

# FAO Prevention of Food Losses Programme

## **Milk and Dairy Products, Post-harvest Losses and Food Safety in Sub-Saharan Africa and the Near East.**



## **A Review Of The Small Scale Dairy Sector – the Syrian Arab Republic**

**June 2003**

## **ABBREVIATIONS AND ACRONYMS**

<b>ACB</b>	Agricultural Cooperative Bank
<b>AHD</b>	Animal Health Directorate
<b>APD</b>	Animal Production Directorate
<b>AWRA</b>	Animal Wealth Research Administration
<b>FA</b>	Faculty of Agriculture
<b>FAO</b>	Food and Agriculture Organization of the United Nations
<b>GCE</b>	General Cattle Establishment
<b>HACCP</b>	Hazard Analysis Critical Control Point
<b>HF</b>	Holestein Friesian
<b>MAAR</b>	Ministry of Agriculture and Agrarian Reform
<b>MI</b>	Ministry of Industry
<b>MHE</b>	Ministry of High Education
<b>MS</b>	Ministry of Supply.
<b>NPLCG</b>	National Project for Local Cattle Grading
<b>SAR</b>	Syrian Arab Republic
<b>VC</b>	Veterinarian College
<b>S.P</b>	Syrian Pound (\$1=51 S.P)

## Table of Contents

Abbreviations.....	2
Table of Contents .....	3
Executive Summary.....	4
<b>1. Introduction</b>	<b>6</b>
1.1 Background .....	6
1.1.1 History of governmental and private dairy sector involvement...	6
1.1.2 Development over the last 30 years.....	6
1.1.3 Inventory of lessons learnt from the past and ongoing interventions in the small-scale dairy sector.....	8
<b>2. Current situation</b>	<b>9</b>
2.1 The process of policy making and the current policy framework	9
2.2 The level and extent of current policy implementation.....	12
2.3 The relevant institution in the dairy sector.....	12
2.4 Milk production systems in Syria.....	13
2.5 The existing marketing systems.....	15
2.6 The type and level of post-harvest losses.....	16
2.7 Consumption patterns.....	18
2.8 The level and extent of public health risks posed by milk.....	18
2.9 Dairy Information Systems.....	19
2.10 Strengths, weaknesses, opportunities and threats.....	19
<b>3. Future</b>	<b>23</b>
3.1 The potential role of small-scale dairy farmers.....	23
3.2 A strategy for including the informal sector in the sub-sector improvement program.....	23
3.3 Recommendations to reduce post-harvest losses of milk and dairy products.....	24
3.4 Identification of Critical Points in the dairy chain.....	24
3-5 Detailed recommendations on how to reduce post-harvest losses of milk and milk products.....	24
3-6 Hygienic rules for milk processing units.....	25
3-7 Staff hygiene.....	26
3-8 Production hygiene.....	26
3-9 Cleaning and disinfection.....	26
<b>4. Recommendations</b> .....	<b>26</b>
4-1- Animal production	27
4-2- Industry	27
4-3- Consumption	27
4-4- Trade	27
<b>References</b> .....	<b>28</b>
Annex 1 Tables.....	29
Annex 2 Figures .....	34

## **Executive Summary**

Syria had 0.84, 12.4 and 0.98 million heads of cattle, sheep and goats in 2001, producing 1.03, 0.48 and 0.06 million tones of milk respectively. The Friesian, local improved (upgraded), local Akshi and local Shami cattle made up 15.4%, 66.07%, 17.4% and 1.1% of the total number of cattle, and produce 25.8%, 67.6%, 5.6% and 0.9% of total milk, respectively.

### **The dairy cattle production sector is comprised of :**

- Public sector (11 farms, 300 – 500 Holstein Freisian (H.F) dairy cows each).
- Co-operative sector (a few enterprises, 20-50 H.F dairy cows each).
- Private modern enterprises (12 farms, 100-150 H.F dairy cows each).
- Private small-scale farmers (unknown number of farmers having 2-10 dairy cows of various breeds).

### **Milk Processing and Marketing:**

The first three sectors mentioned above generated 5% of the total milk production which goes mainly to the formal milk market. Private small-scale farmers produce 95% of the total milk production which goes mainly through the informal milk market. Only 10% of the dairy cow milk is processed by modern processing plants (3 public and 12 private) into safe milk and dairy products which are packed in bottles, cartons or pouches.

In the informal sector some of the cow milk and most sheep milk is processed at the production site. It is usually processed using traditional methods into yoghurt, cheese and ghee, which are sold in the city streets by the farmers themselves or through processors/vendors without any effective controls. Some cow milk is collected by informal dealers, who sell it to processing factories or small milk processing units. The former government policy was to increase the amount of milk available at a low price for the majority of people, and to improve the welfare of resource-poor livestock holders.

The current suggested policy focuses on the quality of milk and dairy products, through reorganizing, and improving the dominant small-scale dairy sub-sector. The strengths of the smallholders sub-sector include a recent increase in milk production, and noticeable willingness of the stakeholders to improve small-scale dairy. The weakness of the sub-sector is the current milk production, processing, and marketing systems. In addition the lack of information, experience, management, and training in various aspects limits the development of the small-scale sub-sector.

The opportunities include the government policy which aims to reorganize and improve the dairy sector with the help of regional and international expertise.

The threats which are growing rapidly and continuously for both the small-scale farmer's and small-scale milk processors/vendors include continuous importation of large quantities of low price milk powder which negatively affects the development of dairy sector in general.

***The overall post harvest milk losses of small-scale dairy sub-sector range between 10-15% in summer and 2-5% in other seasons. The losses of the public sector do not exceed 1% in summer.***

To improve the dairy sector in Syria, interventions should be focused on reorganizing the production, processing and marketing systems. Critical procedures should be taken to prevent or limit the importation of the milk powder. Planning for an actual price policy of milk and dairy products is suggested.

***Improving the formal milk culture, the co-operative culture, the improved management and training are the keys to improve the dairy sector and realize any project in this field.***

## **1- Introduction**

### **1.1 Background:**

Syria has a Mediterranean type climate, a total area of 18.518 million hectares, and a population of 18.392 million (2001). Syria may be divided into 5 agro-ecological zones according to rainfall and agricultural activities. Natural grazing, agricultural, uncultivated land and forests account for 45%, 32%, 20% and 3% of total land, respectively. About 65% and 16% of the agricultural lands are cultivated and irrigated. Total water precipitation was 51.5 million cubic meters, of which 89.3% was rainfall, and 9.7% from rivers and springs (1998). Agriculture contributes about 27-32% of the net domestic income, of which animal production accounts for 28-31%.

#### **1.1.1 History of governmental and private dairy sector involvement:**

The modern dairy industry started in Syria in the 1960's when the government had started to import H.F cattle into Syria. Before that time the main source of milk and dairy products was local sheep, cattle and goats which were raised in marginal farms or extensive production systems. Similarly milk processing and marketing were carried out using traditional methods.

The first shipment of imported H.F cattle was for 3 new state farms and for 10 farmers co-operatives. After that, the dairy sector grew rapidly to meet the increased demand for dairy products to achieve self-sufficiency, especially for the big and growing cities in Syria. The newly established state farms (11 farms) and many small-scale farmers have seen the advantages of high productivity H.F cows and neglect the local, low productivity unimproved cows.

#### **1.1.2 Development over the last 30 years:**

The Ministry of Agriculture and Agrarian Reform (MAAR) has built infrastructure and provided facilities to increase milk production in Syria. One of the most important projects in this field was the National Project for Local Cattle Upgrading (NPLCG) which had been started in the 1970's. The NPLCG aimed to upgrade the local cattle (Akshi) by crossbreeding them with Friesian sires gradually to improve the milk production traits. The production of the local Akshi cow was about 766 kg of milk per annum, while the production of improved local cattle was about 2625 kg. This project is still ongoing.

The immediate objectives of NPLCG were:

- To supply the small-scale farmers with good and low price milking cows.
- To improve rural livelihoods and provide small farmers with regular income and create off-farm employment.

The overall objective was to increase milk production in Syria to meet the growing demand for milk and dairy products.

Over the last three decades some investors started to invest in the dairy sector. They formed the medium size private dairy projects (100-200 milking cows).

Sheep milk processing takes place at the production site. It is usually processed by traditional methods into yoghurt, cheese and ghee. Roughly 10% of cow milk produced is consumed fresh within the milk producer families. 15% is processed by traditional methods into cheese and yoghurt by small-scale processors. Over 60% of the produced milk is distributed as raw milk in open containers informally to consumer's door by a network of milk vendors and milk dealers who collect the milk from small-scale farmers. This product (hereafter referred to as "informal milk") is characterized by the lack of any treatment or control.

The modern dairy processing sector has been developed during the last three decades. It is divided into public and private enterprises. The public sector is composed of 3 state-owned dairy factories located in the three main cities i.e., Damascus, Homs and Aleppo. These plants are generally characterized by 36 year old equipments with a daily processing capacity of 72,000 liters of which 50% as liquid milk and 50% as dairy products (cheese and yoghurt).

The private sector is composed of some modern processing plants (8 plants), and characterized by modern machines and technology, whose processing capacities are underutilized because of the limited availability of good quality raw milk and limited market demands for processed milk due to the high price. They produce pasteurized milk (short shelf-life), sterilized milk (medium-long shelf-life), UHT milk (long shelf-life). Those products are packed with different materials such as HDPE and PET bottles and aluminium/plastic/cardboard packs. Cows milk processed by modern technology makes up about 10% of total production.

There is a remarkable and growing demand for modern processed milk and milk products at a reasonable price. The informal milk used to have a low price especially in spring and early summer when sheep milk production peaks. Due to the increase in the amount of smallholders involved in dairying an increased amount of milk is available in the informal sector. During peak season this has resulted in lower prices for milk and milk products. Income has consequently decreased for all producers and processors.

### **1.1.3 Inventory of lessons learnt from past and ongoing interventions in the small-scale dairy sector:**

The strategic plans of the MAAR through the last decades were based on the following:

- Improving the welfare of resource poor livestock holders through:
  - Providing them with high or medium productive cattle (H.F or upgraded local cattle)
  - Giving them easy loans to buy some feedstuffs to feed their animals.
  - Providing them with semen and animal health care free of charge.

These plans match the policy of sustainable development of rural resources, providing the citizens especially, the low-income consumers, with the most valuable food through increasing the supply of milk and dairy products.

This strategy has had several weaknesses which are caused by the current situation of the dairy sector in Syria. This might be characterized by the following:

- Very high number of small-scale farmers, spread all over the country, with few milking cows, poor equipment and in general, without any cooling and transport facilities.
- The raw milk produced by the small-scale farmers has generally low quality level, poor hygienic standards, high level of acidity and significant losses.

The informal milk used to have a low price depending on demand and supply. Milk production in Syria has a high seasonal fluctuation with peaks in spring and summer, which severely affects the income of small-scale farmers.

- The last strategy for increasing milk production through the small-scale farmers was not accompanied by an actual policy covering collection, cooling, and modern processing and marketing systems.
- There were no effective registration systems or breeder's association on any geographical level, to control and monitor the production and marketing problems of the small-scale farmers.

***So, it is clearly understood now to stakeholders that there is a big necessity to work on a revised strategy to improve the dairy sector in Syria, which includes food control systems, product quality and reduction of post harvest losses. The focus point of this strategy is the improvement of the small-scale sector.***



## **2. Current situation:**

### **2.1 The process of policy making and current policy framework:**

The Ministry of Agriculture and Agrarian Reform (MAAR) with the other governmental institutions conducted several studies and held 2 meetings about the dairy sector in Syria. A meeting was held on 28/02/2001 at the Faculty of Agriculture (FA) Damascus University with cooperation of MAAR, Ministry of Public Health, Ministry of Supply, Ministry of Industry and other institutions to analyse the current situation of production, processing and marketing of milk and dairy products, and to control dairy products quality and safety. At that meeting there was a suggestion to conduct a project titled "Control Cattle Milk Production, Quality and Safety in Syria". A group of Italian experts completed a study in July 2002 on "Dairy Sector Improvement Program in Syria" with the cooperation of MAAR.

*The overall results of the studies conducted were included in the draft policy which was designed to improve the dairy sector in Syria. The basic framework of the policy suggested was:*

#### **2-1-1 Milk Production:**

- Defining the role of the public sector, which acts through the General Cattle Establishment (GCE), in research and extension. The GCE owns 11 big scale farms (herd size from 300 to 500 dairy cows) and produce about 22 thousands tones of raw milk per annum. The GCE has to sell the milk produced to the public dairy processing sector, which is composed of state-owned dairy factories located in the main big cities (Damascus, Aleppo and Homes).  
This entails minimizing the role of the public sector in the field of milk production, but on the other hand enhancing the milk production in the private sector.
- Developing the small-scale farmers sector which produces about 95% of cows milk produced in Syria. This should be done through making changes in the systems of milk production, processing and marketing.
- Supporting the recent medium size enterprises (100 – 200 dairy cows), and enhancing the investments in this sector by offering easy loans from the Agricultural Cooperative Bank (ACB), and providing them with the needed facilities and requirements.
- Planning an integrated programs for genetic improvement of local and imported cattle focusing on traits related to milk quantity and quality.
- Planning effective training and extension programs to improve the performance of small-scale farmers in the field of animal husbandry, nutrition, reproduction and health care.

- Organization of breeder's associations or cooperatives in the areas where large number of small-scale farmers are found. The roles of these associations are as follows:
  - Controlling the milk production process from the animal to the consumer.
  - Planning specific local projects in order to control milk production, processing and marketing.
- Studying the cost of milk produced in all production systems, and suggesting a suitable range for its selling price.

### **2-1-2 Milk Marketing:**

- Establishing milk collection and cooling centers in the areas where large numbers of small-scale farmers are found.
- Suggesting and testing integrated production and processing systems in milk production areas.
- Development and application of appropriate, strong and suitable regulations on milk marketing. This should include a stepped approach to improving practices and standards.
- Application of codex approaches such as the Hazard Analysis and Critical Control Point (HACCP) system.

### **2-1-3 Milk processing:**

- Supporting the public dairy sector to achieve the goal of providing the majority of potential milk consumers with good quality milk at a reasonable price.

This target can be approached by rehabilitation of the processing lines in the state factories.

- Enhancing investment in the dairy processing sector.
- Improving the acceptance of milk and dairy products as a valuable, nutritious and safe product (hereafter referred to as the “milk culture”) and the level of education all over the country, either through the sale (and marketing activities) of the products, or through direct facilitating activities, like awareness raising, campaigns, sector regulation and supervision, promoted by the public and private sectors together.
- Controlling the small-scale milk vendors, through gradual application of strict hygienic and safety regulations.
- Providing training and technical assistance to women in the small-scale dairy sector to produce the traditional dairy products of good quality with appropriate safety measures.

#### **2-1-4 Enhancing research work to improve the quantity and quality of milk, and to resolve the problems of processing and marketing.**

The Animal Wealth Research Institutions in Syria defined their main goals in the field of animal production to increase the quantity and quality of milk produced from all local farm animal resources (including HF cattle) through the following:

- Putting into practice genetic improvement programs.
- Improving the nutritive value of crop residues and using them for ruminant feeding.
- Conducting experiments to improve the quality of dairy products.
- Conducting some surveys to describe the marketing channels of milk and dairy products produced throughout all branches of dairy sector.
- Conducting research work in the fields of nutrition, husbandry, health care and reproduction.

#### **2-1-5 Suggesting and testing new socio-economical production systems.**

The recent common production system can be mainly described as a small scale dairy production system. This poses a challenge for the government programs to improve the dairy sector in general. There is an urgent need to improve the small-scale dairy sector and shift it gradually towards a cooperative production system.

It would be very difficult to complete this process using a dictated or command approach. Small-scale farmers need to be firstly convinced of the benefits of group activities by demonstrating the advantages of joint projects or enterprises, which reduce losses and produce safer milk and dairy products.

The medium scale dairy sector may play an active role in creating such a modified cooperative production system. Figure 3 (Annex 2) shows a flow diagram for an integrated dairy project which depends on the cooperation between small-scale dairy farmers and medium scale dairy investors. The two mentioned dairy sectors are working separately in some areas in Syria. The question is how they can co-operate to ensure their stability and gain more benefits from adding value to their milk. Otherwise the small-scale dairy sector could be developed if collecting and cooling centers and dairy plants are established in the areas where big quantities of milk are produced by the small-scale dairy sector.

## **2-2 The level and extent of current policy implementation:**

During the last two years, the implementation of the new suggested policy has started in several fields. Two milk collection centers were established in different areas in Syria. But there are still serious problems concerning marketing and the price of raw milk. This may be due to the absence of milk processing factories near the collecting centers. On the other hand, there is a noticeable weakness in the organization and management of these centers.

*The implementation of the current policy is facing problems such as, the lack of experience, training, management and funding.*

## **2-3 The relevant institutions involved in the dairy sector:**

**2-3-1** MAAR has the full authority for organizing, supervising and providing the services for animal wealth through the following institutions:

- Animal Production Directorate (APD) which is the institute that involved in:
  - Supervising the NPLCG for improvement of local cattle.
  - Supervising the artificial insemination program for cattle in all dairy sectors.
  - Planning the breeding programs for livestock.
  - Giving the license for animal production enterprises.
  - Collecting the information and statistics about the animal wealth through applying limited registration plans.
- Animal Health Directorate (AHD):  
The main activities of AHD are the following:
  - Setting the programs of health control of the animal wealth.
  - Supervising the public vet. laboratories.
  - Supervising the production of animal drugs and vaccines in Syria.
  - Providing the farmers at all sectors with health care services, vaccines and advice without charge through the veterinary units scattered all over the country.
  - Setting the health regulations for importing animals, animal products, animal feeds and animal drugs to Syria.
  - The issuance of animal health certificates.
- General Cattle Establishment (GCE):  
GCE supervises the public dairy production sector and has 11 public farms distributed all over the country.
- Animal Wealth Research Administration (AWRA) which is responsible

for the scientific research in the field of animal production and health.

### **2-3-2 The Ministry of Industry (MI):**

The main roles of MI are to organize, supervise and control the food industry, including the dairy processing sector (factories).

### **2-3-3 The Ministry of Supply (MS):**

The main roles of MS are to design and implement the regulations and standards for food products, including milk and dairy products. The MS also supervises the Food Quality Laboratories.

### **2-3-4 The Ministry of Higher Education (MHE):**

The 5 Faculties of Agriculture (FA) and one Vet. College, (VC) which belong to the MHE shares with AWRA responsibilities in conducting studies and research work in all fields of animal production and health. The staff of Faculties of Agriculture and Veterinary Collage cooperate with MAAR through the joint committees.

The activities of these committees include:

- Planning all national programs of animal production and health care.
- Exchange experience and experts.
- Training and extension.
- Planning the dairy sector policy.
- Defining national research priorities.

## **2-4 The Productions Systems and Milk Production in Syria:**

Syria had 0.84, 12.4 and 0.98 million heads of cattle, sheep and goats in 2001 producing 1.03, 0.48 and 0.06 million tones of milk, respectively. ( Annex. 1 Tables). The H.F, local improved, local Akshi and local Shami cattle account for 15.4%, 66.07%, 17.4% and 1.1% of the total cattle number, respectively and produce 25.8%, 67.6%, 5.6% and 0.9% of the total cow milk production.

### **2-4-1 The Production systems:**

- **The Extensive Production System (EPS):**  
The EPS is the most common production system for sheep, mountain goats and some of local Akshi (unimproved) cattle. Most of milk produced in this system is processed informally at the site of production into yoghurt, white cheese and ghee by traditional means.
- **Margin Farm Production System (FMPS):**  
The FMPS is the most widespread production system for the Friesian, local improved, some local unimproved and Shami cattle. Most of the cow milk (95%) for the informal sector comes from this production system. It consists mainly from small-scale cattle holders, who rear a few animals in the suburban areas.

- **Semi-Intensive Production System (SIPS):**  
There are just a few big sheep enterprises and many medium-scale sheep flock owners. This system is growing noticeably. The main output of this system is sheep meat and milk.
- **Intensive Production System (IPS):**  
This system is typical for the private medium size enterprises (100-200 heads) and public large-scale (300-500 heads) dairy cattle farms. The large dairy farms and the private medium scale enterprises belonging to the system are distributed throughout the country. The milk produced by this sector composes of 5% the total cow milk production. The milk produced is transported to dairy processing plants after cooling, and then is then processed into yoghurt, liquid yoghurt, cheese, pasteurized and sterilized milk in compliance with the hygienic and safety standards. This may be considered as the formal sector.

#### **2-4-2 Milk Production in Syria:**

Total milk production in Syria was 1.57 millions tones, of which cow milk was 64%, sheep milk 30.6%, goats, milk 3.9%, and buffalo milk 0.1% in 2001. Milk availability per caput was 95 kg per annum, and is still under the recommended target which is 100 kg (FAO/WHO recommendations). Most of the milk produced in Syria (about 95%) is passing through the informal market. Milk powder imports have increased continuously during the last few years, mainly in winter, due to the low price and high hygienic standards. The cost of the milk powder importation increased from \$4 million in 1990 to \$59 million in 2000. The latter sum covers about 0.25 million tones of fresh milk. The importation of milk powder and some quantities of butter and ghee is still ongoing, and is locally repacked for distribution through retail-shops.

## **2-5 Description of the existing marketing systems for small-scale milk producers and stakeholders:**

Nutritional security is one of the important challenges facing the growing population in Syria. It has become a national aim and daily concern for the security and stability of the country. Small ruminants are an important source of protein. Nowadays, the per caput consumption of animal products is an indicator for human development. The per caput consumption of animal protein in Syria is less than many developed countries. The government pays special attention to the animal production sector by encouraging farmers and animal owners. Meat and milk are the main products from cattle and sheep and they are also the main source of animal protein in Syria. In addition, fresh milk is an important source of nutrition for children. Milk products (yoghurt, cheese) form part of the main meals in Syria. The high rate of population growth in Syria is one of the important reasons for the need for milk production development, milk and dairy product loss reduction and quality improvement.

### **Dairy Processing:**

#### **• Public dairies**

There are 3 public dairies in Syria, which producing 15,805 tons of long shelf life milk 12,200 tons of yogurt, 2,709 tons of concentrated yoghurt (Labneh), 1,150 tons of cheese and 1,621 tons of butter. These dairies are still using old equipment.

#### **• Private dairies**

There are two kinds of dairies:

The first one is applying modern processing technologies. Table 5 shows the capacity and number of the dairies in the larger Syrian cities. These dairies are mainly processing cow and goat milk into cheese and yoghurt. Their production capacity accounts for 8% of the total cow and goat milk production. The second is the traditional processing units whose estimated capacity is 5-10% of the total milk produced in the cities and 40-60% of the total sheep and goat milk in the Steppe.

### **Milk marketing:**

#### **Cows milk :**

- Milk marketing to the public dairies. Public dairies are buying the milk from cooperatives by yearly contracts. Prices are fixed in the contracts as for daily milk deliveries.
- The standard milk prices for cooperatives are defined by the agriculture department based on the feeding cost and its price in addition to the farmers margin.

- The standard milk price is defined for milk with at least 3.3% fat and titratable acidity <19. When the fat content reduced by 0.1% the price is reduced by 0.01 Syrian Pound (S.P) more or less. If the milk acidity is 19.5 the milk prices decreased by 1 (S.P). Milk will not be accepted when the titratable acidity is >20.

Farmers normally send their milk to the cooperative and the cooperative will send the milk to the dairies according to contract negotiated.

There is another emerging channel where the cooperative sells the milk to dealers, and the dealers send the milk from the collecting centers to the dairies.

The independent farmers sell their milk directly or through a middle man to the dealer. The dealer may cool the milk, or collect it without any cooling. This affects the milk quality especially in summer. The milk is often transported in plastic container without cooling. This may cause more milk losses. The dealer may sell the raw milk directly to the consumer.

Small processing units are buying also milk directly from the farmers and produce mostly yoghurt. The Governmental Supply Department checks the milk and milk products in the market by taking samples for analyses, as well as checking products in dairies and shops.

### **Goat and Sheep milk**

Normally farmers are processing the milk into cheese and yoghurt. Products are sold to the consumers through middlemen and dealers. Market channels are affecting the prices. The price is subject to seasonal change due to the higher quantity of milk available in springtime.

In the steppe, processors buy the milk from the Bedouins and process it without any quality control. They transport the products in poor hygienic conditions. The milk products are sold through dealers who determine the prices.

## **2-6 Identification and quantification of the type and level of post harvest losses in the small-scale dairy sector**

During milk processing there can be losses. The losses are caused by many factors including:

- **Losses during milk production**
  - Animal health plays an important role in milk yield and quality. Udder damage and infection causes significant reductions in milk yield. This often happen as a result of mastitis. The lack of appropriate practices such as udder cleaning and teats sterilization after milking contribute significantly to the level of mastitis in herds. The hygiene of the raw milk plays an important role in the protection of



human health because of the risk of zoonotic transmission e.g., brucellosis and tuberculosis, which can be transferred to humans by consuming raw milk.

-The lack of knowledge about nutrition, poor ranges and high price of feed are the main reasons for low milk yield of small– scale animal owners. This affects significantly the post harvest milk loss in this sector.

-Flock management plays a role in milk production especially the timing of milking. Milk should be cooled immediately after milking in order to preserve the milk.

-Cooling facilities are important to cool down the milk after milking to 4°C to preserve the milk. This is especially important for evening milk which can be lost in summer time due to the acidification of milk, caused by high overnight temperatures.

- **Losses during transportation**

The milk is transported in plastic barrels. To reduce acidification ice blocks are added to the content of the barrels which leads to milk dilution. Lack of suitable cooling transportation results in milk losses in some places. Barrels are washed with water and soap but may not be correctly sanitized. Since April, 2003 a new rule is being applied by The Ministry of Supply which states that milk and meat must be transported in trucks with cooling facilities.

- **Losses during processing**

Lack of appropriate milk testing at the milk receiving point is affecting the quality of milk for processing. Outdated and inefficient milk processing technologies are still being used which results in reduced yield for products and may not have suitable and accurate temperature controls. The quality of cheeses produced by small-scale processors are affected particularly during the hot season. The provision and utilization of cooling facilities will inhibit the acidification and development of bacterial growth in the milk. An alternative may be the lactoperoxidase system of raw milk preservation.

Adequate thermal treatment during processing will solve the problem- ideally through pasteurization or UHT treatment. The lack of knowledge regarding hygiene is affecting the end product. In addition there are losses in cheese yield because of the losses associated with whey extraction. There are some standards for some dairy products which are applied for industrial manufacturing but not for the small-scale manufacturer.

Syrian standards No 404 handling processed cheese

Syrian standards No 196 handling bovine butter

Syrian standards No 189 handling white cheese

Syrian standards No 194 handling raw milk

- **Losses during marketing**

There is a lack of refrigeration and there is a loss in organoleptic properties by conserving the cheese in saturated brine.

*The overall post harvest milk losses of small-scale dairy sector range between 10-15% in summer, and 2-5% in other seasons, whereas the losses of the public sector do not exceed 1% in summer.*

## **2-7 Identification of consumption patterns and consumer preferences:**

Some of the key factors affecting consumption include:

Age: Children and babies consume more milk than adults.

Sex: Women consume 45% to 55% more milk than men.

Region: Villagers are consuming more fresh milk and milk products than urban dwellers.

Season: There is high demand for milk and milk products throughout the year, but there is a higher demand for yoghurt, liquid yoghurt and ice cream in summer, Tables 6, 7 and 8 summarize a questionnaire done in the country in 1993 (Annex 1).

## **The nutritive value of milk and milk products**

A study carried out on the situation of human nutrition in Syria (1993) reported the following:

- the average energy intake per caput in Syria is 2807kcal, of which 307kcal comes from animal sources.
- the average of total energy requirement (kcal) coming from milk and dairy products is estimated as 205 kcal and composed 66.8% of the total animal intake per caput energy.
- the average fat consumption is 62.8g, of which 31.1% comes from animal sources. Milk products contribute 60.5% of this source.

## **2-8 Identification of the level and extent of public health risks posed by milk and dairy products**

Syrian white cheese is a soft cheese type. 95% of this cheese is processed by traditional means in small-scale processing facilities or in the villages. Cow, goat and sheep milk is processed without any thermal treatment to kill the harmful bacteria which may spoil milk in summer. Hand milking is still used which means higher contamination of milk. Only a small amount of milk (an estimated 5-10% of the total milk produced) are processed in big dairies where the milk is pasteurized before processing.

The hygiene of the raw milk plays an important role in the protection of human health because of the risk of zoonotic transmission e.g., brucellosis and tuberculosis, which can be transferred to humans by consuming raw milk.

There are high risks of infection if one consumes cheese processed by traditional without boiling it. Boiling cheese will decrease its organoleptic and nutritional. From a microbiological point of view cheeses are solid media where microorganisms can grow well and produce metabolized components which will stay in the cheese until consumption. The sources for cheese flora are:

- Animal based flora- bacteria which differ according to the animal production and health conditions. Bacteria causing mastitis is a typical example.
- Starter flora which is normally Streptococcus, Leuconostoc, and lactobacillus. These organisms are necessary for maturing cheese and giving it specific organoleptic properties.
- Environmental flora which can arise through contamination during processing by workers, air and contact materials.

Fresh and white cheese processed using traditional methods without pasteurization may cause high risks due to contamination by harmful bacteria such as:

- *Staphylococcus aureus*
- *Salmonella*
- *E.coli*

Salmonella is a rod shaped gram negative. It can grow in a wide range of temperatures (10-45 C) and pH 4.5-9. Salmonella can resist and live in a 9% saline solution. There are harmful species, *S. typhi*, *S. paratyphi* and *S. enteritidis*. The Syrian Health Ministry recorded 9,292 cases of typhoid infections in 1997 due to consumption of dairy products. The distribution of typhoid also varies from region to region as shown in table 8. From the data in table 10 the new Syrian standards for cheese (No 2179) show that the cheese must be Salmonella free and the cheese must be processed from pasteurized milk.

Table 9 summarizes a study which shows that a high concentration of salt in cheese can reduce the risk of infection due to low water activity. The infection by salmonella is higher in summer than other seasons, due to the optimum temperature which is 37C. Another study showed that cheese samples collected from the market were contaminated by **coliforms** and exceeded the standard limits which is 50,000 cfu/g. Coliforms were affected generally by salt concentration. About 72% of samples contaminated with *Staphylococcus aureus* (Staphylococcus is gram positive bacteria, S. aureus causes food

poisoning and can resist in a 10% saline solution) according to the result of the study.

### **2-9 Dairy Information Systems:**

At present there are no actual information systems concerning the small-scale dairy sector. Some information and statistic data are collected through the local units of APD and AHD. There are some suggestions for planning such information systems with stakeholder cooperation.

## **2-10 Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis of the current situation in the dairy sector:**

### **2-10-1 The Strengths:**

Noticeable increase in total milk production which rose from 1.4 tones in 1992 to 1.58 tones in 2001.

The positive aspects of that increase were as follows:

- Milk availability per caput per annum (95 kg).
- Potential to improve rural livelihoods, provide small farmers with regular disposal income and create off-farm employment.
- Increasing milk consumption and product safety for Syrian citizens

To use the above mentioned advantages, efforts should be focused on the following two key areas:

**1.** Reorganization of the small-scale dairy sector. This may be achieved by modifying the recent production systems, and *creating some kind of new cooperative system between the private small-scale farmer and medium-scale dairying enterprisers / investors (Annex 3. Fig.3)*. The objectives of this reorganization is to improve the quality and quantity of the milk produced, and to improve the welfare of poor livestock owners.

**2.** Improving the formal "milk culture" all over the country. This could be done by *applying suitable milk processing technology, combined with suitable packaging to provide the market with good quality milk and dairy products at a reasonable price.*

### **2-10-2 The weaknesses:**

- A large number of small-scale livestock holders spread out all over the country, which makes it difficult to control and improve this sector.  
-To overcome this problem it may be efficient to enhance the "cooperative culture" between the small-scale farmers themselves, and between the medium-scale dairying enterprises. Establishing breeders' associations is recommended to improve milk production control in Syria.
- In general, the consumers still prefer fresh, low price milk and dairy products. In addition to that, they do not trust the industrial dairy products, but are more confident with informal traders and with the habit of milk boiling in the home. This common practice of informal raw milk consumption and even boiling of cheese for a long time, decreases the milks organoleptic and nutritional qualities due to the reduced quality of proteins, sugars (lactose) and vitamins to be absorbed. In the meanwhile, the untreated raw milk and milk products has a high risk of Brucellosis, and Typhus in some areas.

**To correct the above mentioned problems, efforts should be focused on the following:**

- Developing effective information systems about nutrition, health, education and awareness on the advantages of safe milk processing.
- Rehabilitating the processing lines of public dairy sector, and enhancing the private sector to produce good quality milk at a reasonable price to meet the needs of people that are currently consuming raw milk from the informal market which may not be hygienic.
- Enhancing the investment in dairy processing sector or integrated enterprises for milk production and processing.

- Enhancing the experience in the field of program planning, management and training in the different aspects of the dairy sector, as well as, provision of sufficient resources.

*This weakness should be corrected by exchanging the experience of the regional and international stakeholders, with the support of regional and international organizations.*

### **2-10-3 Opportunities:**

- The governmental instructions and policy which aim at improving the dairy production and processing sector in Syria. This priority matches the objectives of the new policy on sustainable development of rural resources, and providing people with good quality, safe and reasonable priced milk and dairy products.
- The noticeable willingness of new investors is to establish new medium-scale dairy enterprises.
- The noticeable willingness of small-scale farmers is to improve their sector.

*To exploit the above mentioned opportunities, a national project could be suggested to link the small-scale farmers with the medium size dairy enterprises to develop modified production system/s suited to specific areas.*

*This project should be planned with regional and international experts.*

*It is also appropriate to finance and support the first stages of this program from external grants or easy loans.*

#### 2-10-4 The Threats:

- Continuous rapid growth of both small-scale farmers sector and small scale milk processors/vendor's, which may complicate the suggested improvement programs/projects in general.
- **The prevalent drought** in the Middle East region has negatively affected crop production, which leads to remarkable changes, specifically in the activities of small-scale farmers. Most of those farmers have made a shift towards raising dairy cattle resulting in additional challenges in the dairy sector, especially in spring and early summer when more informal milk is produced, which means high supply and low demand. As a result the price of informal milk has dramatically decreased and small-scale farmers lost an important part of the value of their milk.
- Consumption of informally traded and non heat treated milk and dairy products increases the risk of exposing citizens to serious diseases, such as Brucellosis.
- The recently emerged private medium and large scale dairying enterprises are expected to occur big capital losses if there is no effective plan to improve the fast growing small-scale dairying.
- The most serious threat to the current situation is the continuous importation of large quantities of low price milk powder for producing some types of ice-cream and other food products, instead of fresh milk. The main reasons for milk powder importation are:
  - The low price of the milk powder in the international market.
  - The suitable properties of milk powder for processing into many kinds of food products comparing with fresh milk produced by small-scale farms, which usually has a high bacterial count and acidity.The above mentioned reasons always force the price of raw milk to a very low level, especially in spring and summer time, when cattle and sheep milk production peaks.

To avoid the threats efforts should be exerted in the following aspects:

-Improving the "**co-operative culture**" within the small-scale dairying sector to rebuild the small animal agriculture sector into an improved market-oriented production system.

-The focal point in the process of small-scale dairy sector improvement is the milk and dairy products price. There are two aspects of the current situation:

The informal milk market and traditional processing versus the formal milk and modern technology.

The main goal of any small-scale dairy sector improvement should be providing the majority of people with medium and low income, with good quality, reasonably priced, safe, processed milk and milk products.

-Measures should be taken to prevent or limit the importation of milk powder, and to improve the quality of milk produced in Syria at the same time.

-Increasing the hygienic awareness of the citizens using the range of available media to point out the high risks of informal milk and dairy products consumption, how the home milk boiling habit may negatively affect the nutritive value of milk and the advantages of modern processing technology.

-To develop and apply guidelines to organize the activity of small units milk processing and street selling of milk and dairy products. These practices and procedures should be accompanied by milk and dairy guidelines and codes of practice, product standards and legislation, in a stepped manner.

-Developing appropriate training modules in the fields of animal health, animal nutrition, animal husbandry, farm management, loss reduction through milk cooling and transporting, safe dairy product processing, (modern and traditional methods) and marketing.

Special care should be taken to ensure the training of rural women.

### **3 – Future :**

#### **3-1 Development of the milk sector in Syria**

Breeding services

- Improving the farm animal genetics.
- Improving the environmental conditions of farm animals (nutrition, husbandry, health care).
- Providing the services for milk analysis
- Providing milk collection services
- Providing milk transport services

#### **3-2- Improve milk quality and quantity through the following:**

- Planning programs for genetic improvement of farm animals focusing on the improvement of local breeds.
- Evaluating the upgraded local cattle, and developing NPLCG.
- Improving animal health care and husbandry.
- Improving animal nutrition and the feed resources.
- Increasing milk quality by providing milk cooling tanks.
- Planning milk price strategies based on quality.
- Establishing breeders associations for all animal breeds.
- Establishing milk collection centers in the areas where there is extensive milk production.
- Enhancing contracts between producers and dairies with milk collecting centers.
- Enhancing cooperative culture between the small-scale farmers themselves



- and between the medium scale-dairing enterprises.
- establish a tailored chemical and microbiologically milk quality standard system.

### **3-3- Consumer needs:**

- Improving processing conditions.
- Extending the production period to eliminate production seasonality and unstable prices.
- developing and improving a wide range of dairy products to meet consumers requirements.
- Providing good quality milk and dairy products at a reasonable price.

### **3-4 Dairy sector improvement**

Dairy sector improvement can be done by supporting the following:

- Increasing forage production.
- Improving the productivity of all breeds.
- Improving animal health conditions.
- Regulating market prices as well as production.
- Improving the consumers formal “milk culture”.
- Improving the cooperative culture among small-scale farmers.

### **3-5 Detailed recommendations on how to reduce Post-Harvest Losses of Milk and Milk Products:**

#### **\*At the milk production site:**

- Improving the skills of the small-scale livestock holder on hygienic milking practices and milk cooling before the collection by dealers. Training and extension are the keys to achieve this goal.
- Establishing the cooling centers in intensive milk production areas.

#### **\*Raw milk reception:**

The raw milk must be stored in a hygienic reception tank complete with refrigeration.

#### **\*Improved processing technology**

Improved and modern processing equipment is required to efficiently and effectively heat treat milk and dairy products in order to make them safe for human consumption. Time-temperature measurement should be accurate and well calibrated to ensure consumers consistently received a quality safe product. Product losses in all sectors can be reduced by using well designed and robust equipment from milk cans with tight fitting lids to well maintained piping and good packaging materials.

**\*Pasteurization:**

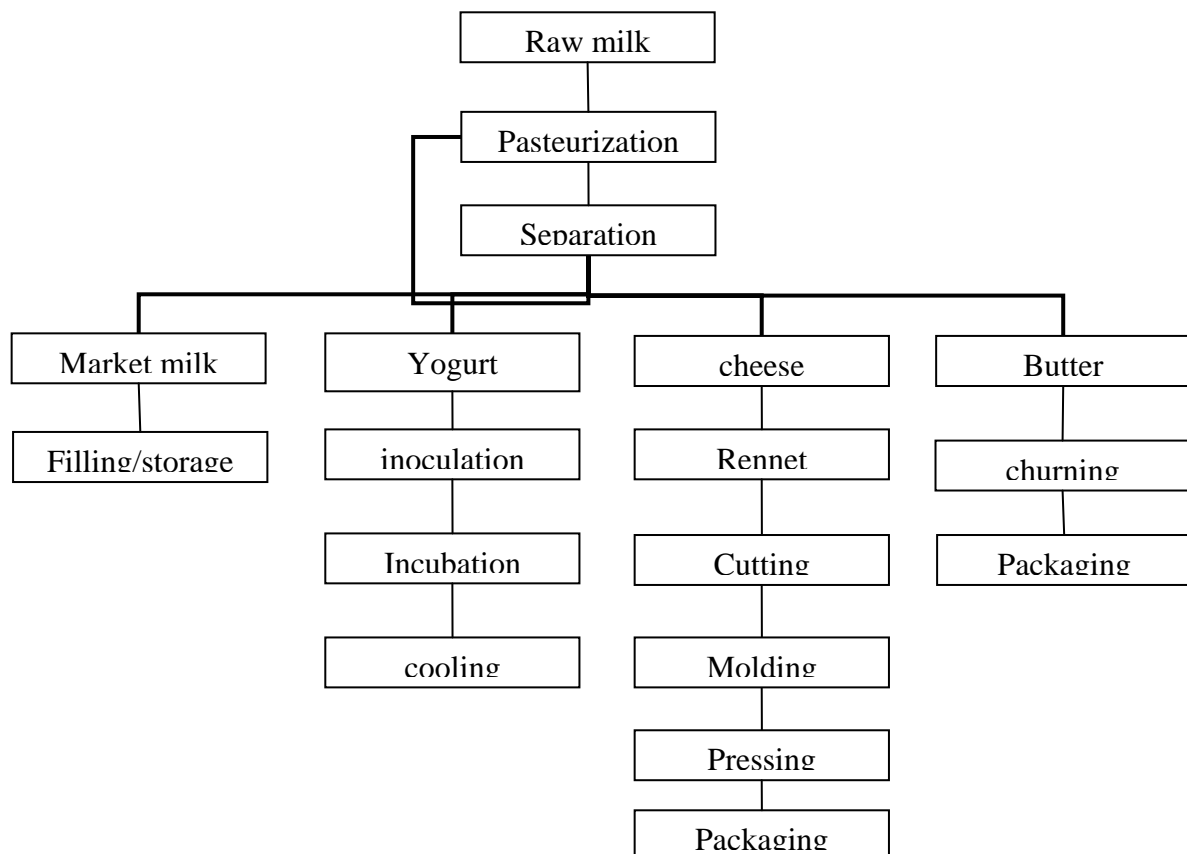
The milk must be pumped from the storage tank to the pasteurization unit. After this process the milk is prepared to be used for following processes:

-Filling into bags or bottles (milk for the market): The milk should be pumped a filling station and filled into 0.5-1 liter bags or bottles and stored in a refrigerated area.

**Production of yoghurt:** the milk will be inoculated with the starter and incubated. After that the yoghurt is filled in suitable bags.

**Production of cheese:** the pasteurized milk must be filled into the cheese vat, and set with Rennet. The curd is then filled in cheese molds.

**Production of butter and ghee:** the fat is separated by a fat separator after the pasteurization of the separated cream. It will then be cooled and filled into the butter churn. Through the stirring process fat will be converted into butter. The butter is melting by heat treatment to obtain the pure fat which is ghee.



**3-6 Hygienic rules for milk processing units**

- To present the systems of quality assurance and quality management, and to demonstrate existing regulations and specific requirements for production units.
- To comment on the statements made in the rules for production units and to justify them.
- To present the consequence and possible action to be taken in the case of anomalies and mistakes.
- To compare hygiene rules for different types of products, and to interpret similarities and differences in a simple way.

### **3-7- Staff Hygiene**

- To demonstrate the importance of staff health in milk processing units by giving examples, to derive possible measures to be taken by management or staff and to justify them.
- To explain personal hygiene as an element of hygiene, to name the measures to be taken, to indicate the correct behavior of staff in food production units and to explain these as well as to demonstrate the right behavior and procedure regarding hand washing.
- To show the importance of work clothes in general terms, to present possible measures in this field and to suggest rules for the use of work clothes.
- To present the advantages arising from good personal hygiene for staff, company and consumers and to draw conclusions for staff management.

### **3-8- Production hygiene**

- To show the general importance of the provision of raw materials and other components and to draw conclusions for the control in goods reception, storage and the handling of stocks.
- To justify the basic hygiene requirements in production facilities and to explain the conclusions to the staff.
- To detect possible sources and risks of contamination in the process of production, to propose possible measures for preventing them and to characterize processes for the inactivation of pathogenic and food-contamination germs.
- To show the most important factors which may endanger the quality of products during storage and distribution, also to identify preventive and corrective measures.

### **3-9- Cleaning and disinfection**

- To show the importance of cleaning and disinfection in the dairy.
- To compare standard cleaning process in dairy production units with regard to clean effect, safety and efficiency.

## **4- Recommendations**

The absence of a specialized organizations such as milk marketing associations or a dairy board comprising all parties related to the sector is another serious problem in Syria. The absence of this kind of organization causes instability of prices and problems related to the quality of raw material, which are among the factors constraining the development of the sector.

**4-1- Animal production:** Reorganization of the animal production strategy emphasizes rural development and modifying production systems for improving the quantity and quality of milk. Applied research work, training and extension efforts should be focused on animal breeding, nutrition, husbandry, reproduction and animal health care. Forming breeders association with an international support is an essential need for improving the dairy sector in Syria.

Establishing joint projects between the small-scale dairy farmers and the private medium-scale dairy investors might be a suitable procedure to modify the dairy production system in certain geographical areas in Syria. Otherwise, establishing collecting and cooling milk centers with mini dairies could be a good solution for preventing milk losses by small-scale dairy farmers.

**4-2- Industry:** Checking the Milk and Dairy Products Codex Standards during the processing stages.

**4-3- Consumption:** It is necessary to initiate consumer awareness on milk and milk products consumption by means of campaigns and educational programs, that will increase the “milk culture”. This will also limit the informal milk consumption habits, and perhaps reduce the street (informal) sale of milk and dairy products.

**4-4- Trade:** It is necessary to regain the export markets which had been lost because of the low quality of milk products, and trying to acquire new export markets by encouraging the production of Syrian traditional dairy products.

*The improvement of dairy sector in general and small-dairy sector in particular has recently become a priority in Syrian agricultural policy. International experience and support are needed to carry out the different aspects of that policy. The recent PFL/INT/860/PFL may contribute to achieve the target of improvement of the small-scale dairy sector in Syria.*

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**Table: 1**  
**Milk production in Syria(2001).**

<b>Species</b>	<b>Cattle</b>	<b>Sheep</b>	<b>Goats</b>	<b>Buffalo</b>	<b>Total</b>
<b>Milk/ Ton</b>	1032322	482809	61714	938	1577783
<b>/ %</b>	65.4	30.6	3.9	0.1	100

**Table: 2**  
**Number of cattle and their production in Syria (2001).**

	<b>All breeds</b>	<b>Friesian</b>	<b>Cross F*A</b>	<b>L. Akshi</b>	<b>L. Shami</b>
<b>Total/Head / %</b>	836868	129080	553231	146240	8317
<b>Females</b>	614291	95541	399044	114245	6461
<b>Milking F</b>	415567	69316	265933	75603	4715
<b>Milk/Ton</b>	1032322	266753	698240	57948	9380
<b>Kg/Milk/ Cow/Year</b>	2484	3848	2625	766	1989
<b>Meat/Ton.</b>	42266	10419	26697	4703	447

**Table: 3**  
**Number of sheep, goats and buffalo and their production in Syria (2001).**

	<b>Sheep</b>	<b>Goats</b>			<b>Buffalo</b>
		<b>Total</b>	<b>Shami</b>	<b>Mountain</b>	
<b>Total/head</b>	12361824	979325	27820	951505	2477
<b>Milking/head</b>	8099544	661913	18289	642624	1478
<b>Milk/Ton.</b>	482809	61714	4172	61714	938
<b>Kg/Milk/head</b>	60	93	228	96	635
<b>Meat/Ton.</b>	168548	4922	4172	57542	235
<b>Wool/Ton.</b>	13983	678	-	-	235

**Table: 4****Number of Cattle (head) and milk production (ton) 1991-2000**

Year	Shami Cows			Imported cows			Local cows		
	Total	Milking	Total milk	Total	Milking	Total milk	Total	Milking	Total milk
<b>1991</b>	18201	8127	14924	221867	106809	403850	217922	78974	63820
<b>1992</b>	15153	6456	13000	216478	103706	382919	215534	77587	58127
<b>1993</b>	8241	2959	7436	155018	79043	305475	221344	72773	61295
<b>1994</b>	8830	2730	8131	167217	84532	328857	226071	75344	65140
<b>1995</b>	9051	3655	8155	185735	92743	367991	207681	101014	61667
<b>1996</b>	9851	4205	8011	186189	90500	349982	203517	80666	61748
<b>1997</b>	11022	4626	9270	199816	100089	385354	199891	67015	55929
<b>1998</b>	25831	10495	20992	175634	91057	346152	180260	62236	78124
<b>1999</b>	20534	8410	16942	193237	100023	373061	182238	62689	46770
<b>2000</b>	21232	8879	17878	181784	94959	361399	180777	65298	61755

Source: Yearly Syrian agro-statistics collection 2001

**Table 5****Number of sheep (per head) and ewe milk products (in ton) 1991-2000**

Year	Sheep		Milk and dairy products				
	Total	Milking	Milk Total	Cheese	Yogurt	Butter	Ghee
<b>1991</b>	15193659	9498476	513219	48236	53445	1050	9897
<b>1992</b>	14665086	9274674	512076	48547	51841	1061	9627
<b>1993</b>	10146617	6396194	436713	32313	90615	2309	4818
<b>1994</b>	11256623	7144327	395447	36553	45043	1696	6063
<b>1995</b>	12075190	7819884	453843	35478	48094	1791	7713
<b>1996</b>	13119498	8506611	498728	42096	86420	1039	6841
<b>1997</b>	13829316	8980353	523755	50241	56437	1125	8538
<b>1998</b>	15424717	10074419	581939	54763	83789	1585	7731
<b>1999</b>	13998459	8993384	445913	40471	58798	1285	6853
<b>2000</b>	13505235	8622093	445558	39891	56329	968	7553

Source: Yearly Syrian agro-statistics collection 2001

**Table 6:**  
**Number of goats (head) and milk production (ton) 1991-2000**

Year	Shami			Mountain		
	Non milked	Milked	Milk	Non milked	Milked	Milk
1991	20517	40930	10268	308163	593333	47343
1992	18431	35844	10329	308142	588453	51918
1993	13152	25282	7473	285613	661912	56868
1994	14266	26143	6924	316682	677855	59705
1995	16666	32231	10480	321556	692120	60423
1996	18549	35203	10510	317965	710158	64316
1997	19360	35535	10684	327021	718489	66106
1998	14693	27338	9122	315848	743104	69582
1999	15161	28213	5861	298539	703663	59992
2000	16335	30560	9193	297460	705184	61129

Source: Yearly Syrian agro-statistics collection 2001

**Table 7**  
**List of the public dairies**

Company	Theoretical capacity	Shift capacity
Damascus dairy	28.0	12.6
Homs dairy	14.4	10.0
Aleppo dairy	20.6	12.6
Sum	62.0	35.2

**Table 8:**  
**Number of dairies across the country**

Province	Dairy	Yearly processed milk (ton)
Damascus	18	17042
Aleppo	12	40024
Latakia	3	1059
Raqqa	3	6668
Daraa	2	1200
Idleb	1	90
Homs	1	180
Total	41	66264



**Table 9:  
Consumers in the northern part of Syria**

Products	Frequency	Importance	Difficulty
Milk	Everyday	1 price	Price high
Ghee		2 quality	Adulteration
Butter		3 packaging	
Cheese	Weekly		
Yogurt	everyday		

**Table 10:  
Consumers in the middle part of Syria**

Products	Frequency	Importance	Difficulty
Milk	Everyday	1 price	Price high
Ghee		2 quality	Fluctuation price
Butter		3 packaging	
Cheese			
Yogurt	everyday		

**Table 11:  
Consumers in the southern part of Syria**

Products	Frequency	Importance	Difficulty
Milk	Weekly	1 price	Quality low
Ghee	Season	2 quality	Price high
Butter	Weekly		
Cheese	Weekly		
Yogurt	everyday		

**Table 12:  
Typhus infections in Syria**

Year	1989	1990	1991	1992	1993	1994	1995	1996	1997
infections	1349	1086	428	1252	2823	12724	11149	10159	9292

**Table 13:**  
**Typhus infection in the Syrian regions**

<b>Year</b>	<b>1993</b>	<b>1994</b>	<b>1995</b>	<b>1996</b>	<b>1997</b>
Damascus	183	331	493	493	562
Damascus region	7	273	1315	1044	1590
Aleppo	264	469	1873	1781	1731
Latakia	103	225	379	155	180
Tartus	519	536	498	441	404
Idleb	80	5738	594	703	596
Homs	149	696	1050	774	692
Hama	597	677	885	931	1186
Raqqa		381	382	327	146
Deir ezzor	4	73	151	218	161
Hasakeh	469	1017	1572	852	437
Dara	350	1988	1697	2150	1403
Suaida	53	261	209	147	59
Qunitera	45	59	51	143	145
<b>Total</b>	<b>2823</b>	<b>12724</b>	<b>11149</b>	<b>10159</b>	<b>9292</b>

**Table 14:**  
**Salmonella infected cheese sample collected from the market**

<b>Cheese type</b>	<b>samples</b>	<b>Salmonella infected</b>	<b>Percent of infection</b>
Fresh from cow	43	10	23.25
Fresh from sheep	18	4	22.22
Akkawi from cow	14	-	0
Akkawi from sheep	25	-	0

**Table 15:**  
**Affect of salt concentration on salmonella**

<b>Salt concentration</b>	<b>No of samples</b>	<b>No of Salmonella infected</b>	<b>Percent of infection</b>
1-4%	34	8	23.52
4-8%	45	6	13.33
Above 8%	22	-	0

Annex 2 : Figures

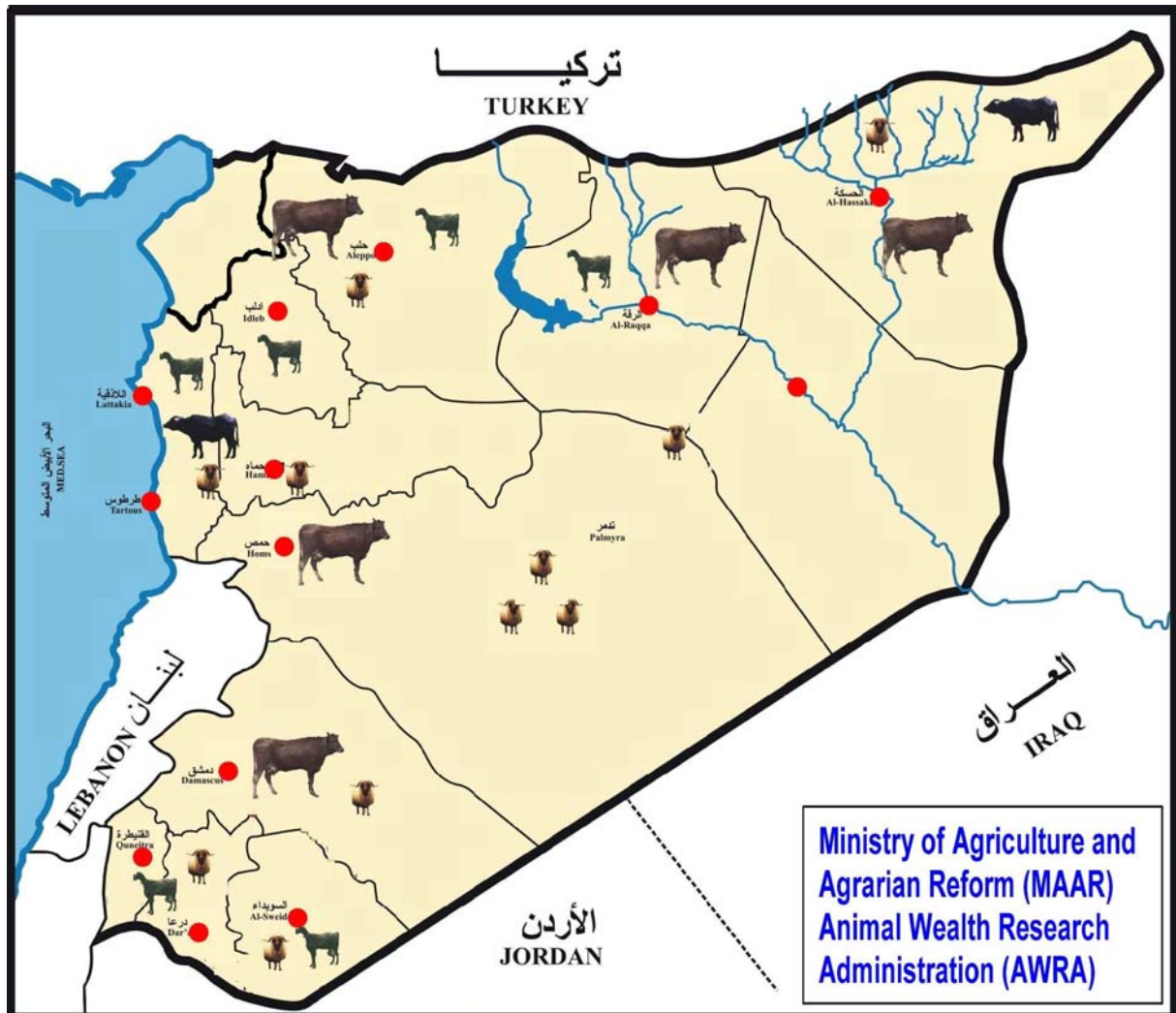
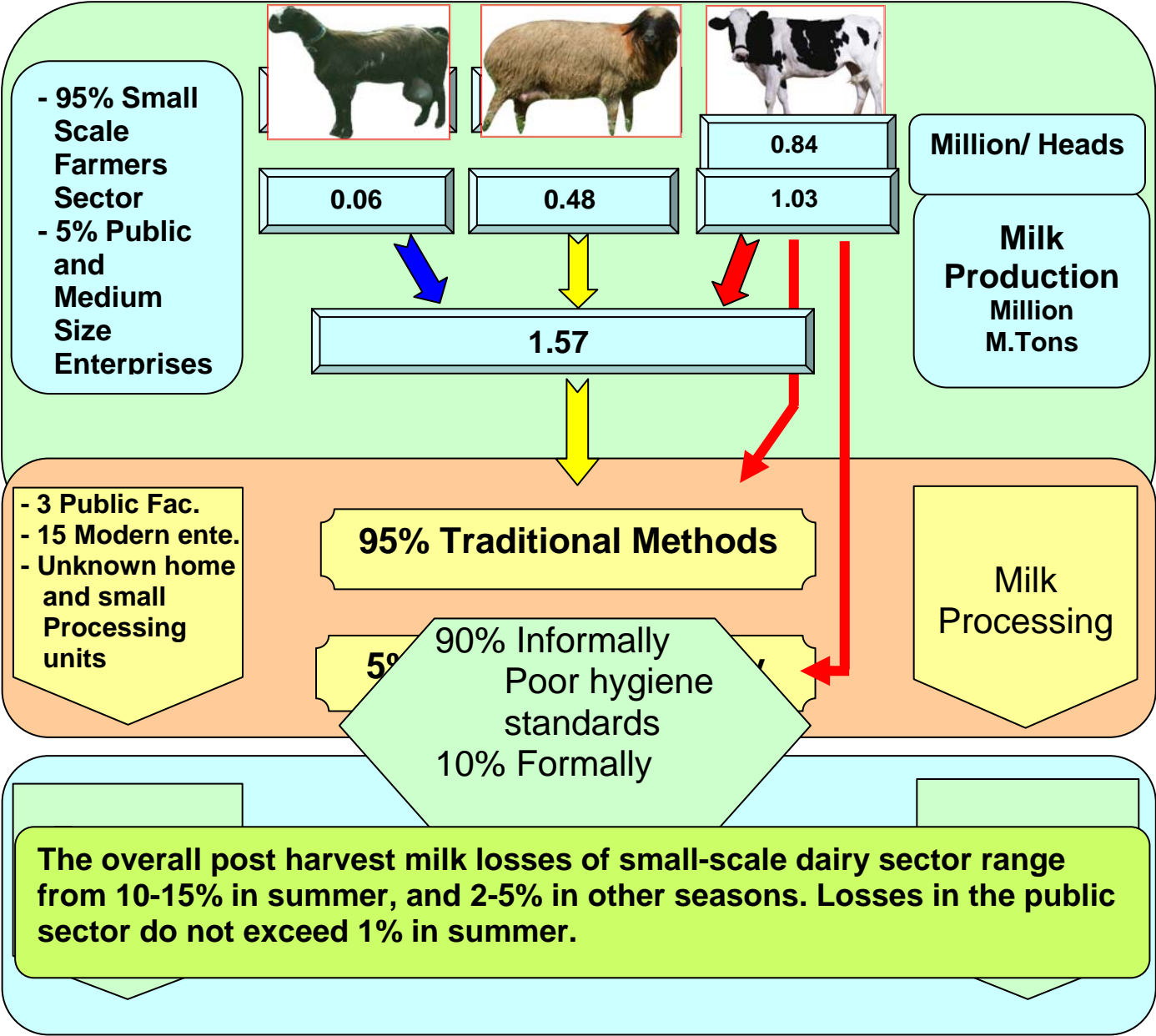
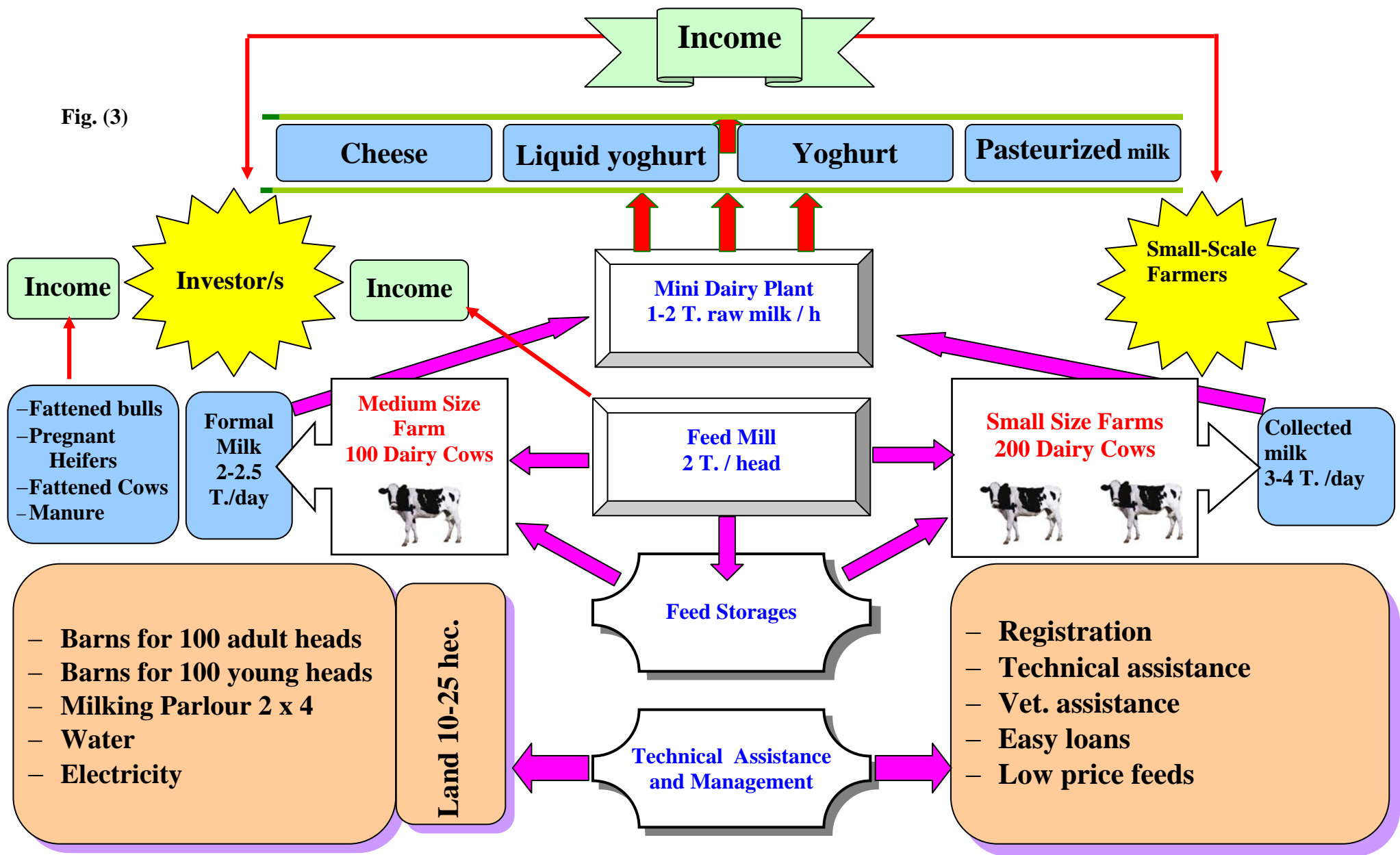


Fig. (1)

# Diary Sector





**Fig (3) Flow diagram for Integrated Dairy Project 100 dairy Cows, Feed Mill, Mini Dairy Plant, Cooperated with Small-Scale Farmers (200 dairy cows).**