains in other agriculture sectors such as inadequate technologies, low productivity, lack of extension support etc. However, there are aggravating factors which are related to goat production only. One of them, if not the biggest, is too small goat population.

These days it is not possible to find accurate records on size of goat population in BiH but some realistic estimates indicate that it is between 30 000 and 40 000 goat with the Balkan goat dominating over 97%. This small population and in particular nonexistence of stud farms with more productive breeds impedes establishment of commercial farms and growth of the sector.

This study lists the biggest constrains within the sector, present current situation, overview trends and movements in the local and the regional markets and their reflection on situation in BiH. It also includes overview of subsidies available to producers within the sector and financial benefits that can be realized through Governments' programs for agriculture. It will, using experience of successful goat farms located in all parts of BiH present financial benefits and employment opportunities which this sector can offer. For this purpose, a financial model simulating various scenarios is used.

Information for this study is collected through meeting, interviews and visits to farms in the country. Some of the farms have organized milk processing on the farms and have developed particular marketing strategies. Some of the farms exist for over 10 years, some were founded recently and are still developing. Their experiences and testimonies were priceless. Some of the visited farmers are planning to enter into goat business and their views were considered too.

Experience of entrepreneurs who invested significant resources in goat business which are in different phases of development, from planning stages to developed business entities with defined profile in the market, gave an immense contribution to this study.

Representatives of municipal and cantonal authorities in charge of agro business were interviewed. Staff from Agriculture Institutes and Agencies was consulted and there is a great interest to contribute to revival of goat sector from technical point of view.

Interviews with representatives of over 20 milk processors in BiH were conducted in order to obtain information on market trends and estimate their interest in linking with goat sector.

Also, contacts were made with some processors in the region specialized in goat milk processing and which are exporting their products to EU market. They confirmed that goat industry has its specific place in the market with potential to grow.

1.1. Purpose of the study

This study is an informative document which may help in designing potential projects aimed at development of the sector and ultimately poverty reduction in rural areas. Bosnia and Herzegovina, with all its natural resources can feed themselves and, with some preconditions which are quite achievable, can offer good export products. Goat products are amongst them.

The key driver and initiator of this study in broader terms is revitalization of the local economy, facilitating sustainable economic growth, via the creation of the employment opportunities and making better use of available physical and human resources.

The specific objectives are two-fold:

- Inclusive market projects implemented, by supporting the set-up of goat farms within the rural areas which have been identified as seriously underdeveloped and in need of assistance.
- To link those and the existing farmers to the potential market channels and sales opportunities
- Creation of employment opportunities for poor within the value chains, especially returnees and those living in poorest regions

Wider objectives are:

- Identifying BiH regions ideal for set-up of goat farming opportunities
- Improvement of goat farm productivity, and
- Improvement of services to support the goat sub-sector.

2. EXECUTIVE SUMMARY

Bosnia and Herzegovina, with some 2 million hectares of agriculture land out of which 40% is arable, moderate climate suitable for production of cheap and good quality fodder, high unemployment rate, developed processing sector, trends which show signs of growing demand for goat products, favorable subsidy programs, has many precondition for goat industry to become a sector which can offer significant number of working posts in rural areas and become sustainable source of income for rural population.

Although an average goat herd in BiH is small and not suitable for commercial production due to low performance of domestic breed, a certain number of commercial farms emerged in the last couple of years. Their herds are made of dairy breeds and their cross breeds with domestic goat. Trend to process milk on the farms is recognized amongst these farmers. They rely on direct market sales of their products and they develop their own sales networks. Prices of their products such as raw milk, pasteurized milk, whey, cheese are relatively high and make them operate well over profit margins.

In addition, several significant investments in the goat sector such as establishment of stud farms and dairy processing capacities for goat milk only, were announced. This indicates interest of entrepreneurs for the sector and shows its potential.

Universities, Agriculture Institutes and Agencies are also showing interest in development of the sector. There are plans to open 2 educational centers on 2 farms for both university students and farmers. If this comes through this would be a great boost to the sector and the farmers who are planning to enter in to this business.

Goat milk and its products are known for its properties regarding the health benefits. They are easy digestible food with a high nutritional value and curative properties. They are used as food, for prevention and treatment. Their consumption improves immunity, resistance to diseases, provides faster growth, optimal body weight, better bone mineralization etc. There have been numerous researches indicating that goat milk has *anticancerogenic* properties. On the other side goat meat is low fat meat, easy digestible, good tasting and presents alternative to chicken or fish, suitable for those who care about their diet.

Goat milk is a unique production *niche* with potential to growth which is not competing with cattle dairy sector. Goat products, with certain preconditions created, such as standardized quality, guaranteed food safety, continuity in delivery, branding, attractive packaging, etc., have export potential.

Goats have importance in environment protection. They are meant to be browsers and then grazers and therefore can be used in controlling of annoying vegetation, elimination of brush that feeds fires, and restore pasture quality.

Small goat population in BiH has been identified as main impediment to the growth of goat sector. On the other side goat population in BiH is dominated by the Balkan breed which under current situation and very small portion of dairy breeds cannot provide sustainable growth needed for the sector and its commercialization. The only solution is import of animals and improvements of domestic population by crossing with the more productive breeds.

Extension support to the sector is weak and responsible institutions do little in this regard. It results in inadequate technology and mistakes which can be seen even in the farms where significant investments in facilities and equipment is undertaken. This is related to production of poor quality fodder, inadequate feeding, herd management techniques, food safety procedures etc.

Despite growing interest of processing sector to collect and process goat milk, current quantities of raw milk are so low that it is not justifiable to organize collection.

3. ECONOMICS OF GOAT FARMING WITH ORIENTATION ON MILK PRODUCTION

Starters who are planning to enter in goat business with orientation on milk production should have several things in minds in order to have sound business operation:

- *Clear vision on production goal,*
- *Necessary knowledge,*
- *Have good management system,*
- *Know market,*
- *Have adequate production level by using all resources in an optimal way and*
- *Have good input output ratio.*

In the process of making decision to start goat farming business it is important to know structure of the investment for this venture:

- *Facilities 40%*
- *Reproductive animals and replacements 25%*
- *Machinery and equipment 30%*
- *Other (forage, feed replacements, medicines) 5%*

The above percentages may vary as they are given in general terms but can serve as guidance in practice. Milk production has a specific cost structure. It depends on system of production, geographical area (altitude, climate, soil etc.) and may vary through longer period on the same farm.

Table 1. Milk cost structure

Type of costs	Variation %
Feed	45-60
Labor	10-20
Services, transport, bedding, other materials	3-5
Depreciation	3-20
Other direct costs	2-6
Other indirect costs	2-8

The highest single cost in milk production is associated with feed. For a farmer who wants to operate above gross margins and to have sound business performance it is an imperative to produce cheap but good quality feed. As a rule, all bulky feed (hay, haylage, silage) and as much concentrated feed as possible should be produced on the farm. As production level raises costs of the forage and its share in production price of milk drops.

The second highest cost is labor. This cost can vary depending on type of organization, equipment used of the farm (milking, manual or mechanical). Most of labor cost is related to milking, feeding,

then manure removal, and other activities. Regardless of the type of production due to specific nature of goat business share of labor will stay high.

Depreciation costs are related to animals, buildings, machinery and equipment.

Every reproductive animal is treated as fixed assets and must repay itself within production life which is on average 5 or 6 lactations. Milk production in goat rises from the 1st until the 3rd lactation and starts to drop after the 6th lactation but not as rapidly as it rises in the beginning of production life (from 1st to 3rd lactation). If production life is short it will burden cost of milk production through higher replacement rate (more animals should be kept for the farm and less for the sales) and lost lactations. Good feeding, adequate housing, appropriate management practices, can expand life span and reduce depreciation costs associated with replacement of reproductive animals. This is very important for good milking animals as lactating goats are sensitive animals and need care. Longer production life will increase number of offsprings from good milkers. Every producer should tend to produce as much offspring as possible especially, from good milking animals in order to have as much 'good genes' as possible in his flock. As a rule, each farmer should provide as much replacements as possible from his own farm. Replacement rate is approximately 15 to 20% which means that 15 to 20 % of older animals are replaced each year with young animals. Old animals are sold in the market for meat.

Building and equipment must provide conditions for a successful production, and equally important, welfare for animals. Milk production is under strong influence of external factors and housing is one of them. Therefore, facilities for accommodation of goats must be functional and provide optimal condition for the stay of animals especially in winter times.

Production of milk particularly on farms with more than a 100 animals requires specialized facilities such as parlor where milking operations are taking place and milk is stored until processing or transportation. Depreciation rate for the buildings is 3-5%.

Mechanization, transportation vehicles, milking machines or milking systems are assets on farms and their depreciation rate ranges from 10-20%.

Other costs related to production are veterinary services and medicines with the share of 1-2%, mechanization services, 3-5%, and other materials and services 1,5%.

Indirect costs burden production with 2-8% but have no direct impact on production results.

4. SUBSIDIES AND PREMIUMS FOR GOAT FARMING IN BiH¹

In both FBiH and RS goat farming and investment in goat business is financially supported by the Ministries of Agriculture.

4.1. Subsidies in Federation of Bosnia and Herzegovina

In Federation of Bosnia and Herzegovina subsidies are divided in several groups:

- *Subsidies for production of goat milk and breeding of animals*
- *Subsidies for capital investments*
- *Subsidies for interest rate*
- *Subsidies for insurance premiums*
- *Subsidies for rural development*
- *Subsidies for certification and production of traditional products*
- *Subsidies for foundation of primary production cooperatives and their development activities*

Production of goat raw milk in FBiH is subsidized by 0,30 KM/l if a producer delivers at least 400 l/month with minimum fat content of 3,2%.

Goat breeders in FBiH are subsidized by 15 KM per reproductive animal if they have at least 25 reproductive goats in a herd.

Investment in goat business in FBiH is co-financed by MoA if a user is financing his/hers activities through loans taken from financial institutions. Co-financed are:

- *construction of stables,*
- *purchase of equipment,*
- *purchase of reproductive animals*
- *purchase of mechanization*
- *cheese production plants with processing capacity of up to 3000 l/day*

Subsidies are paid if minimum amount of investment is 25 000 KM. Share of financial support by MoA in this segment can reach maximum 25% of the total investment while maximum amounts granted per an activity are:

- *up to 100 000 KM construction of stables*
- *up to 100 000 KM for purchase of equipment*
- *up to 80 000 KM for purchase of reproductive animals*
- *up to 100 000 for purchase of mechanization*
- *up to 200 000 KM cheese production plants*

Producers may claim subsidies for interest rate in the amount of 4% annually for loans taken for investment purposes.

¹ The system of subsidies in both entities is subjects to changes each year and is usually adopted in the beginning of each year. At the time of writing of this Study subsidies for 2011 were not adopted yet.

Producers can claim subsidies for insurance of animals and facilities in the amount of up to 50% per premium while the total amount within one year paid to one producer in this regard cannot exceed 30 000 KM.

Within rural development component individual producers can claim:

- *maximum 50 000 KM if they purchase processing equipment and*
- *maximum 100 000 KM if they purchase processing equipment and this activity is a part of harmonized measures of rural development on BiH level.*

Primary producers can claim subsidies for organic certification:

- *up to 1 000 KM for an individual producer*
- *up to 5 000 KM if a group of producers is certified*

Processors can claim subsidies for organic certification in the amount of up to 2 000 KM.

Production of traditional products can be supported in the amount of up to 7 000 KM.

Within harmonized rural development on BiH level maximum subsidy for purchase of new mechanization (tractors, harvesters, attachments, ect.) is 25 000 KM.

Within harmonized rural development on BiH level subsidy for purchase of new processing equipment is up to 25% of the investment while maximum amount is 100 000 KM.

Foundation of primary production cooperatives will be supported in the maximum amount of 5 000 KM.

Cooperatives can claim subsidies if they are planning development activities, maximum 50% of the investment or maximum 100 000 KM.

4.2. Subsidies in Republika Srpska

In Republika Srpska subsidies are divided into several groups:

- *Subsidies for production of milk*
- *Subsidies for capital investments*
- *Subsidies for business activities of primary production cooperatives*
- *Subsidies for foundation of producers' associations and their business activities*
- *Subsidies for cluster foundation and their operations*
- *Subsidies for certification*
- *Subsidies for insurance premiums*
- *Subsidies for business activities in rural areas.*

In Republika Srpska production of goat raw milk in RS is subsidized in the same way as cow or sheep milk:

- *0,22 KM/l for E class*
- *0,20 KM/l for I class*
- *0,18 KM/l for II class*

- 0,14 KM/l for III class
- 0,10 KM/l for IV class

Investment in goat business in RS is co-financed by MoA within rural component. Co-financed are:

- *purchase of mechanization*
- *purchase of equipment including transportation costs and installation*
- *construction and reconstruction of stables including transportation costs, labor costs, infrastructure costs (water, electricity)*

Maximum amount granted for mechanization is 40% of the value per piece and cannot exceed:

- 25 000 KM for a harvester,
- 15 000 KM for a tractor over 50 HP, a roll baler, and a silage trailer,
- 5 000 KM for a tractor less than 50 HP
- 8 000 KM for a maize harvester
- 3000 KM for attachments
- 1500 KM for a tractor trailer
- 2000 KM for a motocultivator

Maximum amount granted for a milking machine is 40% of value of the machine and cannot exceed 1500 KM for a movable machine.

Maximum amount granted for a closed milking system is 40% of value of the system and cannot exceed 100 000 KM for the system.

Amount granted for reconstruction of existing and construction of a new stable is 40 % of the overall investment or maximum 30 000 KM if minimum investment by the producer is 5 000 KM.

Cooperatives will be subsidized for development of their business activities in the amount up to 50% of the investment or maximum 30 000 KM.

Associations will be subsidized for development of business activities in the amount of up to 50% of the investment or maximum 25 000 KM.

Foundation of producers' associations is subsidized by 5 000 KM.

Cluster foundation and their operations are subsidized in the amount up to 50% of the investment or maximum 20 000 KM.

Introduction of food safety standards, and standards of good agriculture practice (GAP) will be subsidized in the amount of up to 50% of the investment or maximum 15 000 KM per a claim.

Producers can claim subsidies for insurance of animals and facilities in the amount of up to 30% per premium while the total amount within one year paid to one producer in this regard cannot exceed 30 000 KM.

Financial support to foundation of micro, small or medium production capacities in rural areas is 50% of the investment or maximum 30 000KM.

5. FINANCIAL MARKET IN BIH AND LOANS FOR AGRICULTURE

5.1. Financial market of Federation of Bosnia and Herzegovina

Most favorable loans for agriculture in Federation of BiH are given by the Development Bank of FBiH. Loans are given directly to consumers without commercial banks as mediators.

5.1.1. Loans for agriculture production

Beneficiaries of these loans are private and legal persons in sector of agriculture.

- *Repayment period up to 10 years.*
- *Grace period different*
- *Interest rate for legal persons is 4,51% for loans up to 100 000 KM and repayment period up to 10 years (charge for processing claim is 1% for legal persons)*
- *Interest rate for private persons is 4,35 % for loans up to 100 000 KM and repayment period up to 10 years (charge for processing claim is 0,75% for private persons)*

5.1.2. Loans for employment from Federal Agency for Employment

Loans for agriculture production

- *Repayment period 7 years.*
- *Grace period up to 24 months*
- *Interest rate for legal persons is 4% for loans up to 100 000 KM and repayment period up to 7 years (charge for processing claim is 1% for legal persons)*
- *Interest rate is 3,28% for private persons for loans up to 100 000 KM and repayment period up to 7 years (charge for processing claim is 0,75% for private persons)*

Collaterals are mortgage on real estate which amount is at least 1,5 time bigger than the value of the taken loan.

Interest rates on loans of commercial banks are higher and range from 8 % to 12%.

5.2. Financial market of Republika Srpska

Most favorable loans for agriculture in RS are given by Development Bank of RS through commercial banks. Loans are given for:

- *Financing of micro business in agriculture*
- *Loans for agriculture*

5.2.1. Financing of micro business in agriculture

Beneficiaries are persons entered into the Farm Registry. Interest rate applicable until 31 March 2011 is 5.90%. For projects implemented within the territory of underdeveloped and extremely underdeveloped municipalities interest rate is 5.40% and for cluster members 5.60%

Purpose of the loan is acquisition of fixed and current assets and amount of loan ranges from 5,000 to 50,000 KM. Repayment period is up to 10 years. Grace period is up to 36 months

5.2.2. Loans for agriculture

Beneficiaries are legal entities and entrepreneurs dealing with production and processing in agriculture or fishery and which are registered in the Farm Registry.

Interest rate applicable until 31 March 2011 is 5.10%. For projects implemented within the territory of underdeveloped and extremely underdeveloped municipalities 4.60%, and for cluster members 4.80%

Purpose of loan is acquisition of fixed and current assets re-finance of existing debts.

Amounts that can be taken:

For legal entities (companies):

- *From 30 000 to 5 000 000 KM for fixed and current assets, re-finance of existing debts (minimum participation of fixed assets 40%)*
- *From 10,000 to 2.000,000 BAM for current assets only*

For entrepreneurs:

- *From 5,000 to 500,000 BAM - for fixed and current assets, re-finance of existing debts (minimum participation of fixed assets 40%)*
- *From 5,000 to 100,000 BAM – for current assets only*

Repayments period:

- *Up to 15 years for fixed or fixed and current assets*
- *Up to 5 years for current assets only*

Grace period:

- *Up to 36 months for fixed or fixed and current assets*
- *Up to 12 years for current assets*

Collaterals are mortgage, endorsers, and movable properties.

Interest rates with commercial banks are ranging from 8% to 12%.

Although it was announced that Guaranty Fond of RS worth 30 000 000 KM would start to operate in November 2010 it did not happen yet.

GOAT SECTOR SWOT ANALYSES IN BiH

<p>Strengths</p> <ul style="list-style-type: none"> • Vast unused land resources • Price of goat milk and its products • Preserved nature and floral diversity of grazing areas suitable for goat farming • Moderate climate appropriate for fodder production • Dietetic and therapeutic properties of goat meat, milk and milk products • Raising awareness amongst local population on properties of goat milk • Relatively favorable subsidies for the sector 	<p>Weaknesses</p> <ul style="list-style-type: none"> • Small goats population • Lack of stud goat farms and limited market of goat with high genetic potentials • Small number of goat farmers • Low market orientation of goat farmers • Absence of modern productive technologies • Low level of education of individual agricultural producers • Lack of clear strategy for development of goat sector • Weak technical support of agricultural extension services • Unawareness of opportunities that goat sector offers amongst farmers • Weak bonds with the primary sector and lack of associations of goat producers
<p>Opportunities</p> <ul style="list-style-type: none"> • Orientation of commercial farmers to have value added product • Growing interest of processing sector for goat milk • Growing foreign market of goat products • Supplies lower than demand • Relatively high prices of goat products • Existence of conditions for organic production • Self-employment in goat sector • Linkage with other industries such as tourism, wine production 	<p>Threats</p> <ul style="list-style-type: none"> • Aging of rural population • Possible budget instability and reduction of subsidies for the sector • Increased interest rates • Increasing prices of grains • Outbreaks of infective diseases • Predators

6. CURRENT SITUATION WITHIN GOAT SECTOR IN BIH

According to data from Statistical Agency of BiH current goat population in BiH is about 50 000 animal. However, according to other sources² which are directly working on monitoring and registration of animals this number is lower and ranges from 30 000 to 35 000 heads.

Bosnia and Herzegovina has some 2 million hectares of agricultural land of which some 40% is arable and the rest is covered by meadows and pastures. Each part of Bosnia and Herzegovina provides very good conditions for raising and breeding of goats and utilization of natural resource.

Goats are bright, inquisitive and highly adaptable animal, capable of using wide range of plants. They are suitable for rising in various systems such as open pasture and browse, close confinement or combination of the two. Now days in BiH all these systems can be seen in practice. There are modern commercial farms with the high investment in facilities and equipment with orientation on milk production and quite opposite commercial farms with improvised barns providing minimum standards with basic equipment.

Due to small goat population and history of goat farming in the last 60 years, no strategy, documents or plans related to agriculture in BiH, foreseen goat industry as opportunity to employ people in rural areas and generate sustainable incomes.

In Republika Srpska breeding of goats is not subsidized while production of goat milk is not separated from cow and sheep milk. Also, in RS, unlike other livestock sectors purchase of high quality reproductive animals for the purpose of establishment of goat farms is not subsidized.

In BiH there is no goat breeding programs established by competent authorities. Reflection of ban on keeping of goats on open pastures is still so strong that goats business is given minor attention in comparison to other livestock branches even in the textbooks of university students.

Anyway weak agriculture extension service gives no needed support for the sector. It results in lack of technical knowledge on the farms and lower performance of the herds.

Even better farms established recently (see below), despite high investments in buildings and equipment and 'good genetics', with some rear exceptions, suffer from lack of technical knowledge. Most of the problems are related to:

- *inadequate feeding,*
- *poor quality feed,*
- *serious mistakes related to reproduction (too early mating or inadequate body condition in reproductive animals)*
- *inadequate microclimate in barns*

In one case, it was reported a significant number of fatalities and abortions on a farm where animals in late pregnancy were transported from Herzegovina to the Sava region in December and were accommodated in too cold barn. This is elementary violation of husbandry principals.

² This is an estimation of Agro Mediterranean Institute from Mostar which is working on registration of animals.

In some farms which are processing milk and produce cheese, hygiene of milk is an issue and violations of principal milking rules are noticed.

Almost all interviewed farmers were not aware of rights and financial benefits that they can claim through system of subsidies.

Despite many aggravating factors there are encouraging signs observed recently in the goat sector of Bosnia and Herzegovina.

A certain number of farmers and entrepreneurs recognized potential of the sector and established goat farms in the last couple of years with the orientation on milk production mainly. The herd size is between 50 to 200 goats. There is one herd with over 700 animals. The herds are composed of the Alpine or the Saanen goats, the German fawn goat or their cross breeds. In some rare cases pure breed Alpine or Saanen goats can be found but in smaller herds of about 20 goats.

These farms produce and deliver to market raw milk, pasteurized milk, cheese and whey. They developed their own sales network. They are located in vicinity of cities such as Sarajevo, Banja Luka, Mostar, Zenica, Travnik Gorazde. They built up their strategy on low supplies and properties of goat milk. Due to relative high price of their products they operate well above profit margins.

The only processor which collect goat milk is a 'Pudja and Perkovic' from Livno. They collect over a 100 liters of milk on daily bases from one farmer through period of 7 months. A main product made of goat milk is cheese. As they explained all quantities of cheese are contracted even before it is produced. Cheese is exported to Croatia. Management wants to collect 1 000 liters on daily bases and increase it over to 5 000 liters but quantities are missing. They canceled contracts with 2 other farmers because of poor hygiene. According to their information goat cheese market is growing.

Cooperative 'Eko Vlasic' started collection of goat milk and production of cheese and last year they produced over 1 ton of cheese. Their plan is to establish a stud goat farm with 1 000 goats. They are negotiating joint investment with owners of a BiH supermarket chain.

'Meggle' a milk processor from Bihac is planning to start collection of goat milk in that area of BiH and supply to market some 250 t of pasteurized milk this year. They are working on development of their own cooperative network which will supply milk for this purpose. This is a sign that processors recognized potential of the sector. Also, a survey³ conducted amongst milk processors in BiH showed that 18 out of 25 interviewed milk processors in BiH expressed their interest in collecting and processing goat milk.

Foundation of goat **Cooperative 'Una'** and joined investment of IFAD and private entrepreneurs worth over 400 000 Euros in Bosanski Novi indicates new trends within the sector in that region of Bosnia and Herzegovina. A modern goat farm with 500 dairy goats will be established as well as a cheese making plant with processing capacity of 7 500 l/day. Cheese will be packed in glass jars with olive oil and aromatic herbs collected in that region. In winter months when milk dries off 'tofu' cheese (soy cheese replacement) will be produced using similar technology. Products will be certified

³ Survey was conducted as part of this study in January 2011 in order to estimate interest of processors in BiH in collection of goat milk. The dairy industry in BiH consists of 53 processors of which the majority are small and medium scale with a capacity of less than 100 000 l of milk per day. See list of interviewed processors Annex 1.

as organic. According to management of the cooperative market for their products seem to be secured in Italy.

Facility of 1000 m² is ready to accept goats while the first import of animals is expected in February 2011. Employment of 7 staff (5 food technology specialist and 2 livestock specialist) is planned in the cooperative. According to management of the cooperative they are planning to organize their own cooperative network of 30 farmers with some 50 dairy goats on each farm. Animals for the network will be partially provided from their own farm which will be registered as a stud farm. Farmers will be supported through establishment of extension service and educational center for transfer of technology which will be located on the farm. Artificial insemination will be administered on the farm.

Cooperation with Faculty of Biotechnological Science from Bihac is planned to be established as technical support.

Business corporation '**Lijanovici**' from Siroki Brijeg have 3 farms with 200 goats on each farm. They are planning to open another farm of the same capacity this year. They process some 25 tons of goat milk to cheese. They export cheese to Croatia, Serbia, and Albania. Processing of milk is currently taking place in a plant of 'Sapit' a dairy processor from Posusje. In order to resolve this issue it is planned an investment in a cheese processing plant with capacity of 2 500 l/day. Development plans according to management, are to have organized cooperative network with 2 000 goats which will provide milk for their plant.

Company '**Miora**' from Banjaluka is planning to import processing technology of 'Select milk', a dairy from Serbia which process goat milk only (10 000 l/day) and produce cheese, yogurt, pasteurized milk, whey. As a part of this venture it is planned an establishment of a goat farm which will be registered as stud farm. Import of animals is planned in February 2011. The main aim is to have own processing plant, a cooperative network of goat farms which will supply milk for the dairy. The company is currently working on market development strategy. As part of it they are selling goat products of the mentioned dairy in the Banja Luka city market. They built up their strategy on education of consumers, with emphases on properties of goat milk and related products, as well as affordable price of the products. Special target groups are kindergartens, schools which provide meals for their pupils, hospitals, sport club. According to Miora's manager, a Slovenian commercial chain 'Mercator' operating in BiH and other countries of South-Eastern Europe has shown interest in seeing goat products in their shops.

Miora is planning to establish link with Agency for Selection of Animals of RS for technical support.

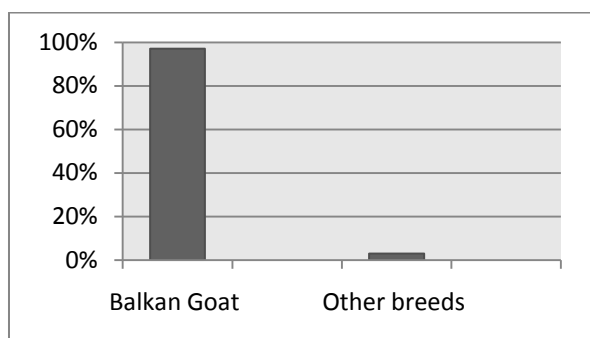
In the end, Miora is working on foundation of Goat Breeder Association called 'Stijena' with members of association from all over the country. The aim of association is development of goat sector in BiH.

7. GOAT MARKET

7.1. Market of live animals

According to estimates goat population in BiH is about 30 000 of reproductive animals and Balkan goat as dominant breed with over 97%. Rest of population is Alpine goat, Saanen goat, German fawn goat and their cross breeds with Balkan goat. Also, in rear flocks can be found cross breeds with the Boer breed mainly in Herzegovina and Livno region.

Figure 1. Goat breed distribution- in BiH- Estimation



This population gives approximately:

- 30 000 kids for meat,
- over 7 000 culled animals for meat
- 7 000 replacement animals

There are no registered stud goat farms in Bosnia and Herzegovina so it is almost impossible to find good quality animals for reproduction. This is one of the biggest constrains for development of goat business in BiH. Usually, small number of farmers who breed Alpine or Saanen flocks keeps best animals for replacement on their own herds while the rest of animals are sold for meat. For someone who plans to start goat business and purchase high production potential animals only solution is import.

Regional markets in Croatia and Serbia offer limited number of pure breed animals. There are several specialized farms of pedigreed animals of the Alpine, the Saana and the Boer breeds in both countries. In addition, several Associations of Goat Breeders are operating in both countries. In Croatia, Center for Reproduction of Animals provides semen of bucks of Alpine and Saanen breeds (for artificial insemination).

Price of domestic reproductive goat is 200 KM.

Prices of dairy goats (Alpine or Saanen breed) in the regional market (on farm price) range from 150 Euros for 5 months old doelings to 200-300 Euros for reproductive goats in the 2nd lactation. If animals are imported, to this price should be added transportation costs, custom costs and the cost of quarantine. Two farms in BiH are currently on the way of getting permissions for organizing quarantine on their own farms.

Table . Price list reproductive animals

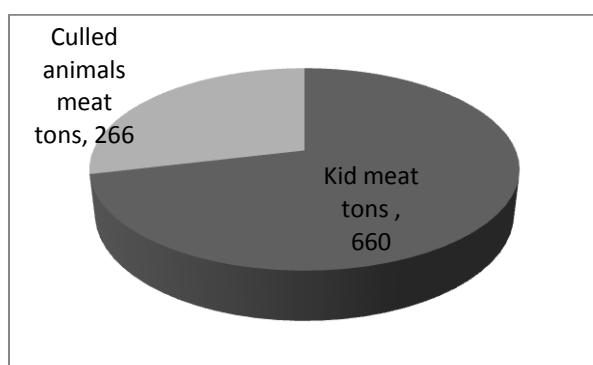
Category of reproductive	Price KM/head
Domestic Goat	180-220
Domestic Buck	300-350
Domestic doeling (female for reproduction)	170-200
Dairy does	400-500
Dairy buck	600-1000
Dairy doeling	300-400

7.2. Goat meat market

Most of goat meat is consumed as kid meat for barbecue. Meat of older animals is consumed as dried and smoked meat.

As we saw in the previous chapter realistic estimation indicates that BiH goat population offers:

Figure 2. Goat meat quantity in BiH market Estimation



- 30 000 kids, or 660 tons of meat
- over 7 000 culled animals or 266 tons of meat

Kids are slaughtered at the age of 2 to 6 months weighting between 10 and 30 kg or more, which means in some cases before weaning. Dressing percentage in such cases is about 50% of the weight of live animal.

Goat meat production has a seasonal character which, apart from low number of goats, makes supply of goat meat irregular and occasional. Another factor which affects goat meat production is low performance of domestic breed with low reproduction rate and low daily gains. For those who breed goats for meat only, solution would be crossing with meat breeds and the first choice would be the Boer breed.

Kid meat consumption in BiH reaches its peak at the time of religious holidays Christmas, Easter, Bajram and New Year and prices are highest at that time. It reaches 7 KM/kg of live weight while it drops to 4.5-5 KM for the rest of year and usually follows prices of lamb meat. In the period from February to May supplies are at the lowest level and prices of live weight can go up to 8 and 9 KM/kg of live weight. Various herd management techniques make it possible for farmers to have kids of commercial weight at this time of the year. Some farmers in Herzegovina advised by extension service seize this opportunity and sell kids in this period achieving favorable prices.

The nature and structure of goat production has a significant impact on marketing pattern of this industry. Like any other livestock production, goat production consists of several operations involving breeding, raising kids and feeding them to market weight. Usually, all these operations are performed on one farm which makes market channels relatively short. Farmers usually sell their animals for meat to butchers, restaurants and private persons. There are several restaurants which sell barbecued goat meat.

Table 2. Pricelist of goat meat throughout year

Category of animal	Sale period	Price KM/kg of meat
Kid	Religious holidays	7
	February to May	7-9
	Rest of year	4,5-5
Culled animal	Throughout the year	3,5-4

7.3. Goat milk market

Goat milk is consumed as fresh milk, pasteurized milk and cheese. *Whey*, as by product of cheese production with specific properties, is also supplied to the markets of BiH.

Population of some 30 0000 goats can provide some 3880 tons of raw milk annually. Milk is used in the first months after delivery for kids' consumption. Rest of milk is used for home consumption and market. Some 400 000 l of milk annually is delivered to the market as raw milk including quantities delivered to one processor. Quantities delivered to the processor approximate 27 tons annually.

Goat milk production has a seasonal character with milk supplies reaching its peak in warmer months and starts to drop through August and September. Supply usually stops in November or December when goats are dried off. Price of milk shows no seasonal fluctuation.

In most of the shops in BiH there are no regular supplies of goat milk. Only a few supermarkets offer 'Vindija's' (a milk processor from Croatia) pasteurized goat milk in tetra pack of 0,2 l. Price of this package is 0.80 KM.

In Banja Luka city market there is one specialized shop for pasteurized goat milk, yoghurt, whey, and different types of cheese. These are products of 'Select milk' a milk processor from Serbia specialized in processing of goat milk only, with processing capacity over 10 000 liters of milk a day.

In Sarajevo and Mostar market places is possible to find occasionally raw and pasteurized goat milk, and whey from local farms.

Currently in BiH a large portion of goat milk sales take place through the farm gate with producers selling milk directly to consumers. Several farmers are running processing and packaging operation on the farms and they sell milk in specialized shops in Sarajevo, Mostar and Banja Luka or deliver it directly to consumers. For example, owner of the biggest goat herd in BiH with over 500 does pasteurize milk and pack it in plastic bottles of 0.33 l. Price of such milk is 4 KM/l on the farm while its retail price in a market place in Sarajevo is 6 KM/l. Another producer from Banja Luka region has the same marketing strategy and he sells milk in the local market. Some producers sell goat milk directly

to consumers where consumers are ordering raw milk and producers are delivering it on home address in glass bottles. Price of raw milk is 2,5 to 3,5 KM/l. These farmers are located in vicinity of cities Sarajevo, Banja Luka, Prijedor, Zenica, Travnik, Bihac and Gorazde.

Whey has similar marketing pattern. Sales in market places, delivery on home address. Price of whey is from 1-3 KM/l.

Marketing channel is short, with no middleman interference.

All farmers are claiming that demands for goat milk are growing and that they cannot meet requirements.

Farmers are running their marketing campaigns exploiting properties of goat milk and its products. Most of them are working on promotion of goat milk and other products through printed materials, electronic sites, presence in fairs and events promoting agricultural production.

7.3.1. Processors' interest in goat milk

Only one registered processor 'Pudja i Perkovic' from Livno collected goat milk last year. Daily quantity of over 130 litters were collected from mid-April to November from only one farmer. It is some 27 tons of milk annually. According to the manager of the company they collected milk from 2 more producers but they cancelled contracts with them as hygiene was an issue. Nevertheless, they would be ready to collect 5000 l a day in the beginning of next season.

According to the survey⁴ conducted amongst 25 dairy processors in BiH 18 processors showed interest in collecting goat milk while 7 interviewed processors were not interested in collection of goat milk.

Interestingly, at the moment all big processors except 'Meggle' (see ANNEX 1) are not interested in collecting goat milk. Generally, they already have their market niche and they do not want to operate with smaller quantities of goat milk. This would require introduction of new technology lines.

'Meggle' is planning to start collection of goat milk this year and supply some 250 tons of pasteurized goat milk to market.

Smaller processors (see ANNEX 1) occupying limited local markets (and some of them are already exporting to regional markets) are interested in collecting goat milk and introduction of new products. They all produce cheeses and introduction of new product of this type would be welcomed. They are well informed on growing demands for goat milk products and they see chance in exporting it. Although management of interviewed processors could not give accurate data on quantities that they would collect as it needs detailed market research and analyses, according to their initial estimates these quantities in the first phase would range from 14 000 to 25 000 l a day or 3780 tons to 6750 tons of goat milk annually. Heaving in mind that goat market sector is yet to be developed these quantities would certainly be bigger.

⁴ Survey was conducted as part of this study in January 2011 to estimate interest of processors in BiH in collection of goat milk. See list of interviewed processors in Annex 1.

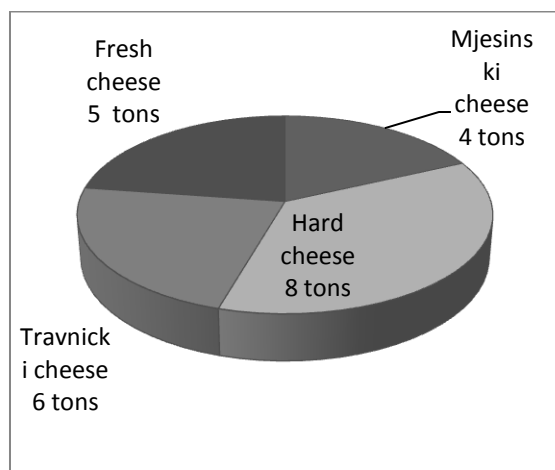
Table 3. Price list of goat milk and whey

Product	Producer	Package	Price on farm KM	Market price KM
Pasteurized milk	Vindija Croatia	Tetra pack 0,2 l	-	0,8
Pasteurized milk	Mostar farm	Plastic bottle 0,33l	1,3	2
Raw milk (home delivery)	Zenica, Sarajevo Banjaluka, Travnik, Prijedor, Bihac, farm	Glass bottle 1 l	2,5-3,5	2,5-3,5
Raw milk delivered to processor	Livno farm	At loose	1,25	1,25
Whey	Mostar farm	Plastic bottle 0,33 l	1	1,3
Raw milk	Select milk	0,750 l	-	3,98
Raw milk	Select milk	0,350 l	-	2,14
Yoghurt	Select milk	0,750 l	-	5,48
Whey with orange flavor	Select milk	0,750 l	-	3,83
Whey with orange flavor	Select mil	0,350 l	-	1,99
Whey	Select milk	0,750 l	-	3,68
Whey	Select milk	0,350 l	-	1,84

7.4. Cheese production

According to estimates obtained through interviews with the farmers' and inspecting their records on processed milk as well as record of the only registered processor which collect goat milk (Pudja I Perkovic from Livno) it is estimated that annual goat cheese production in BiH is over 20 t. There are several varieties of cheese produced in BiH:

Figure 3. Quantities of goat cheese in BiH –Estimation



- *Mjesinski cheese 4 tons*
- *Hard cheeses 8*
- *Travnicki cheese 6*
- *Fresh cheese 5 tons*
- *Cheese in olive oil 0,12 tons*

In Herzegovina region is produced 'mjesinski' cheese made of whole milk and packed in lamb's or kid's skin for ripening. This cheese is ripening for some 4 months in the sacks which are kept in ripening chambers with controlled temperature and humidity. It is then taken out of the sacks and packed in vacuumed plastic forms or plastic transparent boxes for the market. Color of this cheese is white, while the texture is semi hard. The cheese is in form of clumps when taken out from sacks. For one kg of cheeses is needed 10 kg of milk. Price of this cheese is 22 KM on farm gate. Retail price is 26 KM. Limited quantities can be found in specialized shops or ordered directly on farms. Cheese is mainly exported to Croatia, Serbia, and Montenegro Albania.

Another type of cheese is also semi hard. It can be found in Banja Luka region. This cheese after putting curd in to a round form is drained and salted, and then packed into vacuumed plastic sacks, labeled and delivered to the market. Color of this cheese is white, while the texture is semi hard. For one kg of cheeses is needed on average 7 kg of milk. Price of cheese is 17 KM/kg. A variety of this cheese in form of slices is put into small glass jars of 0,250 kg which are then filled with olive oil and chilly paper or various aromatic herbs. Price of a jar is 7 KM.

Similar production technology is applied for the Travnicki type of cheese which is preserved in salted water and as such delivered to the market. Color of this cheese is white, the texture is semi hard. For 1 kg of cheese is needed on average 7 kg of milk.

There are two types of hard ripened cheeses also found in Hercegovina. One is packed in plastic film weigh 0,5 and 1kg and another is sold in smaller pieces. Color of this cheese is creamy yellow, while the texture is hard. For 1 kg of cheese is needed on average 10 to 14 kg of milk. This cheese is mainly exported.

Dairy processor 'Pudja and Perkovic' from Livno make Livanjski cheese of goat milk. For 1 kg of cheese is needed on average 10 to 14 kg of milk. This cheese is exported to Croatia.

Most of the hard goat cheeses produced in BiH are exported to Croatia, Serbia Albania, Montenegro.

Table 6. Price list of goat cheeses in BiH

Product	Producer	Package	On farm price KM	Market price KM
Mjesinski cheese	Mostar, Siroki farm	Plastic vacuum package , plastic boxes 0,3 kg	20-22	26-30
Fresh cheese	Banja Luka farm	Plastic vacuum 1kg	18	20
Fresh cheese in olive	Banja Luka farm	Glass jars 0,250 l	7	9
Travnicki cheese	Zenica, Vlastic Farm	1 kg	10-13	14-26
Livanjski hard cheese	Mljekara Livno	1kg	14	17
Ripened hard cheese	Mostar, Siroki farm	1 kg	22-30	26
Semi hard cheese	Select milk	1 kg	-	43
Ripened cheese	Select milk	1 kg	-	49
Fresh cheese	Select milk	0,250 kg	-	7,85
Fresh cheese with aromatic plants	Select milk	1 kg	-	26,5
Cheese in salted water	Select milk	1 kg	-	37,1
Trapist like cheese	Select milk	1	-	56,30

7.5. Trends

Interest for goat farming is growing amongst the farmers across the country. Existing farmers want to increase number of goats; many farmers want to start goat business and are in quest for good dairy goats. Local entrepreneurs are showing interest in investing in the sector. Again, goat population of dairy breeds in BiH is too small to sustain all requirements. Domestic goats cannot be a choice for commercial breeding.

Goat industry is in the early development stage in BiH. This industry offers limited stocks of their products to market. The trends recognized amongst most of farmers with capacity to produce certain surpluses for the market, is processing of milk on the farms and development of their own sales network. Due to particular properties of goat products and low supplies they achieve favorable prices for their products especially for milk, whey and cheese. Prices of their products will stay on the current level in the near future.

In many regions of BiH from Herzegovina to the Sava, Podrinje to Krajina there are goat farmers and entrepreneurs which can become leaders in development of this sector. Because of history of goat business in BiH they are pioneers of revival of this industry. They recognized opportunities which goat sector offers and are interested in expanding their business activities. They understand chances which offer foreign market. They also realize that they alone cannot meet growing demand for their products.

Goat dairy industry is not competing with cattle dairy industry. Goat milk and its products are unique and justified niche industry with considerable growth potential.

For comparison and understanding of what may happen here, just a few lines about situation in the regional markets.

In both, Serbia and Croatia farmers are developing their own sales network. Several serious business ventures boosted development of the sector in the last couple of years. A few big farms were established. Number of commercial farmers increased. It resulted in establishment of dairy processors specialized in goat milk only. 'Select milk' a dairy processor founded in 2007, process 10 000 l of goat milk/day and developed their cooperative network. Because of growing demands they lack goat milk. They possess their own commercial farm and sell reproductive animals to members of their cooperative network and others. Company exports most of its products to countries of EU and Middle East.

Enterprise 'Beo Capra' with investment of 1,1 million Euros established a Saanen goat farm in 2009. In December 2010 they opened dairy processing. The plan is to produce 60 tons of cheese and 600 tons of other goat dairy products. Market for their products will be countries EU.

Similar situation is in Croatia with increasing number of farms offering value added products and marketing promoting of their products in electronic sites. 'Vindija' milk processors started goat milk processing even before war and developed their own cooperative network

8. FINANCIAL MODEL

8.1. Basic model

In order to demonstrate economic performance of a goat farm with orientation on milk production, a realistic scenario from a local farm with several variations will be presented in this chapter.

The basic scenario is described for a commercial goat herd with the following profile:

Number of does	100
Number of bucks	4
Doe mortality rate	2%
Doe cull rate	13%
Kid birth rate	175
Kit post-birth mortality rate	2%
Kids sold	157
Average milking days/doe	240
Average milk production/doe (net)	2,1

Given feeding pattern in the model: the herd is on pasture for 180 days and another 185 days (autumn, winter) in the barn. Concentrated fodder will be provided year around and depending on production stage quantities will vary. Rations for the does:

- 2.5 kg of alfalfa hay x 180 x 100 = 45 000 kg x 0,1 KM = 4 500 KM
- 1 kg of concentrate (grains) x 365 x 100 = 36 500 x 0,6 = 21 900 KM
 - 0.3 kg corn
 - 0.3 kg barley
 - 0.25 kg oat
 - 0.125 kg soy bean meal

Capital investments and land resources for a 100 does farm

Buildings :	Value KM
Barn	37000
Dairy parlor	7000
Total building costs	44000

Machinery and equipment	Value KM
Dairy equipment	6000
Tractor	15000
Truck or car	5000
Miscellaneous equipment (attachments)	10000
Total machinery	36000

Dairy stocks	Value KM
Number Value/head	
Does 100 350	35000
Bucks 4 600	2400
Total dairy investment	37400

Land resources	Hectare
Land for pasture and hay	18
Land for grains	10
Total land	28

This model simulates a consolidated herd with kid birth rate 175%. The birth rate is under strong influence of external factors such nutrition, herd management, housing etc. Dairy goats require proper housing with adequate microclimate.

Milk net production level is 500 l/doe. Kids are weaned at the age of 2 months.

This husbandry system is commonly practiced in BiH while the feeding pattern is improved. There are farms where animals are kept in close confinement year around and they operate successfully too. In these farms feeding pattern is based on haylage instead of pasture.

Concentrated feed in our model are fed year around as this farm is orientated on milk production. Rations of does are different in different production stages with concentrates significantly reduced or excluded in the dry period. Emphases should always be on reaching compromise between costs, nutritional requirements of animals and herd performances. In our case hay is produced on the farm while grains are purchased locally. Prices of grain can be lower if produced on the farm.

This farm is run by a family, parents with 2 children. Parents are employed full time on the farm and children are helping them in seasonal works such as kidding or fodder collection.

Hygiene on the farm and particularly during the milking operations is very important. Owner is using milking machine and follows strict rules of good hygienic practice and milking protocol. Cooperation with the local veterinarian is good and he offers all needed assistance. This is a real scenario case.

Producer repays loan and annual amount to be paid for this year is 6 000 KM and he also pays 6 000 KM for labor costs.

The *Table 5* simulates *breakeven price* scenario with 0,72 KM/l of milk. *Net return is – 54 KM.*

The *Table 6* simulates a real situation with processor collecting milk. Processor pays to farmer 0,95 KM/l. Subsidy for milk in Federation is 0,30 KM/l which is in total 1,25 KM /l. *Net return is 26 446 KM.*

Table 5. Income and Expenses Summary for a 100 Doe Dairy Enterprise with breakeven price 0,72KM

Income and Expenses Summary for a 100 Doe Dairy Enterprise					
Income		Quantity	Unit (KM)	KM/Year	KM/Goat/Year
1	Milk l	50000	0,72	36000	360
2	25 kg kids (157)	3925	7	27475	274,75
3	Cull sales (16)	16	120	1920	19,2
4	Manure	0	0	0	0
Total income				65395	653,95
Operational costs					
1,1	Doe/buck feed costs*				
	hay kg	45625	0,1	4562,5	45,625
	barley kg	10950	0,6	6570	65,7
	corn kg	10950	0,6	6570	65,7
	oat kg	10950	0,6	6570	65,7
	soy	3650	0,8	2920	29,2
	Salt and minerals kg	492	1,25	615	6,15
	Total	82617		27807,5	278,075
*kid/buck					
1,2	Kid feed cost (birth to 25 kg)				
	hay kg	44509	0,1	4450,9	44,509
	barley kg	0	0,6	0	0
	corn kg	0	0,6	0	0
	oat kg	14836	0,6	8901,6	89,016
	Salt and minerals kg	0	1,25	0	0
	Total			13352,5	133,525
	Total feed costs			41160	411,6
2	Strew and bedding			214	2,14
3	Vet, Medic. and supplies			1500	15
4	Maintenance and repair			900	9
5	Utilities			1500	15
6	Manure removal			100	1
7	Insurance			1375	13,75
8	Buck replacement			1000	10
9	Dairy supplies			700	7
10	Marketing costs			1000	10
Total operating costs				47949	479,49
Non Cash fixed cost					
1	Depreciation			5500	55
2	Investment (loan)			6000	60
	Total fixed costs			11500	115
Total fixed and operating costs				59449	594,49
Labor				6000	60
Cost of production				65449	654,49
Net return				-54	-0,54

Table 6. Income and Expenses Summary for a 100 Doe Dairy Enterprise with price 1,25 KM

Income and Expenses Summary for a 100 Doe Dairy Enterpr.					
Income		Quantity	Unit (KM)	KM/Year	KM/Goat/Year
1	Milk l	50000	1,25	62500	625
2	25 kg kids (157 kom)	3925	7	27475	274,75
3	Cull sales (16)	16	120	1920	19,2
4	Manure	0	0	0	0
Total income				91895	918,95
Operational costs					
1,1	Doe/buck feed costs*				
	hay kg	45625	0,1	4562,5	45,625
	barley kg	10950	0,6	6570	65,7
	corn kg	10950	0,6	6570	65,7
	oat kg	10950	0,6	6570	65,7
	soy	3650	0,8	2920	29,2
	Salt and minerals kg	492	1,25	615	6,15
	Total	82617		27807,5	278,075
*kid/buck					
1,2	Kid feed cost (birth to 25 kg)				
	hay kg	44509	0,1	4450,9	44,509
	barley kg	0	0,6	0	0
	corn kg	0	0,6	0	0
	oat kg	14836	0,6	8901,6	89,016
	Salt and minerals kg	0	1,25	0	0
	Total			13352,5	133,525
	Total feed costs			41160	411,6
2	Strew and bedding			214	2,14
3	Vet, Medic. and supplies			1500	15
4	Maintenance and repair			900	9
5	Utilities			1500	15
6	Manure removal			100	1
7	Insurance			1375	13,75
8	Buck replacement			1000	10
9	Dairy supplies			700	7
10	Marketing costs			1000	10
Total operating costs				47949	479,49
Non Cash fixed costs					
1	Depreciation			5500	55
2	Investment (loan)			6000	60
	Total fixed costs			11500	115
Total fixed and operating costs				59449	594,49
Labor				6000	60
Cost of production				65449	654,49
Net return				26446	264,46

Subsidies for milk are different in Federation and RS.

In RS for average quality of milk (1st class) producer is subsidized by 0,20 KM/l and in that case price is 0,95+0,20=1,15 KM. *Net Return would be 21 446, 00 KM.*

Table 7. Income and Expenses Summary for a 100 Doe Dairy Enterprise with price 1,15 KM

	KM/Year	KM/Goat/Year
Total income	<u>86.895,00</u>	<u>868,95</u>
Total operating costs	47.949,00	479,49
Total fixed costs	11.500,00	115,00
Labor	6.000,00	60,00
Total cost of production	<u>65.449,50</u>	<u>654,49</u>
Net return	<u>21.446,00</u>	<u>214,46</u>

Most of the goat dairy sales in BiH are organized through direct marketing sales with farmers selling directly to consumers and getting higher prices due to short marketing channel. Table 8 is a demonstration of a real situation. Prices in the model are lower than in practice.

Owner of the farm sells raw bottled milk and deliver it on home adders at the price of 1.8 KM. While interviewing farmers who have organized processing on their farms we saw that prices are higher than in our model here. Prices of milk are varying from 2.5 to 3.5 KM.

Rest of milk is processed to cheese. Price of hard cheese in our model is 20 KM on the farm. However, price of hard cheese varies from 22 to 30 KM and cheese is mainly exported.

By product of cheese production is *whey*. In our model *whey* is also bottled and sold locally at the price of 0,5 KM. However, price of whey in practice varies from 2 to 3 KM/l.

Marketing cost is 5 000 KM and is mainly related to delivery expenses. Cost of bottles, cups, labels and other dairy material is 2700 KM, labor cost has increased as one work post was opened and is now 17 000 KM. Depreciation cost has increased and is now 8 500 KM as new processing equipment was introduced.

As we can, see out of 50 000 liters of milk, 10 000 l is sold as raw milk, and 40 000 l is turned in 3 333 kg hard cheese with 12 l of milk for 1 kg of cheese. They have also sold 15 000 l of whey as by product of cheese production. Farmer paid 5000 KM for loan taken for the processing equipment in this year. Net return is 33 911 KM.

Table 8. Income and Expenses Summary for a 100 Doe Dairy Enterprise with processing

Income and expenses for a 100 doe with processing					
Income		Quantity	Unit (KM)	KM/Year	KM/Goat/Year
1	Bottled milk l	10000	1,8	18000	180
2	Cheese kg	3333	20	66660	666,6
3	Whey l	15000	0,5	7500	75
4	25 kg kids (157)	3925	6	23550	235,5
5	Cull sales (16)	16	120	1920	19,2
6	Manure	0	0	0	0
Total income				117630	1176,3
Operational costs					
1,1	Doe/buck feed costs*				
	hay kg	45625	0,1	4562,5	45,625
	barley kg	10950	0,6	6570	65,7
	corn kg	10950	0,5	5475	54,75
	oat kg	10950	0,6	6570	65,7
	soy	3650	0,9	3285	32,85
	Salt and minerals kg	492	1,25	615	6,15
	Total	82617		27077,5	270,775
*kid/buck					
1,2	Kid feed cost (birth to 25 kg)				
	hay kg	44509	0,1	4450,9	44,509
	barley kg	0	0,4	0	0
	corn kg	0	0,5	0	0
	oat kg	14836	0,6	8901,6	89,016
	Salt and minerals kg	0	1,25	0	0
	Total			13352,5	133,525
	Total feed costs			40430	404,3
2	Strew and bedding			214	2,14
3	Vet, Medic. and supplies			1500	15
4	Maintenance and repair			900	9
5	Utilities			1500	15
6	Manure removal			100	1
7	Insurance			1375	13,75
8	Buck replacement			1000	10
9	Dairy supplies			2700	27
10	Marketing costs			5000	50
Total operating costs				53219	532,19
Non Cash fixed costs					
1	Depreciation			8500	85
2	Investment (loan)			5000	50
	Total fixed costs			13500	135
Total fixed and operating costs				66719	667,19
Labor				17000	170
Total cost of production				83719	837,19
Net return				33911	339,11

Higher prices of milk and whey which farmers are currently getting are on this level since demands are higher than supplies. For the purpose of this study we chose scenario with considerably lower prices.

8.2. Model that could be applied in BiH

Having in mind that this study is aimed at presenting business opportunities for poor rural population, a viable model with moderate investment will be presented here for that purpose. The model is result of observation of current situation in BiH in goat sector, discussion with farmers who are in this business for over 10 year, sublimation of their experiences, constraints they face with, mistakes that they made in the beginning, experience of agriculture authorities met during this study, market trends and trends in the processing sector as well as personal experience of the writer of these lines with over 10 years in livestock business.

8.3. Development of the model

This model will demonstrate establishment of a commercial goat farm with orientation on milk production and gradual development of the farm in terms of herd size as well as acquiring necessary knowledge and experience. In this scenario milk will be delivered to a milk processor.

Business idea behind this case is to have a consolidated herd with 50 does and annual milk production of some 25 000 l in the 5th year after the investment. It is necessary to provide adequate housing for the herd with some 100 m². First phase of farm development will last for 4 productive seasons. Technical knowledge is very important because goat farming with orientation on milk production has many specifics. Production level is under strong influences of external factors which must be on an adequate level in order to have satisfactory economic performances. On the other side beneficiaries of the project will borrow a loan from commercial banks which must be repaid.

Reasons for choosing this model are:

- *Investment per farm is not so high,*
- *A small herd is easier to manage,*
- *Farmers have opportunity to acquire enough technical knowledge until herd becomes bigger,*
- *Risks of making serious mistakes are smaller.*

Loan of 15 000 KM will be borrowed from a commercial bank. In the year of establishment 6000 KM would be invested in purchase of 20 doelings, 5 months old. Ideally it would happen in June or July. First milk delivery is expected in March or April next year. Another 9 000 KM in the same year would be invested in reconstruction of existing stable (7000 KM) and coverage of losses and purchase of grain (2000 KM) which will not be produced on farm. In the first 5 productive seasons there will be no replacement of animals.

8.3.1. First year

Table 9 model simulates 1st year of production. Since all does are in the 1st production year reproduction rate will be 1.3 and they will deliver 26 kids, and milk production will be on level of 325 l/doe. As the plan is to increase number of reproductive animals, 10 best female kids will be kept for reproduction for the coming season and rest 15 will be sold in the market. Loss of 4% kids is calculated. Price of milk is 1,25 KM for Federation of BiH and 1,15 KM for RS. Labor cost is 0 as all work will be done by family members. *Net Return is 58 KM for Federation of BiH and -591 KM for RS* due to difference in subsidies of 0,1 KM. This loss will be covered by funds from loan. In this year there will be no repayment of loan since the farmer decided to use grace period.

Table 9. Income and Expenses Summary for a 20 Doe enterprise-1st year

Income and expenses for a 20 does enterprise 1st year					
Income		Quantity	Unit(KM)	KM/Year	KM/Goat/Year
1	Milk l	6500	1,25 (1,15)	8125	406,25
2	25 kg kids (15)	375	6	2250	112,5
3	Cull sales (0)	0	120	0	0
4	Manure	0	0	0	0
Total income				10375	518,75
Operational costs					
1,1	Doe/buck feed costs*				
	hay kg	9000	0,1	900	45
	barley kg	2190	0,6	1314	65,7
	corn kg	2190	0,5	1095	54,75
	oat kg	2190	0,6	1314	65,7
	soy	730	0,9	657	32,85
	Salt and minerals kg	98,4	1,25	123	6,15
Total		16398,4		5403	270,15
*kid/buck					
1,2	Kid feed cost (birth to 25 kg)				
	hay kg	8901,8	0,1	890,18	44,509
	barley kg	0	0,4	0	0
	corn kg	0	0,5	0	0
	oat kg	2967,2	0,6	1780,32	89,016
	Salt and minerals kg	0	1,25	0	0
Total				2670,5	133,525
Total feed costs				8073,5	403,675
2	Strew and bedding			42,8	2,14
3	Vet, Medic. and supplies			300	15
4	Maintenance and repair			180	9
5	Utilities			300	15
6	Manure removal			20	1
7	Insurance			260	13
8	Buck replacement			200	10
9	Dairy supplies			140	7
10	Marketing costs			200	10
Total operating costs				9416,3	470,815
Non Cash fixed costs					
1	Depreciation			900	45
2	Investment(loan)			0	0
Total fixed costs				900	45
Total fixed and operating costs				10316,3	515,815
Labor				0	0
Total cost of production				10316,3	515,815
Net return Federation (RS)				58,7 (-591)	0,587(-59)

8.3.2. Second year

Table 10 model simulates 2nd year of production. Twenty does are in the 2nd lactation with production level of 430 l/doe. They will deliver 38 kids (reproduction rate 1.9) and 8 600 l of milk. Ten does are in the 1st year of production (reproduction rate 1.3) and they will deliver 13 kids, and milk production will be on level of 325 l/doe which is 3 250 l. As the plan is to increase number of reproductive animals, 20 best female kids will be kept for reproduction for the coming season and rest 29 will be sold in the market. Loss of 4% is calculated. Price of milk is 1,25 KM for Federation and 1,15 KM for RS. Labor cost 0 as all work will be done by family members. In this year farmer will start to repay loan and for this purpose it will be allocated 2000 KM. *Net Return is 4 308 KM in Federation and 3 123 KM in RS* due to difference in subsidies of 0,1 KM/l.

Table 10. Income and Expenses Summary for a 30 Doe enterprise - 2nd year

Income and expenses for a 30 doe herd 2nd year					
Income		Quantity	Unit(KM)	KM/Year	KM/Goat/Year
1	Milk l	11850	1,25 (1,15)	14812,5	148,1
2	25 kg kids (29)	975	6	5850	58,5
3	Cull sales (0)	0	120	0	0,0
4	Manure	0	0	0	0,0
Total income				20662,5	688,8
Operational costs					
1,1	Doe/buck feed costs*				
	hay kg	13687	0,1	1368,7	45,6
	barley kg	3285	0,6	1971	65,7
	corn kg	3285	0,5	1642,5	54,8
	oat kg	3285	0,6	1971	65,7
	soy	1095	0,9	985,5	32,9
	Salt and minerals kg	147,6	1,25	184,5	6,2
	Total	24784,6		8123,2	270,8
*kid/buck					
1,2	Kid feed cost (birth to 25 kg)				
	hay kg	11056	0,1	1105,6	36,9
	barley kg	0	0,4	0	0,0
	corn kg	0	0,5	0	0,0
	oat kg	3685	0,6	2211	73,7
	Salt and minerals kg	0	1,25	0	0,0
	Total			3316,6	110,6
	Total feed costs			11439,8	381,3
2	Strew and bedding			64,2	2,1
3	Vet, Medic. and supplies			450	15,0
4	Maintenance and repair			270	9,0
5	Utilities			450	15,0
6	Manure removal			30	1,0
7	Insurance			390	13,0
8	Buck replacement			300	10,0
9	Dairy supplies			210	7,0
10	Marketing costs			300	10,0
Total operating costs				13454	448,5
Non Cash fixed costs					
1	Depreciation			900	9,0
2	Investment(loan)			2000	20,0
Total fixed costs				2900	96,7
Total fixed and operating costs				16354	545,1
Labor				0	0,0
Total cost of production				16354	545,1
Net Return Federation (RS)				4308,(3123)	143,6(104)

8.3.3. Third year

This model simulates 3rd production year. Twenty does are in the 3rd lactation and will deliver 10 000 l and 38 kids. Ten does are in the 2nd lactation and will produce 4300 l and 18 kids. Another twenty does are in the 1st production year (reproduction rate 1.3) and they will deliver 26 kids and 6500 l of milk. All kids (79) will be sold in the market. Loss of 4% is calculated. Price of milk is 1, 25 KM in FBiH na 1,15 KM in RS. Labor cost is 0 as all work will be done by family members. In this year farmer will repay 5000 KM of loan. *Net Return is 9009 KM in Federation and 6929 KM in RS.*

Table 11 . Income and Expenses Summary for a 50 Doe enterprise - 3rd year

Income and expenses for a farm of 50 does					
Income		Quantity	Unit (KM)	KM/Year	KM/Goat/Year
1	Milk l	20800	1,25(1,15)	26000	520
2	25 kg kids (79 kom)	2075	6	12450	249
3	Cull sales (0)	0	120	0	0
4	Manure	0	0	0	0
Total income				38450	769
Operational costs					
1,1	Doe/buck feed costs*				
	hay kg	22500	0,1	2250	45
	barley kg	5475	0,6	3285	65,7
	corn kg	5475	0,5	2737,5	54,75
	oat kg	5475	0,6	3285	65,7
	soy	1825	0,9	1642,5	32,85
	Salt and minerals kg	246	1,25	307,5	6,15
	Total	40996		13507,5	270,15
*kid/buck					
1,2	Kid feed cost (birth to 25 kg)				
	hay kg	22254	0,1	2225,4	44,508
	barley kg	0	0,4	0	0
	corn kg	0	0,5	0	0
	oat kg	7418	0,6	4450,8	89,016
	Salt and minerals kg	0	1,25	0	0
	Total			6676,2	133,524
	Total feed costs			20183,7	201,837
2	Strew and bedding			107	2,14
3	Vet, Medic. and supplies			750	15
4	Maintenance and repair			450	9
5	Utilities			750	15
6	Manure removal			50	1
7	Insurance			650	13
8	Buck replacement			500	10
9	Dairy supplies			350	7
10	Marketing costs			500	10
Total operating costs				23540,7	470,814
Non Cash fixed costs					
1	Depreciation			900	18
2	Investment			5000	100
Total fixed costs				5900	118
Total fixed and operating costs				29440,7	588,814
Labor				0	0
Total cost of production				29440,7	588,814
Net return				9009(6929)	180(138)

8.3.4. Fourth year

In the 4th year farmer will have a herd with 50 does in the 2nd, 3rd, and 4th lactation with *Net return 11 909 KM in Federation and 9549 KM in RS*. In this year farmer will repay additional 5000 KM.

Table 12. Income and Expenses Summary for a 50 Doe enterprise – 4th year

Income and expenses for a farm of 50 does				Quantity	Unit (KM)	KM/Year	KM/Goat/Year
Income							
1	Milk l			23600	1,25	29500	590
2	25 kg kids (79 kom)			1975	6	11850	237
3	Cull sales (0)			0	120	0	0
4	Manure			0	0	0	0
Total income						41350	827
Operational costs							
1,1	Doe/buck feed costs*						
	hay kg			22500	0,1	2250	45
	barley kg			5475	0,6	3285	65,7
	corn kg			5475	0,5	2737,5	54,75
	oat kg			5475	0,6	3285	65,7
	soy			1825	0,9	1642,5	32,85
	Salt and minerals kg			246	1,25	307,5	6,15
	Total			40996		13507,5	270,15
*kid/buck							
1,2	Kid feed cost (birth to 25 kg)						
	hay kg			22254	0,1	2225,4	44,508
	barley kg			0	0,4	0	0
	corn kg			0	0,5	0	0
	oat kg			7418	0,6	4450,8	89,016
	Salt and minerals kg			0	1,25	0	0
	Total					6676,2	133,524
	Total feed costs					20183,7	201,837
2	Strew and bedding					107	2,14
3	Vet, Medic. and supplies					750	15
4	Maintenance and repair					450	9
5	Utilities					750	15
6	Manure removal					50	1
7	Insurance					650	13
8	Buck replacement					500	10
9	Dairy supplies					350	7
10	Marketing costs					500	10
Total operating costs						23540,7	470,814
Non Cash fixed costs							
1	Depreciation					900	18
2	Investment					5000	100
Total fixed costs						5900	118
Total fixed and operating costs						29440,7	588,814
Labor						0	0
Total cost of production						29440,7	588,814
Net return						11909(9549)	238(190)

In the 5th year farmer will be able to repay remaining 6567 KM of loan. *Net return for this year would be 14 702 KM in Federation and 12 202 KM in RS.*

Repayment schedule:

- ✓ 1st year grace period (only interest rate will be paid)
- ✓ 2nd year 2000 KM
- ✓ 3rd year 5000 KM
- ✓ 4th year 5000 KM
- ✓ 5th year 6567 KM
- ✓ Total loan 18 567 KM (15000 principal + interest 3 567 KM) interest rate 6%

In the 6th year farmer should start to consider another cycle of investment depending on market demands, prices, entrepreneurial attitude, etc.

Subsidies for capital investment were not calculated here. Part of investment will be paid through system of subsidies. Farmers, who decide to undertake this investment should study system of subsidies, seek advice from extension services, local and cantonal authorities and come up with the best deal in terms of investment. It was noticed that majority of farmers are not aware of financial benefits that subsidy program offer.

9. PRICING LIST, AVAILABILITY OF INPUTS, TOTAL ENTRY COSTS FOR GOAT DAIRY INDUSTRY

Inputs needed in goat business are feed (fodder and grains), mineral, medicines, dairy supplements, mechanization, and milking equipment. In each part of BiH there are shops specialized in selling the mentioned staff and providing service and maintenance for mechanization and equipment.

All types of feed are available in BiH. Prices of feed can vary especially for grains. Naturally, in northern regions of the country grains are cheaper. Retail price can vary up to 0,25 KM per kg in different location. However, these prices can be lower if bigger quantities are ordered. Farmers, by entering into formal and informal producers groups, associations or cooperatives can get more favorable prices for bigger orders.

Table 13. Current prices of feed

Feed	Price KM per kg
Corn	0.45-0.60
Barley	0.40-0.65
Oat	0.40-0.65
Rey	0.40-0.65
Wheat bran, corn bran	0.33-35
Beet root pulp	0,35-0,40
Soy bean meal	0.65-0.90
Milk replacement	2,0-3.0
Concentrate for goats (14%)	0.60-0.70

In the last couple of years hay is also added to the list of available feed in the market. Namely, some producers offer baled hay and deliver it to agreed destinations. Quality of hay varies but some good quality hay can be found. There are many deserted unused areas with meadows and farmers who have mechanization cut the grass and sell it as hay.

There are examples of goat farms in Herzegovina which buy all feed including hay.

In the table below are given prices of new dairy equipment. However, a good choice would be second handed equipment which can be found in various advertisement sites. One of them, specialized in dairy equipment, is www.bosnia.dk.

Table 14. Pricelist of new dairy equipment

Equipment	Price KM
Milk cooling tanks depending on capacity, (roughly 12 to 18 KM per liter of capacity of the tank)	3 000 - 6 000
Stainless steel milk bucket of various volume	80 - 120
Milking machines (milk up to 8 goats at a time)	1 200 - 6 000
Closed milking system of various capacity	40 000 - 70 000
Kid feeding machine (feeding milk replacer to weaned kids a 100 kids at a time)	4 000 - 5 000
Milk Pasteurizer (60 l)	>2 000
Processing equipment including cheese making hardware	25 000-40 000

Dairy processing requires investment. Facilities for cheese production and associated equipment, of course, depend on type of operation, foreseen capacity, way the milk will be collected etc. However, in today's market there is available certified and financially affordable dairy hardware. The cost of such a specialized equipment with the capacity of 200 to 1000 l of milk/shift and more ranges between 25 000 KM to 40 000 KM. It includes all hardware needed for the processing. It does not include building costs but the mentioned equipment could be accommodated in a facility not bigger than 50 m².

Prices of new mechanization are given in below table, while second handed market offers a good staff at lower prices.

Table 15. Pricelist of new mechanization

Equipment	Price KM
Tractor up to 50 HP	18 000
Trailer	5 000
Baler	10 000
Various attachments	3 000
Motocultivator	4 000

Prices of 1m² of a facility needed for goat business are about 200 KM m² and can vary depending on type of building, material, price and type of labor provided for the construction by the farmer, etc.

Table 16. Enterprise set up total costs for dairy goat industry per head:

Various systems and combinations	Value KM/head
Milking machine and second-handed mechanization	1100 to 1200
New mechanization and closed milking system	1600 to 1700
New mechanization, closed milking system and processing of milk on the farm	1900 to 2000

10. CONCLUSIONS

1. Small goat population and small number of farmers in BiH impede growth of the subsector.
2. Population of dairy breeds insignificant and cannot provide substantial growth of the population. Import of animals is the only solution.
3. All parts of BiH offer favorable condition for goat breeding.
4. Farmers across country show interest in goats breeding. Existing goat farms want to increase number of animals and many farmers are planning to enter in goat business
5. Farmers lack technical knowledge.
6. Agriculture Extension Services with rear exceptions do not give needed support to the sector.
7. Weak bonds amongst commercial farmers. There is lot of space for improvement in marketing aspects of goat farming.
8. Several significant investments and announcement of a few more investments indicate interest of entrepreneurs for the sector.
9. Milk processors across country indicated interest in collecting and processing goat milk.
10. Goat milk and related products constitutes a separate *niche* with potential to grow and become an export activity.
11. Trend to process milk on farm is recognized amongst farmers in BiH and the region. Establishment of specialized dairy processing plants is seen in the region and may be a pattern that could be seen here soon.
12. Dairy goat producers rely on direct market sales for milk and other products. Internet sales also offer market outlets.
13. Prices of goat milk and other products make commercial goat farmers to operate well over gross margins.
14. Goat business can offer significant number of working posts.

11. RECOMMENDATION

- 1.** Establishment of dairy stud farms would boost development of sector in the long run. Having in mind growing demand for dairy goats this would be a profitable business operation.
- 2.** Commercial herds should be oriented on milk production relying on the improved husbandry system, production of as much as possible doelings for reproduction. Animals for meat should use pasture as much as possible.
- 3.** Domestic population raised in extensive systems could be improved by crossing with meat breeds such as Boer with orientation to use vast browsing and pasture areas. Because of high prices of concentrated feed fattening in barns is not profitable.
- 4.** It is necessary to propose development of a State Program for Goat Commercial Breeding and Program for Preservation of Domestic Breed.
- 5.** It is necessary to develop of a training curriculum for goat farmers. Farmers need support from extension service.
- 6.** Support to establishment of Association of Goat Breeders is needed too.
- 7.** Link extension services, Institutes, Universities with entrepreneurs who are planning to invest in goat sector in order to give them needed guidance and avoid mistakes which some entrepreneurs made.
- 8.** Inform Association of agricultural producers, cooperatives and farmers groups on interest of processors to collect goat milk.
- 9.** Present and promote importance of food safety standards amongst farmers who process milk on the farms and deliver milk and other products to consumers.
- 10.** Present to existing farmers possibilities of milk processing on the farm and diversify their production by introducing new products such as yoghurt, whey.
- 11.** Present commercial goat farming to financial institutions as a viable business venture.
- 12.** Goat product market needs development and increasing in volume.

BACKGROUND

The domestic goat (*Capra hircus*) is a subspecies of goat domesticated from the wild of southwest Asia and Easter Europe and originates from three wild types of goats: *Capra aegagrus*, *Capra falconeri* and *Capra prisca Adametz*.

The goat is a member of the Bovide family and is closely related to the sheep as both are in the subfamily Caprinae. There are over three hundred distinct breeds of goat. Diploid number of chromosomes in goat is 60.

Goats are one of the oldest domesticated species. Goats have been used for their milk, meat, hair, and skins over much of the world.

Female goats are referred to as *does*, males as *bucks*; their offspring are kids. Castrated males are *wethers*. Goat meat from younger animals is called *kid*, and from older animals is *mutton*.

According to FAO, world goat population is over 750 million heads. China and India have the largest goat population.

The European caprine livestock is made up of over 13 million goats

Table 17. The European caprine livestock Source FAO: www.fao.org

Country	Goat population
Greece	5.000,000
Spain	3.046,716
Russian Federation	2.322,143
France	1.230,000
Italy	1.330,000
Albania	1.025,000
Ukraine	991,000

According to FAO Serbia's goat population is made up of over 100 000 goats and Croatia's goat population is made up of 93 000 goats.

13. GOAT BREEDS

13.1. Balkan Goat

Balkan goat has long thick and strong hair and it can be black, white, brown or mixed. This goat has medium long head, long and thin neck and long and thigh body. Buck weight is 40-70 kg and does 30-40 kg. Milk production is 130 l by year and lactation length is from 2 to 4 months. Twins are rare and they can be found in 10-15% of goats. Their weight after birth is 2-3 kg, after 2 months 10 kg, and after 6, they weigh 25 kg.

13.2. Alpine Goat

They are multi-colored and have no set markings. They have erect ears, horns, and have a dish-face. The breed originated in the French Alps. Mature does weigh around 57 kg, and are about 0,8 meters tall at the shoulder. Alpine goats can range in color from white or gray to brown and black. The face is straight. Both sexes can be with or without horns. Alpine goats are heavy milkers producing from 700 to 900 liters within a lactation which lasts for 280 days. Best animals produce over 900 liters within lactation. They are most often used for commercial milking. Reproduction rate is 1.9% These are hardy, adaptable animals that prosper in any climate while maintaining good health and excellent production. They are bright, calm, inquisitive and easy manageable animals.

13.3. Saanen goats

Saanen goats are a white or cream-colored breed of goat, named for the Saanen valley in Switzerland. Saanens are the largest of the goat dairy breeds. Does typically weigh 68 kg or more, with bucks weighing over 91 kg. Regardless of color, the Saanen breed is large and big-boned, but graceful and refined in bone, the ears are erect, and the nose is straight or dished. Both does and bucks usually have beards, and horns (as do most other breeds), unless dehorned at birth. Lactating does older than 30 months produce on average of 800 liters within lactation. Just as Alpines, they are commonly used for commercial milking. The Saanen temperament is, calm and mild mannered. They typically breed every year, producing two kids.

13.4. Toggenburg goat

The Toggenburg is a breed, named after the region in Switzerland where the breed originated, the Toggenburg valley. Toggenburgs are medium in size, and moderate in production. Does are 70 to 80 cm tall at the shoulders and weight 45 kg. Bucks are 75 to 85 cm tall at the shoulders and weight over 65 kg. Does produce over 700 l within lactation and two kids per season. The color is solid varying from light fawn to dark chocolate, with no preference for any shade. They perform better in cooler conditions. They are the oldest known dairy breed of goats.

13.5. Boer (meat production)

The Boer goat was developed in South Africa in the early 1900s for meat production. Their name is derived from the Dutch word 'Boer' meaning farmer. The Boer goat was bred from the indigenous African goats with some crossing of Indian and European bloodlines. They were selected for meat rather than milk production. The Boer goat has a fast growth rate and excellent carcass qualities,

making it one of the most popular breeds of meat goat in the world. Boer goats have a high resistance to disease and adapt well to hot, dry semi-deserts.

Boer goats commonly have white bodies and distinctive brown heads. They possess long, pendulous ears. They are noted for being quiet, fast growing, and having high fertility rates. Does are reported to have superior mothering skills as compared to other goats. Mature Boer bucks weigh between 110–135 kg, and mature does between 90–100.

The primary market for slaughter goats is a 15–36 kg for kids; kids should reach marketable size at weaning age. The kid of a proven fast-growing sire might weigh 36 kg at 90 days.

14. TECHNOLOGY OF GOAT FARMING

Goats are ruminants, highly adaptable to various climate and environmental conditions with the ability to consume a whole range of plants and different type of fodder including browsing, forage, grains, legumes etc.

There is no universal goat technology that is applicable to all situations. Husbandry system will depend on climate, environment, availability of fodder, land resources, type of production, etc. However, there are recommendations which should be kept in mind before starting goat farming business and later, while running operations on farms.

14.1. Location for goat farms

Adequate location for the farm and its design has an important meaning for its organization and operation. Farms should be located on a dry place a bit higher than the surrounding area. Most appropriate location is one on the southern slopes protected from north cold wind during winter. Farm should be accessible by road but not too close to human settlements. Grazing, browsing and harvesting areas should be located in vicinity of the farm. Outlet for animals should be oriented to south because of cold north winds.

14.2. Design of farms

Type and size of building will depend on size of herd, production purpose (milk or meat or both) and climate conditions. Available funds and decision to construct a new building or reconstruct the existing one should be kept in mind.



A modern farm with outlet in
Banjaluka region

14.3. Housing

Goats are very adaptive animals and do not require expensive housing. Goats in BiH are raised in various systems: from extensive grazing and browsing to close confinement and housing, from almost Mediterranean Herzegovina to continental and mountainous areas. Whatever husbandry system or climate conditions, goats need protection from the basic elements. Goats can tolerate cold weather, but should not remain cold and wet for long periods of time. They are sensitive to draft. During the summer months, it is important to provide a shady area with adequate air circulation. The primary need for housing is during kidding, especially if kidding occurs during cold weather.

Housing facility for goats should meet basic requirements such as:

- Relative humidity 60-80%,
- Adequate temperature for all categories of animals, especially for the kids

Table 18. Temperature in barns for different categories of goats

Category	Min. temperature	Optimal temperature	Max. temperature
Adult animals	5 °C	10 - 15 °C	27 °C
Kids	12 °C	18 - 20 °C	27 °C

- Enough space for each category

Table 19. Space for goats

Category	Flooring space m ²	Feeding space m ²	Total m ²
Adult animals	1,2-1,5	0,35	1,5-1,85
Kids up to 30 days	0,2	-	0,2
Kids at weaning	0,25-0,30	-	0,25-0,30
Doelings	1	-	1
Bucks	3-5	-	3-5

As a general rule, with parlor and room for keeping milk it should provide 2m ² /goat.

- Height of side walls should be 2.5 m to 3 m

14.4. Flooring

Dirt or stone floors are preferred to concrete. Slotted flooring is a good choice. Inside the barns pens should be bedded with straw or other absorbent material (poor quality hay, wood shavings) 10 cm if the floor is concrete. In the winter, the manure pack should be allowed to build up, as the decomposing layers provide a source of heat. Does can kid in large community pens. One pen is needed for every 10 does in the herd.

Oftentimes, existing buildings can be utilized to house goats, store hay and equipment. Producers can make almost any housing system work. Confinement housing, which can be completely enclosed as needed, is suitable in cold climates. Confinement housing allows close supervision of animals, but is more expensive than most other types of housing.

14.5. Manure handling

Goat housing should be designed with manure handling in mind. Removing manure with a front end will save labor. Composting of animal waste is a good choice as it reduces odors and fly problems. Composted manure is an excellent natural soil fertilizer which can reach a fairly good price in the market and realize additional income for the farm.

14.6. Ventilation

Ventilation is an important aspect of animal housing, particularly closed housing. Poor ventilation can be detrimental to animal health and performance. Harmful gases (NH_3 , CO_2 , SO_2) and dust can cause respiratory problems, while temperature extremes can reduce animal productivity.

The purpose of ventilation is to provide the desired amount of fresh air, without draft, to all parts of the shelter; to maintain temperatures within desired limits; to maintain relative humidity within desired limits; and to maintain ammonia levels below specified levels.

Ventilation can be natural or mechanical. Natural ventilation systems move air through adjustable and fixed openings, such as windows and doors. Mechanical ventilation systems incorporate fans, controls, and air inlets and/or outlets.

Good ventilation should provide:

- 20 m³/hour of fresh air for each animal
- Speed of air should not be > 0,5m/sec

14.7. Light

In order to provide enough natural light and proper ventilation, windows should constitute 10% of the total flooring area.

14.8. Construction material for goat barns

This will depend on availability of materials and its price. Wood is preferred to concrete blocks, clay brick is a good choice. Regardless of the construction material barns should provide enough space for animals, favorable conditions such as temperature and humidity and proper ventilation.

Dairy goats are susceptible to lower temperatures, draft and moisture. Therefore, microclimate in the barns should be adequate in order to have high productivity.

15. FEEDING GOATS

The goat is a ruminant, having a four-part stomach like the cow and sheep. Goats are energetic, inquisitive and versatile in their feeding habits. *They are adaptable to various environments and can consume over 90 different plants.* Browse materials (trees, leaves, bushes, twigs, etc.) appears to be advantageous and enjoyed by dairy goats. However, the importance of such materials toward the nutritional requirements of lactating dairy goats is probably quite small, especially where a fairly large number of dairy goats are being maintained.

Goats require energy, protein, vitamins, minerals, fiber (bulk) and water. Energy (calories) is usually the most limiting nutrient, whereas protein is the most expensive. Deficiencies, excesses and imbalances of vitamins and minerals can limit animal performance and lead to various health problems. Fiber is necessary to maintain a healthy rumen environment and prevent digestive disturbances. Water is the cheapest feed ingredient and often the most neglected.

Although the goat has a great capacity for consuming fibrous feed (roughage), it needs to be given forage of good quality, such as legume hay.

15.1. Feed for goats

15.1.1. Pasture and browse

Pasture and browse are usually the primary and most economical source of nutrients especially for meat goats, and in some cases, pasture and browse are all goats need to meet their nutritional requirements. Pasture tends to be high in energy and protein when it is in a vegetative state. However, it has high moisture content, and it is difficult for a high-producing doe or fast-growing kid to eat enough grass to meet its nutrient requirements. As pasture plants mature, palatability and digestibility decline, thus it is important to rotate pastures to keep plants in a vegetative state. During the early part of the grazing season, browse (woody plants and brush) and weeds tend to be higher in protein and energy than ordinary pasture. Goats are natural browsers and have the unique ability to select plants when they are at their most nutritious state. *Goats which browse have less problems with internal parasites.*

15.1.2. Hay

Hay is the primary source of nutrients for goats during the winter or non-grazing season. Hay varies in quality and the only way to know the nutritional content is to have the hay analyzed by a forage testing laboratory. Hay is a moderate source of protein and energy for goats. The energy, as well as protein content of hay depends upon the maturity of the forage when it was cut for forage. Proper curing and storage is also necessary to maintain nutritional quality. Legumes make excellent hay and are usually superior to most other hay crops because of their higher protein content. *While alfalfa hay is the best legume hay,* variations may occur in quality. Good quality alfalfa hay should have a green color, small stem, adequate in leaves and 17-20% protein. Legume hays – alfalfa, clover, – tend to be higher in protein, vitamins and minerals, especially calcium, than grass hays.

Grass hay usually varies considerably in quality. Even so, some grass hay may be used in the ration with success. Grass hay as the only roughage source may limit maximum performance. In addition to pasture and/or the forages being fed, the overall ration should be balanced with a good grain concentrate that is fortified with minerals and vitamins. The exact amount needed will vary with pasture and forage quality.

15.1.3. Silage and haylage

Silage and haylage made from forage or grain crops have been successfully fed to goats; however, special attention must be paid to quality, as moldy silage can cause listeriosis or "circling disease" in goats. As with fresh forage, the high-producing goat cannot consume enough 'we' silage meet its nutritional needs.



Haylage on a goat farm with intensive husbandry system Banja Luka region

15.1.4. Concentrates (grains)

It is oftentimes necessary to feed concentrates to provide the nutrients that forage alone cannot provide. This is particularly true in the case of high-producing animals. There are also times and situations where concentrates are a more economical source of nutrients. Creep feeding and supplemental feeding of kids has been shown to increase growth weight, but should only be done to the extent that it increases profit.

There are two types of concentrate feeds:

- carbonaceous and
- proteinaceous.

Carbonaceous concentrates or 'energy' feeds include the cereal grains – corn, barley, wheat, oats, and rye and various by products feeds such as bran, beet root pulp etc.

One of the problems with cereal grains is that they are *high in phosphorus content, but low in calcium*. Feeding a diet that is high in phosphorus and low in calcium can cause urinary calculi (kidney stones) in wethers and bucks. Inadequate calcium level can lead to milk fever in pregnant or lactating does.

Proteinaceous concentrates or protein supplements may be of animal or plant origin and include soybean meal, sunflower meal.

Protein quantity is more important than protein quality (amino acid content) in ruminant livestock since the microorganisms in the rumen manufacture their own body protein.

Goats do not store excess protein; it is burned as energy or eliminated (as nitrogen) by the kidneys.

Goats should avoid plum and peach leaves and wild cherry.

15.2. Vitamins and minerals

Many minerals are required by goats. The most important are salt, calcium, and phosphorus. The ratio of calcium to phosphorus should be kept around 2:1. Vitamins are needed in small amounts. Goats require vitamins A, D and E, whereas vitamin K and all the B vitamins are manufactured in the rumen. A free choice salt-vitamin-mineral premix should be made available to goats at all times, unless a premix has been incorporated into the grain ration or TMR (total mixed ration). In the very least, does should be fed pre-choice mineral during late gestation and lactation. Either a loose mineral or mineral block may be offered. Force-feeding minerals and vitamins is actually better than offering it free choice since goats will not consume minerals according to their needs.

Many soils are deficient in selenium, thus the premix should be fortified with selenium to prevent *white muscle disease* in kids and reproductive problems in does. Supplementing selenium via the feed or mineral is preferred to giving selenium injections. Goats appear to have a much higher tolerance for copper in their diets as compared to sheep, thus it is recommended that feeds and/or premixes contain copper, unless the goats are co-mingled with sheep. It is possible to get pelleted supplements that contain vitamins and minerals, as well as high levels of protein (34-40%). These supplements can be combined with whole grains to create a balanced concentrate ration.

15.3. Water

Goats should have ad libitum access to clean, fresh water at all times. A mature goat will consume between 5 l and 8 l of water per day. Inadequate water intake can cause various health problems. In addition water and feed intake are positively correlated.

16. FEEDING VARIOUS CATEGORIES OF ANIMALS

Factors that affect the nutritional requirements of goats are:

- *maintenance,*
- *growth,*
- *pregnancy,*
- *lactation,*
- *fiber production,*
- *activity and*
- *environment.*

As a general rule of thumb, goats will consume at least 3% of their body weight on a dry matter basis in feed. The exact percentage varies according to the size (weight) of the goat, with smaller animals needing a higher intake (percentage-wise) to maintain their weight. Maintenance requirements increase as the level of the goat's activity increases. For example, a goat that has to travel farther for feed will have a higher maintenance requirement than a goat in a feed lot. Environmental conditions also affect maintenance requirements. In cold and severe weather, goats require more feed to maintain body heat. The added stresses of pregnancy, lactation and growth further increase nutrient requirements.

16.1. Feeding does

As far as nutritional level is concerned a doe has 2 periods within a productive year:

- *Dry period and*
- *Lactation*

16.1.1. Dry period

The does should be bred to freshen once each year with a dry period of about 2 or 3 months. The dry period allows the mammary system time to repair and regenerate for the next lactation. The greater her production the more likely that her body has been depleted of the nutrients used in milk secretion and the longer the dry period required to replenish the losses and store adequate reserves for the next lactation. Does which are not given a normal dry period usually produce only 65 to 75% as much milk in the subsequent lactation as does given a dry period.

Grain consumption should be reduced or removed near the time that the dairy goat is turned dry. In the first part of dry period they can be fed only of good quality hay in the amount of 2-2.5 kg. During the last 6 weeks of gestation, nutrition becomes more important to the doe. She should receive better quality grass hay and about 0.3 kg of grains or the same type of ration she will receive after kidding.

Table 20. Possible distribution of lactation and dry period

Dry		Lactation									Dry
Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec

The distribution may look differently and farmer can alter this pattern if market opportunities and financial benefits are attractive enough.

The doe should be managed during the dry period so that she is in good condition at the time of kidding. *She should not be allowed to become fat.* The key to success is to have the doe kid in a healthy condition and with a fairly good appetite.

16.1.2. Lactation

From nutritional point of view lactation is the most demanding period. For practical reasons lactation is divided into 3 trimesters each lasting for about 90 days or so. First 90 days is especially demanding. Quantity of milk rises in until 8th week of lactation. One of possible solutions for ration for that period could be:

- *Haylage 4 kg or pasture*
- *Hay 2 kg*
- *corn 0,7 kg and 0,125 kg soy*

or

- *Hay 2,5 kg*
- *Beet root 2 kg*
- *Corn 1 kg*
- *soy bean meal 0,25 kg*

Good quality hay and a balanced grain mix combined with pasture appear to be one of the best approaches in maintaining high levels of milk production.

In the 2nd trimester days milk production starts to drop. Lactating animals producing 2,6-2,7 l of milk are doing well on pasture supplemented with corn or other cereals and hay:

- *Hay 1 kg*
- *Corn 0,5 kg*

In the last 90 days of lactation rations could be combination of pasture and:

- *Hay 1,2 kg*
- *Corn 0,2 kg.*

These are just examples of rations and they may look differently depending on available feed their costs and nutritional value (see ANNEX 2). All rations should be fortified with adequate level of minerals.

16.2. Feeding bucks

This category of animals is not demanding and for the most of the year they can be fed on hay or pasture and minerals. However, mating season is most demanding for them and 7 weeks before mating they should start receiving additional grains in the amount of 0,6 kg/day usually combination

of corn, barley, oat and of course minerals. This feeding pattern should be prolonged 6 weeks after mating.

16.3. Feeding kids

Most critical part for kids is first few days as they do not have established body thermoregulation system while their immune system is total depend on antibodies from the first milk called *colostrum*. The antibodies are concentrated in the doe's udder prior to kidding, are sucked by the kid and then passed through the intestinal wall into the kid's circulation. This transfer, or absorption, is made possible by special cells in the intestinal lining that permit antibodies to pass through for the first 18 hours of life. *It is critical then, that kids suckle soon after birth, preferably within 2-4 hours.* Colostrum is also high in nutrient value, especially vitamin A, B-vitamins, proteins, and minerals. The protein content of colostrum is about 20% as compared to 3.5% for normal milk.

Overfeeding colostrum or other milk to kids can cause loose bowels and possibly scours. The extra colostrum should be placed in the refrigerator and fed later at about body temperature. The kid must be handled gently and not forced to drink. After a few hours, the hungry kid will drink readily. The kid may be changed to goat's milk, cow's milk, or powdered milk after about one day on colostrum.

At birth, the kid weighs approximately 3 to 4 kilos. The kid must be treated as a simple stomach animal. Milk diet is needed for the first few weeks of life. For 1 kilo of gain a kid need to suckle 7 to 10 l of milk. In the first 8 to 10 days kids should suckle *ad libidum* and stay together with its mother. Kids should be fed liquid feed at least 5-6 weeks after birth. If there is market for goat milk, kids should be fed on milk replacement and provide about 1,5 l of milk or milk replacement/day.

A small amount of grain such as a calf starter may be introduced to the kid at 2 to 3 weeks of age. In general, the grain should contain about 14 to 15% crude protein with added minerals and vitamins.

As soon as the kid starts eating, the rumen starts developing and eventually the kid will start chewing its cud. This is an indication that all four compartments of the stomach (rumen, reticulum, omasum and abomasum) are developing. As the animal grows, the rumen becomes the largest compartment.

Clean, fresh water and salt blocks should be available at all times and especially as the kid is weaned from receiving milk at 8 to 12 weeks of age. Kids should start drinking from a bucket after weaning. Also, the kids should start eating some grain and hay.

While on milk or milk replacements kid should gain 150 to 200 gr/day,

Table 21. Weight at different stages

Age	Weight kg
At birth	3,5-3,8
3 months	15,3-18,0
7 months	29,5-35,7
20 months	40,8-58,0

At age of 2-3 month kid should have develop all 4 stomachs and be ready to wean.

17. REPRODUCTION OF GOATS

Reproduction mechanism is closely linked to lactation (milk production). Under normal conditions delivery is followed by lactation. Reproduction like lactation is under strong influence of external factors such as:

- *Nutrition - improved nutrition results in higher fertility*
- *herd management,*
- *accommodation.*

The normal breeding season for the dairy goat starts from late August through September i.e. when daylight starts to shorten. This effect can be used in artificial induction of estrus. Most of the does are bred in September, October and November and produce offspring in February, March and April. Because goats are seasonal breeders, the milk supply may be short for 2-3 months during the late fall and winter months. Planned mating through good record keeping and a sound breeding program will largely overcome this.

17.1. Age to Breed Does

Doelings (teenage female goats) reach puberty by 6 to 8 months of age and are usually bred at 7 to 10 months of age. At the time of breeding they should weigh about 36-40 kg (60% to 70% of weight of adult animals). If the doelings are not at an optimum weight, breeding should be delayed since puberty is more dependent on body size than age. However, delaying breeding much after 10 months of age decreases the reproductive performance. Growth rates of replacements should be monitored and their nutrition adjusted accordingly.

For two to three weeks prior to the breeding season does and doelings should be gaining weight. This is achieved by increasing the amount of energy being fed. Does managed in this manner will have an increased number of ovulations.

17.2. Signs of Estrus

Estrus is the period when the doe will receive the buck. Usually this period will last from a few hours to 2-3 days and is characterized by frequent and persistent "talking", tail wagging, and pink color as well as swelling in the external genital region-sometimes with a discharge. A lactating doe will usually drop in her milk production. The period between estrus' is from 17-21 days. To achieve the highest conception rate, it is best to breed the doe on day two of her estrus period.

During the breeding season bucks have a strong odor and should be kept in separate pens at all times. This will aid in being able to get the does bred over an extended period of time in order that milk will be available over a 12-month period and reduce the possibility of off flavors in the milk.

Maintain good records and record of all heat periods is an important tool in herd management.

17.3. Gestation Period

The gestation period is the time from conception to kidding. Normally this is a period of 145-155 days or on the average 5 months. The kidding interval should be about 12 months.

18. LACTACION (MILK PRODUCTION)

Lactation is the most important economical trait of dairy goats.

Lactation starts right after delivery. Length of lactation is a breed's property but usually lasts from 240 days to 300 days. Level of milk production depends on breed. Some breeds such as Alpine or Saana goats are selected for high production yielding between 700 to 1 000 l and more per season. Also, size of litter determines level of production, the bigger the litter the higher the milk production.

Milk production like other reproductive properties are under strong influence of external factors such as:

- *Nutrition – inadequate level of energy, proteins, minerals and vitamins lowers production*
- *Health status – Only healthy animals can produce milk safe for human consumption*
- *Number of milking per day – usually 2 milking per day but at the peak of lactation it is economically justifiable to introduce 3rd milking which increase production by 10%*
- *Accommodation – poor housing with inadequate temperature, humidity and draft negatively affect production*
- *Milking technique – only 70% of milk is let down right after milking start, additional stimulation is needed to harvest rest of 30%*
- *Weather condition – cold and heat negatively affect milk production*
- *Pregnancy status – after insemination milk production starts to drop*

Within individual lactation milk production rises with the first 6-8 weeks when it reaches its peak. However, peak of appetite does not match lactation peak but comes between 10-14 weeks after delivery.

Level of milk production raises from the 1st to the 3rd and 4th lactation and start to drop after 6th lactation but not as rapidly as it raises from 1st to the 3rd lactation.

Principal milk production of goats (unlike cows) is seasonal - mid-March through October, with the greatest flow in the warm months.

GOAT PRODUCTS

19. GOAT'S MILK

Although cow's milk and goat's milk have similar overall fat contents, the higher proportion of medium-chain fatty acids such as *caprylic and caprylic acid* in goat's milk contributes to the characteristic sour flavor of goat's milk cheese. (These fatty acids take their name from the Latin for goat, *capra*)

Table 22. Average composition of milks from various mammals. Source: *Fundamentals of Dairy Chemistry*, page 6. Ed.: Webb, B.H. and A.H. Johnson.

Species	Water	Fat	Protein (%)	Lactose (%)	Ash (%)	Nonfat Solids	Total Solids
Goat	87.00	4.25	3.52	4.27	0.86	8.75	13.00
Cow	87.20	3.70	3.50	4.90	0.70	9.10	12.80
Ewe	80.71	7.90	5.23	4.81	0.90	11.39	19.29
Human	87.43	3.75	1.63	6.98	0.21	8.82	12.57

19.1. Appearance and Flavor

In terms of its color, texture and taste, goat milk is similar to cow milk. However, goat milk can taste somewhat saltier and sweeter than cow milk. In addition, other factors may impact the flavor of goat milk, such as certain feed eaten by dairy goats. Goat milk products, such as goat milk cheese and yogurt, may have stronger flavor than equivalent cow milk products.

19.2. About goat milk

- *Goat's milk is naturally homogenized unlike cow's milk, due to its smooth texture, which makes it easy to absorb in the body and digest.*
- *Goat's milk contains less lactose than cow milk.*
- *Goat's milk contains more vitamins A and B than cow milk although both types of milk have the same levels of vitamins C, D, Iron, Protein and Fat.*
- *Goat's milk is a very good source of calcium and other minerals and trace minerals*
- *Goat's milk known for its medicinal properties*

Goat's milk is naturally homogenized since fat globules present in goat milk are smaller than those present in cow milk. As a result, the fat globules in goats milk do not cluster together, making them easier to digest. The mechanical homogenization process required for cow's milk releases the enzyme, xanthine oxidase, which has been shown to invade the blood stream and create scar damage to the heart and arteries. This damage stimulates the body to release cholesterol to lay protective fatty material on scars, causing arteriosclerosis. In naturally homogenized goat milk, this is not a problem because there is little or no absorption of this enzyme.

Naturally, milk of all mammals, including people, contains *lactose* – milk sugar. However, a lot of people who are diagnosed with lactose intolerance are able to consume goat milk which is easily digested. Because of its quick passage through the digestive system, goat milk leaves less undigested remains in the colon to ferment which usually cause unpleasant symptoms of lactose intolerance.

Goat milk proteins are more easily digested than cow milk proteins and absorption of amino acids is more efficient. The protein α s-1 casein, which causes allergic reactions in many people, and which, unlike in cow milk, is only found in traces in goat milk, you can freely consume goat milk.

Compared to cow milk, goat milk consists of 13% more calcium, 25% more vitamin B6 and 47% of vitamin A. It also contains higher concentrations of Chlorine, Copper and Manganese.

Children given goat milk have had better immunity, higher resistance to diseases, various viruses, had faster growth, optimal body weight and better bone mineralization compared to children given cow milk

19.3. Therapeutic properties of goat milk

Goat milk is healthy food with high advantage of being easily digested because of softer curds and smaller and thus more absorbable, fat particles. For these reasons, goat milk is extremely favorable for sensitive and slow digestive systems. *Goat milk is digested in about 40 minutes, while cow milk takes about 2.5 hours.*

Goat milk has great medicinal and therapeutic characteristics and has been known to aid/cure skin problems, assist respiratory and digestive processes in infants and promote all around good nutrition in humans. It is recommended to be used in cases of pulmonary diseases, various allergies, improving immunity, renewal of bone structure and enhancing activity of the digestive tract.

Goat milk does not contain the complex proteins that are the main stimulants of allergic reactions to cow dairy products.

Milk fat of goat milk contains *conjugated linoleic acid* which has been proved to have anticancerogenic effect. There have been numerous researches indicating that goat milk has anticancerogenic properties.

Goat's milk has long been used and recommended as an aid in the treatment of ulcers due to its more effective acid buffering capacity.

Goat milk is well-known for its therapeutic qualities to the skin. It moisturizes and balances the skin pH. This is because goat milk has the same level of acidity as human skin. Goat milk can greatly aid in healing cases of acne, eczema and dermatitis.

Goat's milk is a rich source of the trace mineral selenium. The trace mineral selenium, which is often deficient in the human body, is necessary for its immune modulation and antioxidant properties. It helps control the human immune system and works directly on viruses by preventing reproduction.

19.4. Whey

Whey is a byproduct in the process of making cheese. Goat whey is the pale yellow liquid that remains after *cassein* protein and cream are removed from the goat milk.

Goat whey was credited with eliminating everything from intestinal disorders to arthritis.

Goat whey contains protein from goat milk, which has a chemical structure that is very similar to human milk. Many lactose-intolerant individuals who have shied away from cow's milk products have

found goat whey much more tolerable. Rich in sodium, potassium and calcium, goat whey is highly concentrated and packed with minerals beneficial to the human body. Consistent use of goat whey can help restore weak joints and reduce the pain involved in movement, making goat whey very attractive to athletes.

Goat whey soothes the digestive and intestinal tract, strengthening the immune system in the process, helping protect the user from common infectious diseases. Goat whey is particularly effective in battling persistent gastrointestinal diseases.

Goat whey is a popular diet supplement for athletes because it is a great source of protein, vitamins, minerals and lactose. Athletes use goat whey to help build muscle and repair muscles strained by repetitive exercise or strenuous weightlifting. In addition to high levels of protein for muscle strength, goat whey contains potassium, magnesium, chloride and phosphorous, all minerals the healthy body needs.

Heavy with electrolytes, goat whey is restorative. Known as the fast protein, goat whey has a high metabolic absorption rate for rapid restoration of spent muscles. Goat whey protein contains valuable amino acids which fight fatigue and speed the recovery of muscles.

20. MEAT

Preferences and consumption patterns for goat meat are dictated by cultural, traditional, and religious backgrounds, and the socioeconomic status of the community.

According to FAO goat meat comprises 63 percent of all red meat that is consumed worldwide. Goats are the main source of animal protein in many North African and Middle Eastern nations. Goats are also important in Southeast Asia, the Caribbean, and other tropical regions.

Goat meat has been established as a lean meat with favorable nutritional qualities, and it is an ideal choice for the health-conscious consumer.

Table 23. Comparatives of the nutrient values of prepared meat. *Source:* USDA Nutrient Database for Standard Reference, Release 14 (2001)

Nutrient	Goat	Chicken	Beef	Pork	Lamb
Calories	122	162	179	180	175
Fat (g)	2,6	6,3	7,9	8,2	8,1
Saturated Fat (g)	0,79	1,7	3,0	2,9	2,9
Protein (g)	23	25	25	25	24
Cholesterol (mg)	63,8	76	73,1	73,1	78,2

As shown in *Table 23*, goat meat is lower in calories, total fat, saturated fat, and cholesterol than other meats. Less saturated fat and less cholesterol mean healthier red meat for the health-conscious consumer.

Less saturated fats and a relatively high proportion of total unsaturated fats make goat a very healthy meat choice. According to the Harvard School of Public Health, saturated fats (bad fats) increase the risk for cardiovascular disease and other chronic conditions, while unsaturated fats (good fats) improve blood cholesterol, ease inflammation, stabilize heart rhythms, and play a number of other beneficial roles.

Goat meat should be cooked and baked at low temperatures. Due to its low-fat content and lack of marbling (small streaks of fat found within the muscle), goat meat can lose moisture and toughen quickly if cooked or baked at high temperatures.

20.1. Production of goat meat

Size litter in more productive goats breeds ranges from 1,9 to 2,25 kids per season. In practice it means production of some 50-75 kg of live weight and 25-36 kg of kid meat per goat.

Some breeds selected for meat production have daily gains from 200-250 gr/day. Good results can be achieved by crossing domestic breed with meat breeds such as Boer breed. It would increase size of litter and daily gains too.

Apart from breed influence amongst factors that determine yield, quality and dressing percentage of meat are feeding pattern, age and sex.

If fattening animals are fed on rations with higher protein content daily gains and carcasses percentage are higher and conformations are better. Male kids have higher birth weight and higher weight at weaning from 10 to 25 % than in female kids. Male animals have higher dressing percentage than females because of richer muscles. Younger animals have higher dressing percentage than the older ones. Fatness refers to quantity of fat in the body. Goats deposit fat first internally and then subcutaneously (under skin). Ideal thickness of fat is about 2 cm evenly distributed over shoulders, ribs and hips.

Dressing percentage varies in goats between 35 and 53 %. Color of kid meat is light pink.

Having in mind prices of concentrated feed and capacity for meat production of domestic goat and their low daily gains, intensive fattening is not profitable. Production of goat meat should be organized on pasture as a part of dairy operations.

21. VERMICOMPOST

The process of producing *vermicompost* is called *vermicomposting*. Vermicomposting is a simple biotechnological process of composting, in which certain species of earthworms are used to enhance the process of waste conversion and produce a better end product. Vermicomposting differs from composting in several ways. It is a mesophilic process, utilizing microorganisms and earthworms that are active at 10–32°C (not ambient temperature but temperature within the pile of moist organic material). The process is faster than composting; because the material passes through the earthworm gut, a significant but not yet fully understood transformation takes place, whereby the resulting earthworm castings (worm manure) are rich in microbial activity and plant growth regulators, and fortified with pest repellence attributes as well. In short, earthworms, through a type of biological alchemy, are capable of transforming manure and other types of organic garbage into best natural fertilizer.

Containing water-soluble nutrients, vermicompost is an excellent, nutrient-rich organic fertilizer and soil conditioner widely used in organic farming.

Besides reducing the application of chemical fertilizers and pesticides that is detrimental to the environment, it is also confirmed that the water requirement of their plants was much less with the use of vermicompost because of its moisture-holding capacity.

An average commercial goat farm with a 100 goats can produce some 40 tons of manure. It can be turned into 20 tons of compost.

The production process is not complicated but requires specific technology, knowledge, enough food for worms (manure and other organic waste), water and awareness that it can be a way to make farm business more profitable.

One litter (1 kg of worms) of worms needs two 2m² of space and one ton of manure and other waste to eat which they turn into 0.5 ton of vermicompost. As they have very good reproduction rate one litter of worms under favorable conditions (enough fodder, water, ambient temperature over 10°C) can produce two more litters within a production cycle. One production cycle lasts 12 months. One litter of worms costs around 200 KM. Compost is harvested once a year, usually in early spring. Worms can live up to 15 years.

Current price of one ton of 1st class compost is between 600 and 800 KM. Part of the compost can be used for the farm production while the rest can be sold out to market.

22. DESIGN OF THE PROJECT

Bearing in mind that well organized goat farming with processing of milk on farm or linked with processing sector can offer employment opportunities and generate incomes for rural population a viable model will be presented here to exploit chances that this sub-sector can bring.

This project is foreseen as a pilot project with possibility to be implemented in one or more locations at the same time.

22.1. Location

Possible location of the project would be rural areas of under developed municipalities with significant returnee populations and precondition for goat sector. Vicinity of processors is an important factor. Possible locations are Stolac, Grahovo, Rudo, etc. List of municipalities is much longer since many municipalities are meeting above requirements. Processors who expressed their interest in collecting goat milk are located in various parts of BiH. (see ANNEX 1)

22.2. Concept

Essence of the project is creation of a producers' group with 10 goat farmers who would supply milk to the processor with two possible options:

1. *Milk is processed on one of the ten farms,*
2. *Milk is delivered to an already existing processor.*

Each of the 10 farmers would be supplied with 20 to 30 does. In case that that processing takes place on one of the farms lead farmer would be supplied with processing equipment.

Each farmer will enlarge his/hers herd gradually and in the 4th year have at least 50 does. It will be then a group of farmers possessing 500 does or more with capacity to produce some 250 tons of milk annually.

Size of groups can vary. Groups should be located in vicinity of farmers who are already processing milk or processors who expressed their interest in collecting goat milk. In various parts of BiH there are farmers who could be potential group leaders.

All relationships amongst farmers and processors will be strictly on commercial base. Farmers would borrow funds for the project from commercial banks.

UNDP would provide technical support through organizing extension service and training for the farmers. It will also help them in submitting claims for subsidies especially for capital investments. Depending on available funds UNDP may support farmers in purchasing of grain, or seeds for fodder, small machinery such as motocultivators, attachments for tractors and so on.

An UNDP mobile extension team would cover more location at a time. One team can effectively cover 80 to 90 farmers.

Farmers will be supported from the very beginning.

Training curriculum for the farmers would be developed and on-farm training provided. Various aspects of goat farming will be covered and will include but will not be limited to:

- *production of fodder,*
- *adequate feeding,*
- *reproduction,*
- *diseases,*
- *economics of goat farming,*
- *food safety, hygiene and milk quality*
- *animals' welfare.*

In case that processing is taking place on one of the farms appropriate trainings will be delivered too. Thorough analyses will be done in terms of quality of products and appropriate solutions will be proposed. Food safety standards will be of prime importance. Diversification of production, wherever possible, will be considered as a way to optimize production and enlarge economic effects. Special attention will be given to:

- *quality of flavor,*
- *body texture (for cheese) and appearance,*
- *consumers' perception of safety and nutrition.*

Marketing issues as an unavoidable part of business will also be worked on. Apart from establishing proper distribution and marketing channels attention will be given to:

- *availability of specialty types,*
- *branding,*
- *attractiveness of packaging,*
- *relative price of products.*

With this concept and small herds in the beginning farmers will have enough time to accept new technologies and have chance to learn husbandry system which will make of their business a successful story.

Ultimate aim is creation of sustainable working posts which will generate incomes for rural population. Also, experiences and lessons learned will be shared through multiplying this project or presenting experiences to interested stakeholders.

One of possible developments in the later stages of the project can be that some farmers, seeing opportunity to develop their own sales network act independently in the market and split from the group. This will in no way jeopardize project and is a wishful outcome.

Entrepreneurship is an important development driver in any society.

22.3. Resources

As earlier said, most of resources for this project could be secured from commercial banks and all relationship within the group and with the processor would be strictly on commercial base. Of course, part of funds could be secured through donor's funds but significant portion of funds should

be secured commercially. Many projects where funds were provided by donation 100% failed. Commercial approach makes farmers entrepreneurs.

Part of the funds for purchase of animals and equipment, reconstruction and construction of stables, repayment of interest rates, payment of insurance premiums and establishment of milk processing plants, foundation of associations and cooperatives will be reimbursed through the program of subsidies in the 1st year of the project. Farmers will need support in this segment by extension officers. These resources are significant and thorough analyses to gain best possible deal would be needed. A possible solution is foundation of cooperatives in order to facilitate fund allocations and gain more financial support.

Table 24. Goods to be procured for a group of 10 farmers

Goods to be procured	Value KM	Subsidies %
200 does	90 000	25
Reconstruction of stables	80 000	25
Processing equipment (if processing is taking place on a farm)	45 000	25
Vehicle for milk collection (if processing is taking place on a farm)	30 000	25
Quality control equipment	5000	
Total	240 000	25

If collection and processing of milk is organized by a processor processing equipment and vehicle will not be purchased.

Extension service and necessary logistics will be provided by UNDP in the 1st year. This will require 2 full time working posts and 1 part time job:

- *livestock specialist and*
- *food technology specialists*
- *marketing specialists-part time*

These 3 staff can serve 10 groups of this size with the distance between the groups in mind.

22.4. Selection of beneficiaries

Selection of beneficiaries is one of the most critical phases in each project. Beneficiaries would be selected through competitive process with clearly defined criteria through public call in cooperation with municipal and/or cantonal authorities. Adequate scoring system will be designed in order to properly evaluate each criteria.

Criteria to be considered but not limited to:

- *Social status (returnee status, age, gender, level of income),*
- *Available resources (available land, machinery, facilities, available labor force, work experience, borrowing capability),*
- *Marketing location, distance from main road*
- *Attitude to commercial approach and entrepreneurship*
- *Expressed interest to participate in the project under defined conditions*

22.5. Stakeholders

Selection of stakeholders is determined by nature of the project. They could be: municipal and cantonal authorities, regional extension services, Agriculture Institutes and Agencies, Veterinary Office and local veterinaries, Food Safety Agency (if processing is taking place on farm), Ministries of Agriculture, Custom Service (import of animals).

22.6. Environmental and Social Aspect

Goats can be successfully used in extensive grazing systems to control annoying vegetation, eliminate brush that feeds fires, and restore pasture quality as well as to produce meat for the market. As vegetation control agents, animals are managed intensively using high stocking rates to overgraze an area. The elimination of brush and weeds reduces competition for soil nutrients and moisture, and over time, improves the carrying capacity of pastures. In some parts of the country, dairy goats are hired out to work as weed-eaters especially in the deserted rural areas where weeds are an issue. This provides the preceding environmental benefits on a larger scale.

Another environmental aspect would be production of vermicompost as a natural fertilizer which subsequently reduce use of artificial fertilizers.

Important social aspect of the project is that it would increase supply of milk and related products which consumptions is beneficial in many ways and helps in battling various diseases (*see chapter 19*).

22.7. Employment and genders issues

Goat sector with orientation on milk production can offer significant number of working posts in rural areas.

System of a 10 farmer group can offer 15 working posts.

According to estimates obtained from the survey conducted amongst dairy processors in BiH in January 2011 (see chapter 7.3.2.), current demand for goat milk range in this sector ranges from 14 000 to 25 000 litters of milk/day. This would mean 7 000 to 12 500 dairy goats in the first phase. This would, in other words mean, 70 to 125 herds of a 100 goats which can offer 140 to 250 working posts. Bearing in mind that this is just initial estimation and that over 20 milk processors (small and medium) were not interviewed and taking into account indications from regional markets on growing demand for milk products these quantities would be significantly higher. Also, it is concluded that most of the milk sales is organized through direct sales (farmers to consumers). This indicates that this segment too, can offer significant number of work posts.

Realistically, as we could see in our model, growing of dairy goat population which is a bases for growing of this sub-sector in the improved husbandry system can be increased by 250% in 4 years period, or a herd with 20 does in the 1st year can in the 4th year be a herd of 50 does. A herd of a 50 does can provide 1,5 job. A herd of a 100 does offers 2 full time jobs. If processing is taking place on the farm with the developed own sales network it can generate additional 1,5 to 2 working posts.

Goat farms are family job involving equally men and women. Processing sector is traditionally women's area.

Narrative summary	Expected results	Performance measurement	Assumptions / Risks
<p>Goal</p> <ul style="list-style-type: none"> to create employment opportunities for poor within the value chains in goat sub-sector to secure new markets for goat sub-sector products 	<p>Impacts</p> <ul style="list-style-type: none"> Supported entrepreneurship efforts of rural population especially amongst women Developed new value added products within goat sub-sector Developed model that would be applicable in various regions 	<p>Impact indicators</p> <ul style="list-style-type: none"> Client's satisfaction Economic indicators Sales indicators 	<p>Impact assumptions</p> <ul style="list-style-type: none"> Demands for goat products will rise Need to expand model to other regions
<p>Project objectives</p> <ul style="list-style-type: none"> to increase number of goat commercial farms in under-developed rural areas and using improved husbandry technologies thereby increase volume of goat farming production to create farmers' groups in order to increase volume of standardized goat sector products to link goat farmers' groups to the potential market channels and sales opportunities 	<p>Outcomes</p> <ul style="list-style-type: none"> Increased goat sector production capacity Introduced new goat dairy processing Increased number of value added products Increased number of producers with outlet to market Introduced and improved food safety standards within the groups Better understanding of advantages of joined marketing approach 	<p>Outcome indicators</p> <ul style="list-style-type: none"> Profitability indicators Efficiency indicators Consumers' satisfaction Products' quality Gained certificates 	<p>Outcome assumptions</p> <ul style="list-style-type: none"> With stable prices of products profitability will stay on the same level Need for production expansion is obvious Improved techniques and lessons learned will keep consumers' satisfaction on high level
<p>Resources and activities</p> <p>200 000 KM borrowed from commercial banks per a group</p> <p>Coverage: 10 group of 10 farmers</p> <p>Timeframe: 24 months</p>	<p>Outputs</p> <ul style="list-style-type: none"> Gained knowledge on new technologies in the primary production sector Gained knowledge on goat dairy processing technologies Gained awareness on importance of food safety standards Purchase of 200 goats 	<p>Output indicators</p> <ul style="list-style-type: none"> Questionnaires Performance log books 	<p>Output assumptions</p> <ul style="list-style-type: none"> Quality assessment Accountability Effective trainings Good selection criteria

ANNEXES

ANNEX 1. LIST OF INTERVIEWED PROCESSORS

	List of interviewed processors which expressed their interest in collecting goat milk
1	Meggle Bihac
2	Nocno Zivinice
3	Mljekara Gornji Vakuf
4	Mljekara Kupres
5	Mljekara Livno
6	Vitmark Kotor Varos
7	Maja Gacko
8	Padjeni Bileca
9	Perfeto Nevesinje
10	Glogovac Nevesinje
11	Dedic Breza
12	Dramond Mokro Pale
13	Mljekara Rakitno
14	Pudja and Perkovic Livno
15	Mljekara Sipovo
16	Snjegotina Teslic
17	Nur Travnik
18	Tippas Posusje

	List of processors which did not express their interest in collecting goat milk
1	Milkos Sarajevo
2	Inmar Gradacac
3	Natura Vita Teslic
4	Bjanka Zvornik
5	Mlijeko product Kozarska Dubica
6	Mljekarska Industrija Banja Luka
7	Tuzlanska Mljekara

ANNEX 2. Possible feeding rations for different production levels

Level of production 1 l of milk
Summer
✓ Pasture
✓ Hay 0,2 kg
Winter
✓ Hay 1,7 kg
✓ Beet root pulp 3 kg

Level of production 2 l of milk
Summer
✓ Pasture
✓ Hay 0,3 kg
Winter
✓ Hay 1,9 kg
✓ Beet root pulp 3 kg
✓ Corn 0,3

Level of production 3 l of milk
Summer
✓ Pasture
✓ Hay 0,3 kg
✓ Beet root 0,4 kg
Winter
✓ Hay 1,9 kg
✓ Beet root pulp 0,6 kg
✓ Grains 0,5

Level of production 4 l of milk
Summer
✓ Pasture
✓ Hay 0,3 kg
✓ Beet root 0,4 kg
✓ Grains 0,5
Winter
✓ Hay 1,5 kg
✓ Beet root 3,5 kg
✓ Grains 1,2

ANNEX 3. LIST OF CONTACTS

Farmers

1. Dzevad Kovac, dzevad.kovac@gmail.com , farmer and processor , Mostar, 061 273 676
2. Sukrija Celamen, farmer and processor, Zenica ,032 438 039
3. Hazim Tahirovic, farmer and processor, Travnik, 061 592 847
4. Branislav Rajic, farmer and processor, Laktasi, 065 621 772
5. Sulejman Huseinovic, farmer and processor, Kljuc ,061 163 389
6. Zilic Fatmir, farmer and processor, Zenica, 061 795 800
7. Zeljko Perko, farmer and processor, Siroki Brijeg, 063 443 240
8. Marin Mioc, farmer and restaurant owner ,Kupres, 063 929 096
9. Renato Delic, farmer, 065 346 689, Ustipraga
10. Selver Perijan, farmer, Gorazde, 062 564 529
11. Elfad Masala, farmer, Gorazde, 061 136 970
12. Mladen Celan, farmer, Livno, 063 836 383
13. Sveto Matic, farmer, Srbac, 065 510 899
14. Radovan Topic, farmer, Sipovo, 065 664 513
15. Zeljka Sidran, farmer, Stolac, 036 853 756,

Entrepreneurs

1. Senija Rakovic, Novi Grad sigma.novigrad@yahoo.com, 066 674 148
2. Pero Galic, Siroki Brijeg, 063 623 229
3. Nedeljko Tesic, Miora, Banja Luka, 065 466 631, office@miora.info
4. Samir Vitoskic, Sarajevo, 062 334 255
5. Slavko Poznanovic, Bihac, 065 446 056
6. Elevedin Mehic , ZZ Eko Vlastic, 062 965 700 zz_ekovlastic@yahoo.com

Processors

1. Meggle Bihac, Vedad Pasic, 063 896 416
2. Pudja I Perkovic, Livno, Marjan Pudja, 063 371 643
3. Nocko, Zivinice, Nusret Nocijevic, 061 196 133
4. Padjeni Bileca, Nenad Vukoje, 065 520 909
5. Zenicka mljekara, Eniz Saric, 032 457 458
6. Milkos Sarajevo, Rasim Palic , 061 563 742
7. Mljekara Gornji Vakuf, 061 183 092
8. Mlijekoprodukt , Kozarska Dubica, Snjezana, 052 448 244
9. DTD Snjegotina, Vjekoslav Jovic, 053 453 000, 065 510 937
10. Tuzlanska mljekara, Stjepan Vilusic, 061 896 454
11. Inmar Gradacac, 035 822 055
12. Banjalucka industrija mlijeka, 051 307 663

13. Mljekara Sipovo , Pero Millojevic, 050 372 195,065 978 951
14. Vitmark, Kotor Varos, 065 689 970
15. Perfeto Nevesinje, Gordana Kljakic, 059 610 080, 066 116 696
16. Glogovac Nevesinje, 059 602 656
17. Mljekara , Kupres, Ruzica Hrvoje, 063 820 060,
18. Dramon Mokro, Pale, 057 233 194, 065 521 709
19. Maja , Gacko, Vukovic Mladen, 059 473 020
20. Natura Vita, Teslic, Zoran Cupic, 065 441 354
21. Mljekara Dedic, Breza, 061 985 411
22. Mljekara Susa, Livno ,034 265 050
23. Nur Travnik, 061 593 643
24. Tippas, Posusje, 039 681 246
25. Mljekara Rakitno, Tomislav Pavkovic Siskovic 039 692 085
26. Select Milk, Indjija, Serbia, Milovan Bulatovic , 00 381 22 554 5632,

Extension Services

1. Dubravko Pocrnja , Agromediteranski Zavod, Mostar, 063 997 123
2. Mladen Stojanovic, Agencija za Selekciju u Stocarstvu RS 065 983 748

ANNEX 4. PICTURES



A farm in Herzegovina



A modern farm in W. Bosnia



A farm in Banja Luka region-intensive system



Interior of the above farm in W. Bosnia



A goat farm in the Sava region



Feeding lot in the outlet



Mixed herd of Alpine and Saanen goats



A nice Alpine herd in Gorazde

A



Goats on winter browse in Herzegovina



Outlet

PROCESSING



Cooling tank



Pasteurizer on a farm



Dairy (processing equipment) part of a goat farm



Vacuum machine



Building of a dairy which should be opened in March 2011

CHEESES



Mjesesinski cheese in ripening chamber



Mjesinski cheese in vacuum package ready for market



Mjesinski cheese in plastic boxes ready for market



Hard cheese



Hard vacuumed cheese



Fresh vacuumed cheese



Cheese in olive oil and chilly paper



Hard cheese

MARKET



Market



Milk, yoghurt, whey on the shelf



A shop in Banja Luka selling goat products