2004

The food chain of sheep and policy implications on the sheep sector in Syria in highlight of international arrangements

Samir Grad
Iowa State University

The food chain of sheep and policy implications on the sheep sector in Syria in highlight of international arrangements

by

Samir Grad

A thesis submitted to the graduate faculty

in partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE

Major: Agricultural Economics

Program of Study Committee:
John D. Lawrence, Major Professor
Paul Gallagher
Paul Lasley

Iowa State University

Ames, Iowa

2004

Graduate College
Iowa State University

This is to certify that the master's thesis of

Samir Grad

has met the thesis requirements of Iowa State University

Signatures have been redacted for privacy

Table of Contents

List of Figures

List of Tables

Appendix A
Complementary Tables for the Sheep Meat Chain

Appendix B
Complementary Tables for the Sheep Milk Chain

List of Symbols

A
AIDS: Almost Ideal Demand System
ANOVA: Analysis of Variance
C
CAB: Cooperative Agricultural Bank
CAM: Commodity Accounting Matrix
CCA: Commodity Chain Analysis
CNS: Chains and Networks Science
CRB: Carcass Retailer Bones
CRC: Carcass Retailer Carcasses
CRM: Carcass Retailer Meat
CS: Cooperative Sector
CSCH: Cooperative Sector Cheese
CSGB: Cooperative Sector Ghee and Butter
CSLO: Cooperative Sector Labneh and Others
CSM: Cooperative Sector Milk
CSY: Cooperative Sector Yogurt
CWC: Carcass wholesaler Carcasses
D
df: Degrees of freedom
dl: Under Bound of Durbin – Watson Test for Autocorrelation
DP: Price Difference
D.P: Dairy Products
DRTS: Dairy Retailer Dairy Products
du: Upper Bound of Durbin – Watson Test for Autocorrelation
DWC: Durbin – Watson Test Critical Value
DWHSCH: Dairy Wholesaler Cheese
DWHSGB: Dairy Wholesaler Ghee and Butter
DWT: Durbin – Watson Statistic Calculated
E
Econ 571: Economics 571
ED: Excess Demand
ES: Excess Supply
EX: Exporter
EXCH: Dairy Exporter Cheese
EXGB: Dairy Exporter Ghee and Butter
EXP: Exponent
F
FAO: Food and Agriculture Organization
FWHS: Fersh Milk Wholesaler
F: F-statistic
G
GAIDS: Generalized Almost Ideal Demand System
GDP: Gross Domestic Product
GEF: General Establishment for Fodder
GFQC: Goldfeld – Quant Test Critical Value
GFQT: Goldfeld – Quant Test Calculated
GIPSA: Grain Inspection, Packers and Stockyards, Administration
GFU: General Farmers' Union
H
Ha: Hectare
HAC: Higher Agricultural Council
HACCP: Quality Assurance System

I
IMP: Importers
ISO9000: Quality Assurance System
K
km^2: Square kilometer
kg: Kilogram
L
LAW: Live Animal Wholesaler
LES: Linear Expenditure System
LAWB: Live Animal Wholesaler By-products
LAWC: Live Animal Wholesaler Carcasses
M
MAAR: Ministry of Agriculture and Agrarian reform or Ministry of Agriculture
MEET: Ministry of Economy and External Trade
Mill.S.p: Million Syrian Pounds
MS: Mean Square
MSIT: Ministry of Supply and Internal Trade
MT: Metric ton
N
N.Milked: Non-Milked
NAPC: National Agricultural Policy Center
O
OLS: Ordinary Least Squares
P
Pr.: Processed
PS: Private Sector
PSCH: Private Sector Cheese
PSGB: Private Sector Ghee and Butter
PSM: Private Sector Milk
PSLO: Private Sector Labneh and Others
PSY: Private Sector Yogurt
R
ROW: Rest of the World
RT: Retailer
S
S: Standard deviation
SAR: Syrian Arab Republic
SC: State Centers
SCM: State Centers Milk
SHB: Slaughterhouse By-products
SHC: Slaughterhouse Carcasses
SHLA: Slaughterhouse Live Animal
S.p (s.p): Syrian pound
SS: Sum of Squares
T
T,t: T-statistic
TPCH: Traditional Processing Cheese
TPM: Traditional Processing Milk
TSP: Program for Econometrics
t stat: T-statistic
U
UN: United Nation
U.S.: United States
USDA: United States Department of Agriculture
W
WHS: Wholesaler

Acknowledgement

The author wishes to express his deep gratitude to Professor John D. Lawrence for his guidance and helpful advice throughout the course of the study.

Appreciations are also expressed to Professor Paul Gallagher and Professor Paul Lasley for their careful readings of the manuscript and valuable suggestions throughout the whole of this thesis.

I would like also to extend gratefulness acknowledgement to Professor Marvin Hayenga for his valuable orientations and suggestions and to Professor William Boal for his econometrical advice.

Preface

Exploiting the opportunities offered through international and global trade, regarding resource allocation and the specialization in the comparative advantage products, requires the conducting of detailed sectoral studies about the marketing process from farm until the products are in the hands of consumers or exported. Such studies are crucial tools to explore bottlenecks in the marketing chains. Hereby, the use of detailed marketing analysis tools, such as the commodity chain analysis and the partial equilibrium analysis or a combination of such tools, is very important to improve the efficiency of the supply chains.

Accordingly, the Syrian national agricultural policy center conducted several sectoral studies concerned with this orientation such as wheat, olives, and dairy and red meat products. However, the tools combination in these studies was not fully developed. Thus, in addition to the high economical importance of such studies, they function as an adequate database to assist the development of marketing studies conducted in the private sector.

Consequently, I hope that this study represents a small contribution in this context because the sheep sector is one of the most important sectors in animal production regarding the supply of meat, milk, and foreign currency.

Finally, more accurate studies need adequate information and specialized database. I recommend that this topic should be a major concern of all future studies and research.

Abstract

The sheep sector in Syria is considered as one of the most important sectors in animal production because it is the first source of meat, the second source of milk, and an export oriented sector. Therefore, the need has emerged to study its supply chain in order to identify its weaknesses and bottlenecks and make suggestions for improvement.

Accordingly, the theoretical background of food marketing is briefly presented including the functions and tools used by analyzing the marketing process. Hereby, the focus is on the approaches used by analyzing the food chains from various perspectives. In this context, the major actors of the food system are overviewed, and the stages of the commodity chain analysis (CCA) are illustrated by the means of the Syrian sheep chains. As benchmark, international comparisons are conducted. However, because of the drawbacks of the CCA, a complementary section about benefit – cost analysis is added. In this section, the main aspects of multiple regression analysis, its problems, and its testing methods were included. Moreover, in brief, the various approaches included in the literature about the estimation of supply and demand were furnished highlighting the meat and milk sub-sectors.

Consequently, the above-mentioned tools are applied to the Syrian sheep sector. Thus, the agents operating in the sheep meat and sheep milk chains, their economic behaviors, the changing structure, and their performance are depicted. Then, applications on sheep meat and sheep milk sub – sectors were conducted. In this context, the supply and demand of sheep meat and sheep milk were estimated; equilibrium price and quantity for sheep meat were determined; the effects of the equilibrium price on the agents' performance of the sheep meat chain were calculated; and a sensitivity analysis of the market equilibrium was made.

As a result, a variety of bottlenecks in the chains were explored such as quality, transportation, farm-size, performance, and organization problems.

Finally, recommendations were made to avoid the difficulties in the chains highlighting the establishment of an adequate marketing database and reorganization of the Syrian cooperative sector.

Chapter1
Introduction

The geographical and demographic features of Syria make it important to concentrate on agricultural production. In this context, the area of the Syrian Arab Republic (SAR) is about 185,000 square kilometers (km^2); the neighboring countries are Turkey on the north, Iraq on the east, Jordan on the south, and Lebanon and the Mediterranean on the west; the climate in Syria is Mediterranean; winter is cool and rainy; summer is warm; spring and autumn seasons have usual temperatures; the maximum rainfall occurs in December and January; the rain season begins in September and stops in May except for the coastal areas, where it extends till June; the population of Syria was about 17 million in 2001; the agricultural labor force is about 25.2% of the total labor force; women constitute about 32.2% of agricultural labor force.

Consequently, agriculture, which is performed through the interaction among the private (75% of agricultural activities), cooperative, and public sectors, plays a dominant role in the economy for the following reasons:

- It generates a high share of GDP (Gross Domestic Product).
- It is the main source for covering the increasing food demand of the population and of the food industry.
- It supports the balance of payments and the export ability of the economy.
- It is a main source of employment.

Moreover, agricultural production consists of plant production and animal production. Therefore, the agricultural policies in Syria concentrated on both sub-sectors (plant and animal production). The application of these policies can be divided in two periods. The first period began in the 1970s and extended to the mid 1980s, in which the policies were production oriented in order to achieve food security objectives. As a result, high levels of self-sufficiency in many food commodities have been achieved and agricultural exports have been boosted and diversified. The second stage began in the mid 1980s. This stage has been market oriented in order to adjust to global changes and to exploit the opportunities offered through free trade. The result of both policy orientations was an increasing share of agriculture in GDP as table 1.1 shows.

Table 1.1: Gross domestic product by sectors in million Syrian pounds

At 1995 fixed prices	1985	1990	1995	1997
Total GDP	419,536	389,469	570,975	604,354
Agriculture	112,508	115,974	161,024	178,549
Mining & Manufacturing	33,639	50,035	78,864	85,291
Wholesale & Retail Trade	111,320	95,331	148,650	131,543
Transport & communication	34,940	40,485	66,357	80,587
Share of agriculture %	27	30	28	30
At current prices				
Total GDP	83,225	268,328	570,975	728,794
Agriculture	17,172	75,897	161,024	188,673
Mining & Manufacturing	12,812	54,674	78,864	168,154
Wholesale & Retail Trade	18,509	60,875	148,650	145,082
Transport & communication	8,196	25,542	66,357	90,396
Share of agriculture %	21	28	28	26

Source: MAAR & NAPC

Finally, both the increasing complexity of agricultural sector and its interrelations with the other sectors of the economy especially the industrial and trade sectors, and the ascending scarcity of domestic resources require effective resource management practices and well developed coordination mechanisms starting from farm until the product reaches the final consumer (e.g., commodity chain, partial equilibrium analysis, and welfare analysis). This will help the firms to expand on their long run expansion path which in turns places the economy on its production possibility frontier. Therefore, this research is concerned with such analysis tools.

1.1. Background and justification of the research

Enhancing the potential of agricultural sector necessitates the development of its both sub-sectors (plant and animal production). However, the possibilities of expanding plant production are limited because of the difficulties in acquiring additional cultivable land. Thus, the need has emerged to improve animal production horizontally and vertically in order to enhance efficiency, improve individual food consumption, and increase farm income especially in Albadia (Syrian steppe). Accordingly, the strategy of the Syrian government until 2010 involves the following objectives to encourage animal production:

- Expanding the production of vaccines, increasing vaccine production 5% annually up to 2005 to cover 50% of domestic consumption, and making surplus for export by 2010. Therefore, the Ministry of Agriculture (MAAR) is planning to establish a project to achieve this goal.

- Improving green fodder (forage) supply and other fodder sources.
- Developing the rural industry for animal products and enhancing the establishment of industrial firms for animal products as well as for fodder (feed) supply through providing credits.

Following the above-mentioned objectives, the sheep industry will be enhanced because it is the first source of red meat and the second source of milk (after cattle) as table 1.2 shows.

Table 1.2: Share of sheep meat and sheep milk 1999

	Value of production Million Sp	Share in Gross agricultural production %
Animal production 1	78,876.8	33.84
Red meat 2	48,283.7	20.72
Sheep meat 3=3/2	43,820.0	90.70
Beef 4=4/2	4,463.7	9.20
Milk 5	21,651.0	9.29
Sheep milk 6=6/5	3,515.0	16.20
Cattle milk 7=7/5	17,613.0	81.40

Source: MAAR & NAPC

Consequently, the increase in sheep meat and sheep milk makes it necessary to study the current situation of marketing these products in order to identify the existing bottlenecks and make recommendations for a more effective production and marketing process.

1.2. Thesis objectives and expected output

The purpose of this research is to analyze the current situation of the sheep sector (sheep meat and sheep milk) in order to identify the weaknesses and constraints in the supply chain and to make suggestions for improving the chain's efficiency, taking into account the role to be played by both private and public agents. Accordingly, the expected output of the project can be:

- Determining the actors operating in the sheep chain (sheep meat and sheep milk), describing the changes in their structure and behaviors, and conducting a comparison with international chains to the extent possible.
- Estimating the supply and demand for sheep meat and sheep milk.

- Simulating of policy options, conducting a sensitivity analysis of the market equilibrium, and studying the impact on the chains.
- Evaluating market information and the decision making process within the chains.
- Making policy recommendations concerning institutional arrangements and reforming the marketing channels.
- Defining the role of government especially in term of monitoring, regulating, and supplying marketing information.

1.3. Organization of the thesis

The thesis will be divided in 5 chapters, which can be considered as complementary and interlinked with each other's.

In the first chapter, the study objectives and expected output will be presented after explaining the economic background and the justification of the project for the Syrian economy.

The second chapter is dedicated to presenting the literature used to support the research. Thus, the following theoretical main topics will be discussed:

- Defining food marketing taking into account the domestic, regional, international, and global aspects as well as the key player of the food system.
- Explaining the marketing environment affecting food products including sheep meat and sheep milk considering the main applied policies such as agricultural production planning, pricing, inputs, credits, investments, research and extension, rural development, marketing, and trade.
- Presenting the internal coherence of sectoral policies.
- Discussing the main organizational aspects of food marketing including the importance of market information, risk management, and efficiency considerations.
- Explaining the various approaches used by analyzing the marketing process such as the functional approach, the institutional approach, the behavioral systems approach, and the commodity chain analysis (CCA).
- Discussing some welfare analysis aspects taking into account the theoretical aspects of multiple regression analysis and its problems, the estimation of supply and demand, and the impact of international trade.

The third chapter is concerned with the structure of the sheep sector taking into account the structure of its both sub-sectors: sheep meat and sheep milk. For both sectors the actors operating in the supply chain will be identified and the changes in the structure will be depicted. Moreover, a comparison between the chains as well as with international supply chains will be conducted.

The fourth chapter is dedicated to policy implications and simulations on the sheep sector such as supply and demand estimation, determination of the equilibrium price and its effects on the agents operating in the supply chains, and sensitivity analysis, in order to improve the performance of the agents operating in the chains.

Finally, the fifth chapter will make suggestions to avoid bottlenecks in the chains and to improve the overall performance of the sheep sector.

Chapter 2

Literature Review

This chapter is concerned with the basic theoretical concepts of food marketing, which are necessary for conducting food chain analysis in the following chapters. Moreover, general theoretical and international aspects of supply chain research will be included.

2.1. Food marketing defined

Purcell (1979) defined marketing as the set of economic and behavioral activities that are involved in coordinating the various stages of economic activity from production to consumption. Thus, production is viewed as a part of an interrelated set of economic activities, and emphasis is placed on the marketing system as the means to coordinate production and consumer demand. Moreover, Kohls and Uhl (2002) defined food marketing as the performance of all business activities involved in the flow of food products and services from the point of initial agricultural production until they are in the hands of consumers. Consequently, according to Rama et al. (2001), marketing is used to generate voluntarily exchanges that satisfy the interested parties' objectives (producers, wholesalers, retailers, and consumers) as well as to fill exchange gaps (separations) between producers and consumers. By bridging the market gaps, marketing generates benefit or value for the agents involved in the trading activities. Accordingly, both human needs and organizational needs can be met by four different utilities: form, place, time, and possession.

Form utility

It is furnished by the production of the commodity, the service, or the idea itself; for example, the packer who slaughters lambs and cuts them into sheep carcasses adds form utility; dairies that change raw milk into cheese and butter also add form utility.

Place utility

It implies placing the product within the reach of the consumers; for example, wholesalers and retailers create place utility by transferring meat and dairy products from production to consumption areas.

Time utility

It implies providing the commodity whenever it is needed. Time utility is created when the timing and availability of the product is altered by marketing activities; for example, processors may store some of the meat products for later use; see, Kohls and Uhl (2002).

Possession utility

It provides the product within the means of the consumers; for example, advertising creates possession utility by assisting consumers in shopping for food and selecting various items for purchase.

Accordingly, the objective of marketing is to have the right product at the right place, at the right time, for the right person.

Consequently, the marketing system has three broad functions: a logistical function, an informational function, and a distribution function; see, Rama et al. (2001). These are crucial in determining how well the overall commodity chain operates, and in particular for food commodities, how effectively the marketing system contributes towards maintaining food security.

The logistical function

It can itself be sub-divided into three aspects: transformation over space, transformation over time, and processing.

Transformation over space

It is another way of saying that marketing systems transport food from point A where the food is in surplus, and as a result the price of the food commodity is low, to point B where the food commodity is scarce and the price is relatively high.

Transformation over time or storing a commodity

This function is important because in most countries harvest of a specific commodity takes place over a relative short period, but the commodity is consumed throughout the year.

Processing

This function is crucial for value creation because processing creates more value added than raw commodities.

The informational function

Markets are the channels for the price signals, which harmonize supply and demand. If they don't function properly such as by state regulations, then information may not reach the appropriate agents.

The distribution function

Markets and the prices that arise from their operation are the basis for the distribution of benefits from production and from the exchange between producer, trader, processor and consumer. This distribution role is one of the main reasons governments have been become involved in the marketing system; see, Rama et al. (2001).

In addition, according to Kohls and Uhl (2002), a market is an arena for organizing and facilitating business activities and for answering the basic economic questions: what to produce, how much to produce, how to produce, and how to distribute production. A market may be defined by (1) a location (for example, the Chicago market); (2) a product (for example, the sheep market); (3) a time (for example, the May beef market); or (4) an institutional level (for example, the wholesale food market). Moreover, Pindyck and Rubinfeld (1998) defined an industry as a collection of suppliers operating in a particular market. Many industries may participate in a given market. For example, the food market includes suppliers from the beef, dairy, and grain industries, distributors providing services, manufacturers of packaged foods, restaurants selling prepared foods, and consumers. Accordingly, marketing can be national, international, and global.

National marketing (autarky)

Product and marketing policies related to this type of marketing are confined to the internal market and export is placed next; see, Rama et al. (2001). Consequently, sales on external markets are carried out only in the case of surplus that hardly can be absorbed. In this context, Bressler and King (1970) highlighted the important role of interregional trade because opening of trade between regions has the effect of bringing the combined demand of the regions to bear on the combined supply conditions.

International marketing

It relates to different markets by adapting to their specific requirements; it means expanding the national marketing methodology to every external market or a group of markets; see, Rama et al. (2001). Here, the combined effect of excess supply and excess demand between the countries (assuming two countries case A and B) is the same as in interregional marketing. However, in highlight on Houck (1991), the volume of trade depends on the transportation costs and the other transaction charges that may apply as goods are transferred from A to B.

Global marketing

It obliges the enterprise to meet the world as a global market; see, Rama et al. (2001). Therefore, the old borders are removed in favor of a new single one-the border of the world market, of the global village. Thus, global marketing aims at scale economies, quality and standardization of products, specialization, international division of labor, more and better marketing information, and establishing financial, production, and trade unions.

Finally, each country has its specific food marketing system to move and transform products from producers to consumers. However, there are differences in the organization and conduct of market activities whether the countries are centrally planned or following the market economy. In this sequence, according to Kohls and Uhl (2002), it has often been observed that output, efficiency, and standard of living are higher in market economies, and transitions to market economies frequently produce dramatic increases in the economic performance of nations. As a result, most former command economies are

attempting to make a transition to the free market economy in order to increase productivity and to make rational investment decisions; see, Gelb (1996).

2.2. Marketing environment

Purcell (1979) highlighted that the marketing decision of the firms must always be made within the constraints imposed by the economic environment prevailing in the economy. Thus, the flexibility of the decision maker, the alternatives he can consider, the power to influence price or other terms of trade, and whether he has any discretionary power in the market place are all a direct function of the economic environment. Here, the economic environment will be defined as the set of macro policies which affect the marketing process from both supply and demand side as well as the policies to improve international competitiveness; see, Khan and Knight (1985).

2.2.1. Agricultural planning policy

The aims of central planning policies in Syria, which were mostly implemented through price support, have been achieving food security, providing the public firms with the required raw quantities, adequate utilizing of the scarce water resources, and the implementing of improved farm technologies. In this context, it is to differentiate between two stages of planning policies, which differ in objectives and are complementary to each other; see, NAPC (1999).

The first period ended in the mid 1980s, which had the following goals:

- Achieving high self-sufficiency ratios in most commodities especially the strategic crops (wheat, barley, lentil, chick peas, sugar beet, cotton, and tobacco). Therefore, this stage was more production oriented.
- Supporting the structural changes in agriculture (infrastructure) such as agricultural road, irrigation water canals, dams, improved seed varieties, fertilizer use, mechanization and advanced irrigation methods, and the research and extension services.
- Product diversification (cropping pattern or crop rotation).

The second stage has begun after the mid 1980s with the following objectives:

- Relaxing central restrictions in order to adjust to global changes and to benefit from the opportunities offered through international trade. Thus, market orientation placed first and the planning activities are indicative in order to provide credits and inputs.
- Supporting the use of advanced irrigation technologies in order to avoid the excessive use of the scarce water resources. Thus, central restrictions were imposed only in the case of excessive water use. There are also attempts to substitute those restrictions through adequate price policies.
- Product diversification (branding and crop rotation).
- Highlighting the principle of comparative advantage.

Consequently, it is worth noting that the two stages have common characteristics:

- Agricultural activities are performed privately. Thus, there is no government intervention in the way people produce.
- The central restrictions are on governorate (county) level. Thus, farmers are free to exchange their production goals on individual basis.
- There are no restrictions on animal production. Therefore, the figures are indicative for credits and scientific purposes.

Moreover, according to UN (1995), in Syria the general cropping patterns, production, and the input utilization for agriculture (only strategic crops) are centrally planned. Accordingly, the planning activities are the result of the interactions among the farmers, the Ministry of Agriculture and Agrarian Reform, the Farmers' Union, the Cooperative Agricultural Bank (CAB), and the Higher Agricultural Council (HAC). In this context, the annual planning is dominant within the context of national five-year plans (indicative). Thus, after the figures of the desired planting for the major crops were fixed in corporation with the farmers and cooperatives in the village, the draft plan makes its way through the village, cooperative, province, and governorate to the national level in order to construct the final plans. The final plans then will be passed down via the HAC, the Ministry of Agriculture and Agrarian Reform, and the Farmers' Union to various government departments and ultimately to the farmers.

Consequently, the weather variations make the production planning difficult. Therefore, there are substantial adjustments in the plans, which were submitted at the beginning of the growing season. This is also a justification for some farmers to switch to other more profitable crops.

Finally, Rama et al. (2000) highlighted that the Syrian central planning process consists of two main instruments: production plan and investment plan (only for public sector). The obligations only concern strategic products, while for other products, farmers only receive indications or, for "minor crops", their decisions are completely free. Thus, the main objective is the determination of input and cash credit needs, which is the basis for issuing licensees to farmers.

2.2.2. Pricing policy

Rama et al. (2001) wrote: the importance of price polices in the marketing chains for meat and dairies results from their role in providing an efficient and well functioning supply chain when they function according to free market mechanism in order to reallocate resources, to distribute income, and to encourage investments and capital formation. Moreover, direct price policies, which normally lead to price distortion and social losses, propose increasing outputs, stabilizing prices and income, achieving self-sufficiency and food security, and generating or saving foreign exchange. Consequently, Rama et al. (2000) highlighted that for animal products at farm level, only cow milk has an indicative price, which is paid by state dairies, while prices paid by private processors reflect production seasonality. Moreover, in practice, the price control is less strict especially for meat and dairy products.

Moreover, Marion (1986) highlighted that the market price is the major means for the coordination of the exchange between the stages of the food system. The price also may be used as a basis for other coordination mechanisms such as contracts. Thus, prices will be discovered according to the process by which buyers and sellers arrive at a specific price for a given lot of produce in a given location. In addition, Purcell (1979), and Kohls and Uhl (2002) mentioned six pricing methods from which the following pricing methods are important for the Syrian sheep sector:

Individual, decentralized negotiations

Here, buyers and sellers negotiate separately to establish the product price. This method is common in agriculture to discover the farm gate price. Consequently, the resulting fairness of prices depends on the information, trading skills, and relative

bargaining power of negotiated parties. This method can be considered as the usual pricing method of the Syrian sheep sector.

Organized, central markets

Here, the location of price discovery shifts from the farm gate to a central, often public, marketplace. Thus, because of the open outcry and public nature of these markets, they are said to be more transparent than other price discovery points. This means that the pricing machinery is more open and exposed to the participants; see, Kohls and Uhl (2002). For example, such markets in Syria can be Suk Alhals (markets for agricultural products including sheep products) in Damascus.

Formula pricing

Here, the price discovery is tied to some market reports. In this context, Ward (1988) explained two complex formula pricing models in the meat packing industry: one for fed cattle and the other for oligopoly and oligopsony which take into account the effects of various prices and quality grades. In Syria, for example, such type of pricing is present in beef processing and dairies (fat content and moisture).

2.2.3. Input, credit, and investment policy

The dimensions of input policies in SAR are price level, delivery system, information flows, and the integration between plant and animal production with the objectives to adopt new technologies and to increase the production efficiency; see, Rama et al.(2001) and UN (1995). Consequently, the main Syrian input policies regarding animal production, which have an impact on the sheep sector, are fodder (forage and feed), vaccines, and veterinary services.

Accordingly, The General Establishment for Fodder (GEF) was established (law no. 390/1974) to achieve the following objectives:

- To supervise the current fodder (feed) firms and to assist the establishment of new fodder firms in order to cover the demand on all kinds of fodder.
- To establish new storage fodder (feed) capacities in all governorates.
- To market fodder domestically and internationally.
- To supervise the distribution of fodder.

- To improve the ready made fodder mixtures (feed).
- To help the control of fodder quality.

In addition, a central laboratory for fodder (forage and feed) analysis belongs to the Ministry of Agriculture was established in order to control the fodder quality.

Moreover, the management of vaccines and vaccination is belonging to the MAAR because the private sector is currently unable to deliver such services. Other management practices of the government are the control of grazing areas in the Syrian steppe to improve the efficiency of green fodder (forage) use and the liberalization of fodder (feed) to encourage the entry of new private fodder firms to improve the competitive structure of the fodder industry (competition on equal footing between private and public firms).

In addition to input policies, credit policy, as presented in Rama et al. (2001), also has enormous impact on the sheep sector because it assists the acceleration of economic development and the improvement of farm income through realizing the following goals:

- Increasing capital formation.
- Maintaining the profitability of agricultural activity.
- Increasing marketing efficiency.
- Dealing with variable economic conditions and seasonality between costs and revenues.
- Providing protection from bad natural conditions.
- Improving coordination of the marketing chain.
- Improving integration between plant and animal production.

Consequently, credits are provided in Syria to producers at low interest rate to comply with national production objectives and programs; see, Rama et al. (2001) and UN (1995). They are provided in cash and in kind for short, medium, and long term. The interest rate varies between 4-7.5 % according to period and sector (private, cooperative, public). The period of credit repayment is one year for short term, five years for medium term, and 10 years for long term. For example, short-term credits are provided for animal fattening; medium-term credits are provided for machinery; and long-term credits are provided for establishment of livestock farms. In this context, the management of agricultural government's credits is belonging to the CAB. Accordingly, tables 2.1 and 2.2 show the development of credits according to term and sectors. The tables show also that the highest share of credits is in the short term and for the private sector.

Table 2.1: Development of credits according to term and sector

Unit:Mill. Sp

Year	Total Credits				Private Sector				Cooperative Sector				Public Sector			
	Short	Middle	Long	Total	Short	Middle	Long	Total	Short	Middle	Long	Total	Short	Middle	Long	Total
1989	5,445	1,155	246	6,846	2,722	653	98	3,473	2,570	502	148	3,220	153	0	0	153
1990	6,552	1,763	279	8,595	3,384	1,033	99	4,516	3,046	730	181	3,956	123	0	0	123
1991	8,059	3,417	209	11,685	4,079	2,018	65	6,162	3,843	1,399	144	5,386	137	0	0	137
1992	9,632	3,541	144	13,318	5,318	2,107	49	7,474	4,187	1,434	95	5,716	127	0	0	127
1993	10,584	2,829	123	13,537	5,842	1,768	43	7,653	4,652	1,062	80	5,794	90	0	0	90
1994	11,538	2,806	137	14,481	6,112	1,662	38	7,812	5,317	1,144	99	6,560	110	0	0	110
1995	12,598	2,679	243	15,520	6,512	1,534	89	8,134	5,828	1,145	155	7,128	258	0	0	258
1996	12,516	2,304	242	15,062	6,531	1,302	98	7,932	5,775	1,001	143	6,920	211	0	0	211
1997	9,966	1,881	254	12,101	5,116	1,060	108	6,284	4,621	813	145	5,580	229	8	0	237
1998	10,715	1,743	181	12,640	5,593	1,073	93	6,760	4,910	669	88	5,667	212	2	0	214

Table 2.2: Share of credits according to term and sector

Unit:%

Year	Total Credits				Private Sector				Cooperative Sector				Public Sector			
	Short	Middle	Long	Total	Short	Middle	Long	Total	Short	Middle	Long	Total	Short	Middle	Long	Total
1989	79.54	16.87	3.59	100	49.99	56.54	39.73	50.72	47.20	43.46	60.27	47.04	2.81	0.00	0.00	2.24
1990	76.24	20.51	3.25	100	51.64	58.59	35.41	52.54	46.48	41.41	64.59	46.03	1.88	0.00	0.00	1.43
1991	68.97	29.24	1.79	100	50.61	59.07	30.98	52.73	47.69	40.93	69.02	46.09	1.70	0.00	0.00	1.18
1992	72.33	26.59	1.08	100	55.21	59.51	34.07	56.12	43.47	40.49	65.93	42.92	1.32	0.00	0.00	0.96
1993	78.19	20.90	0.91	100	55.20	62.47	34.75	56.53	43.95	37.53	65.25	42.80	0.85	0.00	0.00	0.67
1994	79.68	19.38	0.95	100	52.97	59.23	27.65	53.94	46.08	40.77	72.35	45.30	0.95	0.00	0.00	0.76
1995	81.17	17.26	1.57	100	51.69	57.25	36.38	52.41	46.26	42.75	63.62	45.93	2.05	0.00	0.00	1.66
1996	83.10	15.30	1.61	100	52.18	56.53	40.70	52.66	46.14	43.47	59.30	45.94	1.68	0.00	0.00	1.40
1997	82.36	15.55	2.10	100	51.33	56.35	42.65	51.93	46.37	43.23	57.35	46.11	2.30	0.41	0.00	1.96
1998	84.77	13.79	1.43	100	52.20	61.55	51.44	53.48	45.82	38.36	48.56	44.83	1.98	0.09	0.00	1.69

Source: MAAR & NAPC

Investment policies also assist in strengthening the coordination of the marketing chains. However, to achieve efficient investment policies the government has not to invest in direct production activities, which can be performed by private sector investments. Thus, all public investments have to function as research centers to improve standards, product quality, and productivity. Accordingly, the Syrian government has issued the investment law number 10/1991, which is in continuous improvement, to promote private investments. Moreover, the investment plan of MAAR provides services that assist maintaining the integration between plant and animal production and the improvement of the supply chains. For example, this plan includes four investment projects which are concerned with rural development: development of southern areas, Ali Alali (project name) for the development of fruit trees, development of coastal and middle areas, and Jabal Alhos (project name) in Aleppo. In corporation with the research and extension services, these projects conduct training courses especially for women regarding learning Arabic language and handicraft industry (especially dairy and textile processing and improving processing quality).

Moreover, According to Rama et al. (2000), the public investments in Syrian agriculture are mostly oriented to create infrastructures, offer production support services, realize irrigation systems, etc. Consequently, the strong impact on the marketing chain will result from encouraging the private investments.

Finally, improving the performance of the sheep sector requires continuing the privatization process, providing the services that improve the efficiency of the supply chain, and improving the coordination among input, credit, and investment policies. In addition, the improvement of law no. 10/1991 effectiveness will strengthen the overall coordination of the various sub-sectors. Moreover, increasing the share of long-term credits will enhance the effectiveness of the sheep chain especially the performance of dairy activities and the use of advanced milking technologies.

2.2.4. Research and extension policy

Research and extension services are crucial for increasing the efficiency of the marketing chains because they generate and transfer new technologies to agricultural marketing activities; see, Rama et al. (2001) and Bottmley and Constant (1988). Their effectiveness relies on several factors:

- The forces selecting the required topics.
- The institutions sharing in research and extension.
- The resource allocation to research and extension activities.
- The management of the research and extension results.
- Priority setting and evaluation the impact of research and extention services.

Accordingly, research and development results about the achievements in plant and animal science enhance economic growth, production, and productivity and solve to a great extent the problem of resource scarcity. The biotechnology achievements reinforce the changes in the structure of the supply chain to more integrated and coordinated activities to make optimal use of the advances in agricultural science; see, Der Wal and Nieuwhof (1989).

Consequently, research and extension in Syria have played a crucial role in productivity growth and economic development. The results of this success relied on the activities of several institutions. However, the coordination among these agents is still inadequate. Therefore, the government has established the general organization for research, which coordinates all research activities in Syria. Accordingly, both activities (research and extension) will play an important role in improving the efficiency of animal and plant production including to great extent the sheep sector activities (improved local sheep breeds and improved processing at farm level).

Finally, more priority setting in scientific research, strengthening the marketing research and its coordination, and enhancing biotechnology research are needed in order to have effective policies. Follow up programs for the effectiveness of the results of public research will be considered also as an important step for a better resource allocation.

2.2.5. Policy for rural development

Policy for rural development can be considered as a basic element of the Syrian government farm policies to increase farm income and productivity. These policies are especially important for the farms concerned with animal production because of the processing activities on farm level. Thus, in addition to the government initiatives to increase the educational level of the rural population, the Ministry of Agriculture

(MAAR) in Syria gave a great attention to rural development issues in its strategic plan up to 2010 regarding developing and encouraging the rural industry.

2.2.6. Marketing and trade policy

According to Rama et al. (2001), the main functions of Syrian marketing policies are assisting the transmission of price signals between producers and consumers as well as the transformation of commodities in form, space, and time in order to:

- Provide protection for producers and consumers.
- Stabilize or increase farm gate prices.
- Maintain reasonable marketing margins.
- Improve product quality and minimum standards.
- Insure food security.

Consequently, Syrian marketing policies have the following objectives:

- Covering the demand on basic food of the domestic market through domestic production and imports at reasonable prices to consumers.
- Balancing the demand and supply in most agricultural commodities.
- Realizing an export surplus through exporting what can be exported.
- Matching imports with exports within the economy.
- Encouraging the private marketing activities and their competition with the public sector on equal footing.

In addition to marketing policies, trade policies play an important role in determining the structure and performance of the marketing chain. Trade will be beneficial for all countries because it leads to specialization of the countries in the products in which they have comparative advantages as well as to transition the traditional food system, which is production oriented, to a modern food system, which is market oriented. In this context, import and export policies constitute the main components of trade policies.

Import policies

Import policies in Syria emphasize the added role of private sector in ensuring the market efficiency. In addition to public sector, private sector is allowed to import animals and animal products such as sheep, powder milk, and ghee and butter, but financing of

imports should occur through export earning. Consequently, when import occurs, a custom tariff and a unified tax should be paid. In this context, it is to highlight that Syrian government accelerates the liberalization of import; an important step in this direction was flouting the exchange rate.

Export policies

Export policy aims at making a positive balance of external trade and foreign exchange earning. Consequently, devalued exchange rate will lead to export promotion. In this context, Syrian export policies highlight the added role of private sector in export earning. Thus, the private sector is allowed to export animals and animal products such as sheep, cheese, and butter in the context of export what could be exported. In addition, the exchange rate for export is currently liberalized. Therefore, there are recently no export restrictions; up to year 2000 a restriction was applied on export of local breed sheep (Awassi) in order to maintain the local genetic potential.

2.2.7. Evaluation the internal coherence of sectoral policies

Sectoral policies have done well to improve domestic animal production especially improving the productivity of local cows and sheep, decreasing of animal disease level, and integrating of plant and animal production. In this context, some indicators can be used to establish an adequate evaluation of the impact of sectoral policies on economic growth. Therefore, table 2.3 shows the growth rate of some indicators for the period 1993/1999 to identify the impact of sectoral policies. Consequently, it can be seen that sectoral policies have positive impact on cattle and sheep sectors in comparison with the population growth rate. However, regarding the sheep sector, there are inefficiencies in the level of production, milk production per capita, and productivity in comparison to population growth. Therefore, there is a need to increase productivity and research activities in this direction.

Finally, it can be concluded that there is coherence in sectoral policies, but it is not enough. Moreover, a general framework with more indicators is needed to evaluate the impact of sectoral policies more accurately.

Table 2.3: Growth rate of some indicators for the period 1993-1999

Sector	Number of heads %	Number of heads per capita %	Milk production %	Milk production per capita %	Productivity (Milk production/ Number of milked females) %	Meat %	Meat per capita %	Population %
Cattle	5.55	2.59	7.47	4.45	-1.80	8.50	5.45	2.89
Sheep	5.51	2.54	0.35	-2.47	2.39	11.47	8.34	

Source: NAPC

2.3. Organizational aspects of the supply chain

According to Kohls and Uhl (2002), there are several forces driving the organization and coordination of the food chain such as prices, contracts, and vertical integration as figure 2.1 shows.

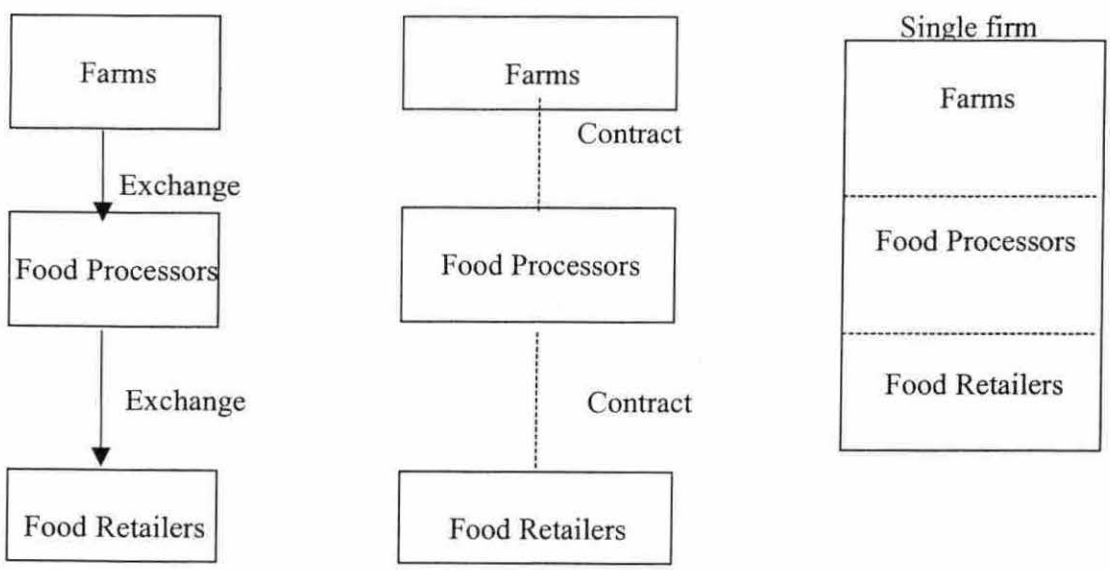


Figure 2.1: Alternative forms of vertical coordination in the food system

Consequently, some economists predict that if the price signals fail to effectively coordinate production with consumer preferences, then a non-price system of

coordination can be expected to evolve, or the industry will shrink and lose market share to competing animal proteins; see, USDA (2002).

Accordingly, the trend of vertical coordination and concentration is spreading out globally in the international food chain. Lawrence and Hayenga highlighted the emergence of highly integrated or coordinated supply chains in the pork and beef industry in the U.S.; Zylbersztajn and Filho described the relationship between coordination and competitiveness in the Brazilian beef business, Farina and Machado explained the importance of the relationship between chain coordination and the high quality standards to meet the the requirements of the widespread demand and the modern retailing services in the Brazilian fresh fruit and vegetable chain, and Padula and Vieira verified that small companies of the Brazilian dairies prefer vertical integration; Kagerhuber and Visscher expected consolidation in the Dutch and German industries; Shadbolt and Oca reported that New Zealand lamb farmers should work in a less adversarial and more coordinated and integrated environment; Kularatne and Storey reported that beef producers in North America agreed that there was a need for increased cooperation both vertically and horizontally; see, Trienekens and Omta (2002); Trienekens and Zuubier (2000).

Finally, the vertical coordination in the Syrian sheep sector is mostly driven by open market operations. However, there are attempts from the processing firms to use sheep milk in dairy production in order to export high quality products. In this case, the contract linkage is the prevailing form of integration. Thus, it is expected that the processing firms will increase their share of sheep milk consumption because of the strong market orientation especially for export.

2.4. Market information

Market information is a facilitating marketing function, and market intelligence is essential to a smooth, efficiently operating marketing system. Thus, accurate and timely market information facilitates marketing decisions, regulates the competitive market processes, and lubricates the marketing machinery; see, Kohls and Uhl (2002). Moreover, market information is the lifeblood of markets; it improves the decision making process and the operational efficiency in the food industry, and regulates product flows and prices in the food market. Accordingly, market information plays an important role both as a coordination mechanism and as a key issue in vertical coordination; see, Marion (1986).

Consequently, numerous private and public agencies are specializing in food marketing information and research. Hereby, the market information should fulfill several criteria to be of maximum benefit for its users. Hence, information should be complete, comprehensive, accurate, trustworthy, relevant and in usable form, confidential, and timely. Moreover, it is desirable to have a balance of market information at all levels of the food industry that each marketing agency can have equal access to all the information relevant to the bargaining and marketing processes; see, Kohls and Uhl (2002). In this context, "An asset market is said to be efficient with respect to the information set if revealing that information to all agents would not change equilibrium-asset prices or equilibrium-portfolio holdings"; see, Kilmer and Armbruster (1987).

Finally, regarding the Syrian sheep sector, the government tries to improve the quality of information combined with the use of information technology. In this context, it will be efficient to make the information available for each stage of the supply chain taking into account the needed information for the analysis of international trade and comparative and competitive advantage framework.

2.5. Risk management

According to Harwood (1999), risk is defined as an uncertainty that affects an individual's welfare, and is often associated with adversity and loss. It may involve the probability of losing money, possible harm to human health, repercussions that affect resources, and other types of events that affect a person's welfare. Consequently, risk management includes choosing among alternatives to reduce the effects of risk. Thus, producers can reduce or avoid risk by enterprise diversification, vertical integration, contracting, and other possibilities.

Enterprise diversification

Diversification means the involvement in various activities in the same time in order to balance the negative and positive effects of a project. For example, an investment in agricultural production can involve several crops or both crops and livestock. Consequently, in Syria, the enterprise diversification is guaranteed through the crop rotation (winter and summer crops) and the nature of Syrian farmers who tend to have

several kinds of animals on the farm in addition to their specialized activity. For example, sheep farmers can have also chickens and goats on the farm.

Vertical integration

Traditionally, the farming system has operated in an open production system (independent from other stages of the marketing chain). However, the technological push and the sophisticated consumers new needs encouraged, enforced, or reinforced the vertical coordination (integration) between the stages of the supply chain so that one firm retains ownership control of a commodity across two or more levels of activity. Here, it is to highlight the contract integration. Consequently, vertical integration is very weak in Syrian agricultural especially the sheep sector.

Contracting

In general, producers prefer the increase in contracting because in addition to managing risk, they determine their prices and profit level in advance, control costs, obtain finance in advance to run their production process, smooth out supply, and meet consumer demands for specific product attributes; see, Ahearn, Banker, and Donald (2003). Consequently, it can be distinguished among production contract, marketing contract, and forward contract.

Production contract

Production contracts typically give the contractor (the buyer of the commodity) considerable control over the production process; see, Harwood et al. (2001). They usually include in detail the supplied inputs, the production quantity and quality of the product to deliver, and the grower compensation. For example, a broiler integrator (contractor) retains control over the producer chicks and the prescription of special management practices throughout the production cycle. This kind of contracting is very limited in Syria.

Marketing contract

Marketing contracts can be verbal or written agreements between a buyer and a producer to set a price and/or an outlet for a commodity before harvest or before a

commodity ready to be marketed; see, Harwood et al. (2001). Here, the ownership and the management decisions remain with the producer. This type of contracts represents the usual method of contracting in Syria especially by sheep producers.

Forward contract

A forward contract is an agreement to buy or sell an asset at a certain future time for a certain price. It is traded in the over-the-counter market usually between two financial institutions or between a financial institution and one of its clients. Consequently, over-the–counter market is a telephone-and computer-linked network of dealers, who do not physically meet. Trades are done over the phone and are usually between two financial institutions or between a financial institution and one of its corporate clients. This contract form is present by Syrian processing firms; see, Hull (2003).

2.6. Efficiency considerations

According to Kohls and Uhl (2000), the most frequently used measure of market performance in the food industry is efficiency. Thus, improving the efficiency level is the common target of farmers, food marketing firms, consumers, and society; higher level of efficiency means better performance, whereas lower efficiency level denotes poor performance. Consequently, food marketing can be considered as an input-output system. Inputs represent the resources in use (machinery, labor, energy, etc.) or the costs of the marketing process. Outputs are time, form, place, and the possession utilities or the results of the marketing process (production, revenues, value added, sales, etc.). Thus, efficiency is the ratio of output to input. Efficient markets maximize this ratio. In this context, the concepts of economic profit and economic value added are fundamental in the sectoral analysis. *Profit* is defined as the difference between the revenues (value of output) and the costs of all inputs (costs). The economic *value added* is the difference between the revenues and the value of tradable inputs (fertilizer, seeds, etc.); see, UN (1995). Moreover, the economic importance of both measures was highlighted by Grant (2003) because they contribute to discovering the economic factors that lead to wealth creation and destruction among companies. In this context, Lawrence (2003) described the value added as one of the measures used to determine the economic impact of agricultural sector.

Accordingly, for the current evaluation of the sheep chain, the following efficiency expression (indicators) in current private prices will be used:

Ratio of revenues to costs

The higher this ratio is, the better the performance is.

Ratio of value added to costs

The higher this ratio is, the better the performance is; hereby, the value added can be considered as an output measure because the domestic output can be measured either according to the expenditure approach, which measures the value of final sale or according to the cost approach, which measures the value added in producing final output.

Moreover, these indicators can be used either to evaluate the same process by different scenarios or to compare the performance of various marketing activities. By comparing the outcomes of various activities, a benchmark should be used; for example, the opportunity cost of invested capital. The opportunity cost will be defined as the value of something in its next best alternative employment or the benefits forgone when a specific decision is made; see, Salvatore and Diulio (1996), Binger and Hoffman (1998), and Nicholson (1998). In this context, Krager (2003) used the rate of return to long-term capital (risk free rate or pure interest rate without risk) to compare the profitability of all stages of the value chain in the Canadian agri-food system. Consequently, it is worth noting that the process is efficient or inefficient only according to the calculated indicator. However, this does not mean that the overall efficiency is acceptable or not because the overall efficiency is a complex expression which should be evaluated according to many indicators that evaluate the process from various points of view in addition to other considerations. In this sequence, Klimer and Armbruster (1987) described the approaches used to evaluate the economic efficiency of food marketing systems and discussed various kinds of efficiencies. Two of these are production efficiency and global efficiency.

Production efficiency

"Productive efficiency requires that each firm produces in such a way as to place the economy on its production possibility frontier"; see, Kilmer and Armbruster (1987). Consequently, "An economy is said to exhibit productive efficiency if, within the limitations of technology and resources, there is no feasible way to increase the amount of produced output, holding fixed the current amount of inputs to production, or to decrease

the amount of inputs to production, holding fixed the current amount of produced output"; see, Tesfatsion (2002).

Global efficiency

"A set of multiple interrelated assets markets is efficient if all markets adjust instantaneously and converge to a stable, general equilibrium allocation as a result of the random arrival of any new information". Thus, global efficiency is a relative concept that measures price dynamics; see, Kilmer and Armbruster (1987).

Finally, according to Rama et al. (2001) and Marion (1986), the structure of a certain industry can be evaluated according to the following indicators:

1. Size of the industry or number and size of buyers and sellers, for example, in terms of:
    - Employment,
    - Value added: Return to factors + taxes/subsidies + profit/losses,
    - Shipment value and /or total sales;
2. Number of establishments (plants, warehouses, stores, etc.);
3. Dimension of plants/establishments/companies (it may be measured by dividing measure of size of the industry by number of plants / establishments / companies);
4. Distribution of plants and companies by size;
5. Ranking the firms by size and calculating any of the concentration ratios (CR4, CR5, etc.) taking into account the clustering of functions;
6. Location of plants and companies;

2.7. Approaches for analyzing the marketing process

In this section, the focus is on the marketing system from viewpoint of the individual product. Consequently, the commodity system will be studied as a network. "Networks are looked upon as the total of actors within one industry and/or between related industries, which can potentially work together to add value to consumers"; see, Omta, Trienekens, and Beers (2002). Thus, network management can be conducted on various levels: industries, firms, relationship portfolios, and exchange relationships. Accordingly, a different organization of a chain or network leads to new requirements or new opportunities in the field of production, logistics, packaging, or storage. New technology, however, causes changes in the patterns and modes of transactions; see, Omta,

Trienekens, and Beers (2001). In this context, chain and network techniques became an important management tool for the firms both nationally and globally for the following reasons:

- They increase the responsiveness and flexibility of the firms, and optimize the ability to react to changes in consumer demand through the exchange of information on stocks and product flows and optimization of these stocks and flows;
- They promote the innovation process, optimize the flow of technical transformation, and improve market development.
- They enable several firms to coordinate in a particular market in order to maximize the value chain for the participants as a whole and not for individual agents.

Accordingly, based on Purcell (1979), Kohls and Uhl (2002), and Rama et al. (2001), the following approaches can be used to analyze the marketing system:

The functional approach

This approach provides the skeletal or vertical framework for a more in depth investigation of the marketing process. It breaks down the supply chain into functions such as exchange, buying, selling, processing, etc.. Thus, the study investigates the efficiency of the various economic functions performed by different institutions in order

- To evaluate the marketing costs and their differences, and
- To improve the performance of the marketing activities.

The institutional approach

This approach studies the institutions involved in the marketing process and their horizontal structure. It considers the nature, character, and role of the various marketing agencies such as wholesalers, retailers, processors, etc. in order to understand the specialization process and its advantages.

The behavioral systems approach

This approach considers the functional and institutional structure of the marketing process, the changes in the chain organization, and the functional combinations in quantitative and financial form (flow quantities, value added) to determine the degree of responsiveness, flexibility, and profitability of the system. This approach can be

conducted in a simple form or a complicated consideration according to purpose. Here, the marketing process will be considered as an input-output system both as a whole and for each stage of the supply chain in order to calculate the successive value creation.

Consequently, the first and second approach were combined to study the main actors operating in the Syrian marketing process in highlight on international agents, and the steps of the third approach will be illustrated by applying the commodity chain analysis to the Syrian sheep sector.

2.7.1. The main actors of the marketing process

The major participants in the marketing process of agricultural products are input suppliers, farmers, processors, traders, and end-users; see, Purcell (1979), Kohls and Uhl (2002), Rama et al. (2001), Rama et al. (2000), Trienekens and Omta (2002), and Kraker (2002).

Input suppliers

Input suppliers are concerned with the delivery of farm's inputs such as seeds and seedlings, fertilizer, fodder (feed and forage), machines, etc.. Their economic performance is very important for a profitable and well functioning agriculture; see Halcrow (1984).

Consequently, the main input suppliers in Syrian agriculture are the CAB, the general establishment for fodder, the general establishment for seeds, the general establishment for cattle, the general establishment for poultry, private input traders, private input processors and suppliers, and others. Here, it is worth mentioning that the role of the private sector regarding input supplies of animal production is increasing continuously. The public input supply, however, is limited and its role is declining in comparison to the development in private sector. Both sectors are competing on equal footing, which assists by improving the efficiency of the public sector. Thus, it can be said that the input supply concerning animal production is functioning according to free market mechanism.

Farming system

Farming, according to Halcrow (1984), will be divided for the purpose of policy analysis into plant production (crops) and animal production (livestock). Thus, the agricultural sector with its both sub-sectors (plant and animal production) is responsible

for the production of agricultural commodities, including food commodities, for the population, the agro- industry, and for export. Accordingly, the farms should supply a determined quantity of plant and animal products according to the quality needed and to their size so that the production of all farms should comply at least with the aggregate demand for agricultural products. This task can not be accomplished without coordination with the other sectors of the economy especially the industrial and trade sectors; see, Rama et al. (2001). Thus, the importance of efficient farming results from responsibility of agricultural sector for raw material delivery to the following stages of the food chain in order to be processed, distributed for fresh consumption, or exported. This means that inefficient farming will lead to inefficient supply chain.

Consequently, farming in Syria is performed in small, middle, and large size farms. However, the small size production is the dominant type (about 80% of cultivated area), which causes difficulties by benefiting from economies of scale, adopting new technologies, and achieving a balanced growth between animal and plant production; see, NAPC (1999). However, in spite of the small farm size, agriculture has a comparative advantage in a variety of products especially animal products. Moreover, agricultural production is performed in 14 governorates and in 5 ecological zones (sorting according to rainfall). In this context, tables 2.4 and 2.5 show the distribution of holdings, parcels, and areas by zones and governorates in 1994 (last census).

Table 2.4: Distribution of holdings, parcels, and areas by zones of Syrian agriculture in 1994

Item	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Total
Number of holdings	302,288	125,517	34,682	28,036	70,373	560,896
Number of parcels	1,038,164	393,251	103,050	74,536	149,973	1,758,974
Total cultivated area (ha)	1,418,531	1,650,748	523,691	394,394	537,630	4,525,264
Average holding size (ha)	5	13	15	14	8	8
Average parcel size (ha)	1	4	5	5	4	3

Source: NAPC

Accordingly, there are four types of farms in Syria: private, cooperative, state, and joint-venture farms.

Table 2.5: Distribution of holdings, parcels, and areas by governorates of Syrian agriculture in 1994

Governorate	Number of Holdings	Number of Parcels	Total Cultivated Area ha	Average size of Holding ha	Average size of Parcel ha
Rural Damascus	36,249	101,185	101,350	2.80	1.00
Damascus City	6,606	14,426	17,037	2.58	1.18
Dara	28,087	93,649	189,105	6.73	2.02
Al-Sweida	22,013	88,518	148,069	6.73	1.67
Quneitra	3,838	13,390	12,365	3.22	0.92
Homs	45,254	146,166	351,516	7.77	2.40
Hama	59,603	185,738	386,706	6.49	2.08
Idleb	52,757	162,186	279,961	5.31	1.73
Aleppo	88,112	293,346	1,059,531	12.02	3.61
Tartous	57,378	276,395	103,535	1.80	0.37
Lattakia	46,811	155,723	88,980	1.90	0.57
Hassakeh	52,043	92,518	943,442	18.13	10.20
Al-Rakka	23,528	46,037	649,428	27.60	14.11
Deir-ez-zor	38,617	89,697	194,241	5.03	2.17

Source: NAPC

1. Private farms

This kind of farms belongs to private individuals and includes a high share of scale economies. Private farms perform either specialized activities (plant production or animal production) or mixed activities (both plant and animal activities). They work according to the general plan and strategy of government for plant production (wheat, sugar beet, and cotton).

2. Cooperatives

The basis of most farmers' cooperatives is achieving economies of scale and raising the bargaining power of farmers over the price and other conditions of sales of their products and of farm inputs; see, Rama et al. (2001) and Marion (1986). Therefore, cooperatives are directly relevant to market conduct in agriculture because they enable their members to integrate around oligopsony processors and may also influence oligopsonists' behavior by acting as yardsticks of competition; see, Johnson and Martin (1993). Thus, cooperatives, as presented by Kohls and Uhl (2002), enable farmers to achieve the following major objectives:

- Improving the market coordination and the bargaining power of farmers, which enhances returns and increases efficiency.
- Decreasing the marketing costs of both their input supplies and their products.

- Improving product and service quality or providing farmers with products and services otherwise not available.
- Assisting farmers to move into supply, assembly, and processing markets.

Consequently, Syrian cooperatives are different from the model known in western agriculture and in centrally planned economies. They have an essential role in the preparation and implementation of the national production plan and the provision of major farm inputs; see, Rama et al (2000). Moreover, they work according to the general plan and strategy of the government and the Farmers' Union to achieve the following main objectives:

- Improving production and using modern farming technologies.
- Organizing and managing credits and land cultivation
- Subsidizing rural processing.
- Managing their production activities and marketing agricultural products.

Accordingly, Syrian cooperatives can be of following types:

Multiple goal cooperatives

They provide the farmers with the following services:

- Providing agricultural inputs and credits.
- Buying, storing, and marketing of agricultural crops.
- Buying agricultural machinery and instruments.
- Performing education and training activities and research.

Specialized cooperatives

They perform one kind of activity such as sheep keeping, cattle keeping, sheep fattening, cattle fattening, etc…

Production cooperatives

They perform one kind or several kinds of production. Their activities include plant production, cattle keeping, and fishery.

Marketing cooperatives

Their activities include fruit, vegetables, and animal products.

Consequently, table 2.6 illustrates the structure of cooperatives according to governorates, their numbers, and their members. The table shows that the dominant types of cooperatives are multiple goal and animal keeping cooperatives.

3. State farms

The government manages them; all fixed assets and returns to factors of production belong to the government; labor gets wages. In this context, the General Establishment for Poultry and the General Establishment for Cattle represent the state farms.

4. Joint ventures

They were established according to the decree No. 10/1986 to promote public-private joint ventures with up to 75% private capital and some control of the government on the company management and administration. Therefore, they have a more dynamic management than state companies; see, Rama et al. (2000). In this context, they have the task to reclaim land, which is not directly usable for farming, in order to expand horizontally. Moreover, they perform mixed activities such as plant production, animal production, and processing.

Processors

Food processors are responsible for adding time, form, place, and possession utility to raw farm products. Their activities may include canning, freezing, dehydrating, separating, disassembling, etc. in order to prepare or transform the raw products to more convenient food. Moreover, the advances in food science and technology affected the entire marketing system to adapt to consumers new needs and/or to create new consumers' demands. These technological developments created incentives for a better coordination among farmers and processors through contracts or other arrangements to adjust to specific processing and consumer want. In addition, biotechnological advances promise to change the nature of food production and processing; see, Kohls and Uhl (2002). Consequently, it can be distinguished among three levels of processing: family level, village (traditional) level, and large-scale level; see Rama et al. (2001).

Table 2.6: Structure of Syrian cooperative sector according to governarates in 1999

Kind of Cooperative / Governarate	Total Numbers	Total Members	Production Cooperatives		A K Cooperatives		Fattening Cooperatives		Marketing Cooperatives		Mutiple Goal Cooperatives		Other Cooperatives	
			N	M	N	M	N	M	N	M	N	M	N	M
Damascus	320	84,564	1	32	66	13,579	8	647	1	1,035	225	64,829	19	4,442
Aleppo	1,032	107,063			103	11,014	7	1,242	2	2,183	915	91,611	5	1,013
Homs	627	82,033			225	26,053	36	4,335	2	1,399	344	48,299	20	1,947
Hama	429	78,218			39	19,949	11	2,000	2	2,896	373	52,940	4	433
Latakia	488	85,940	1	37	62	4,570			2	201	421	80,808	2	324
Idleb	475	81,468			37	8,920	27	2,515	2	381	406	69,172	3	480
Deir-ez-zour	227	75,623	1	258	119	30,891	8	1,744	2	3,547	94	39,042	3	141
Al-Hasakeh	632	104,485			100	30,891	3	500	2	365	522	72,377	5	352
Al-Raka	413	69,936			191	25,209	1	92	2	1,725	212	42,050	7	860
Al-Sweda	172	40,773			54	6,732			2	112	115	33,112	1	817
Dara	156	45,289			46	8,502			2	241	104	36,147	4	399
Tartous	353	75,939	1	35					2	2,762	347	72,176	3	966
Al-Quneitra	69	13,212	1	231					1	38	67	12,943		
Total	5,393	944,543	5	593	1,042	186,310	101	13,075	24	16,885	4,145	715,506	76	12,174

A K: Animal Keeping

N: Number

M: Member

Source: NAPC

Family level

This kind of processing provides great diet diversity. Meat preservation through drying, salting, smoking, and dairy products processing such as cheese, yogurt, butter, etc. are few examples of processing at family level. This kind of processing is private and very important for the sheep sector because a high share of sheep milk is processed on the farm.

Village level

Village based processing includes basic transformation of raw material, for which there is potentially a market. It can be done individually or collectively and provides employment for millions of rural people and an additional income. In general, village based processing occurs when the raw material is perishable, can't be stored for a long time, and needs transportation over long distances; for example, fresh meat and milk in Albadia (Syrian steppe). Again, this kind of processing is private and crucial for the transformation of sheep milk.

Large-scale level

This kind of processing will be conducted in large cities where urban populations demand processed foods in large quantities or in rural communities where it offers the twin advantages of processing perishable crops and animal products; it is close to the sources of raw material and provides employment for rural people. Thus, large scale processing is an economically efficient and a highly mechanized process with high product capacities. This kind of processing can be private and public. Public processing is usually inefficient because of the high production and management costs. Thus, the competition between both kinds of processing on equal footing will improve the efficiency of public firms. Moreover, this type of processing is currently from minor importance for the sheep sector. However, its role is increasing gradually. In this context, table 2.7 includes Syrian private food companies in 1999 and their production capacity. Accordingly, It can be concluded that number and capacity of meat and dairy companies are very small and limited compared to the production of meat and milk in Syria and to the food processing companies in the United States and Europe.

Table 2.7: Syrian private food companies in 1999

Industry	Number of companies				Production capacity 000 tons of raw material
	Number	Of which established under law 10/91			
		Number	Of which hiring more than 10 employees	Of which having partial or total foreign capital	
Cereals	2,005	14	13	0	1,954
Fruits and vegetables	40	14	13	2	424
Meat and processed meat	18	1	1	1	19
Dairy	32	9	7	4	79
Sugar and sweets	391	1	1	0	134
Oils, fats, and animal foodstuffs	207	11	8	1	457
Alcoholic beverages	76	1	0	0	28
Non-alcoholic beverages	126	2	2	2	183
Others	315	5	3	5	10,495

Source: NAPC

Traders

Traders or middlemen (intermediaries), according to Kohls and Uhl (2002) and Rama et al. (2001), are individuals or businesses who specialize in performing the various marketing functions involved in the purchase and sale of goods as they are moved from producers to consumers. Consequently, intermediates are important for the following two reasons:

- Farmers and processors cannot deal directly with ultimate consumers. They are not capable of producing, packaging, shelving, and selling to shoppers in stores at the same time.
- The costs of intermediates might seem high, but without intermediates the costs of bringing buyers and sellers together would be even higher.

In this context, Kohls and Uhl (2002) mentioned a variety of middlemen. However, in this research the focus is on the activities of wholesaling and retailing and government institutions, which are classified under merchant middlemen. *Merchant middlemen* buy and sell for their own gain. Therefore, they take title to and own the products they handle. Moreover, they can be wholesalers, retailers, and government institutions.

Wholesalers

A wholesaler is a business unit that buys and resells merchandise to retailers and other merchants and /or industrial, institutional, and commercial users. In this context, exporters and importers are belonging to wholesaling activities. Moreover, wholesalers don't sell in significant amounts to ultimate consumers. Accordingly, a wholesaler conducts the following services:

For his manufacturers or suppliers:

- Providing a sales force to sell the goods to retailers and other buyers.
- Communicating manufacturers advertising deal and plan.
- Maintaining inventory, thus reducing the level of inventories suppliers have to carry.
- Arranging or undertaking transportation.
- Providing capital by paying cash or quick payments for goods.
- Providing suppliers with market information they can not afford or are unable to obtain themselves.
- Undertaking credit risk by granting credit to customers and absorbing any bad debts, thus relieving the supplier of this burden.
- Assuming risk for the product by taking title.

For his customers:

- Buying goods the end market will desire and make them available to customers.
- Maintaining inventory, thus reducing customers' costs.
- Transporting goods to customers quickly.
- Providing market information and business consulting services.
- Providing finance through granting credit to small retailers.
- Ordering goods of the types and in the quantities desired by the customers.

Finally, Syrian wholesaling activities are numerous and small scale, and function according to open market operations. In the U.S. and Europe, however, the trend is to more concentrate, larger, more efficient, and more powerful wholesaling; see, Kohls and Uhl (2002), and Meulenberg (1993).

Retailers

Retailing is a dynamic marketing activity with a large influence on the economy. It attempts to satisfy the needs of consumers by purchasing and merchandising food products for final consumers; see, Kohls and Uhl (2002), and Rama et al. (2001). Retailers have the following functions:

For their suppliers:

- Anticipating ultimate customer needs.
- Providing inventory, storage, and transportation.
- Financing inventories and breaking bulk.
- Providing market information.
- Assuming product risk.
- Providing personal selling and advertising effort.

For ultimate consumers:

- Anticipating their product and service needs.
- Providing product storage and delivery.
- Breaking product bulk into acceptable size.
- Providing credit.
- Providing product and service information.
- Assuming risk by giving guarantees and after sale service.

Again, Syrian retailing consists of numerous middlemen competing with each others according to open market operations. In the U.S. and Europe, however, the establishment of larger and more powerful firms characterizes retailing; see, Meulenberg (1993), Marion et al. (1979), and Callahan and Zimmerman (2003).

Public institutions

They perform the functions of wholesaling and retailing. Most of them are large, but they are inefficient in comparison to private institutions because of the high management costs and the inflexibility in their marketing decision. Therefore, the government makes attempts to improve the management of these institutions and to concentrate their activities.

End-Users

They can be consumers, by-product users, or rest of the world. End-users are very important to increase and improve the chain performance and efficiency.

2.7.2. Scope of the commodity chain analysis (CCA)

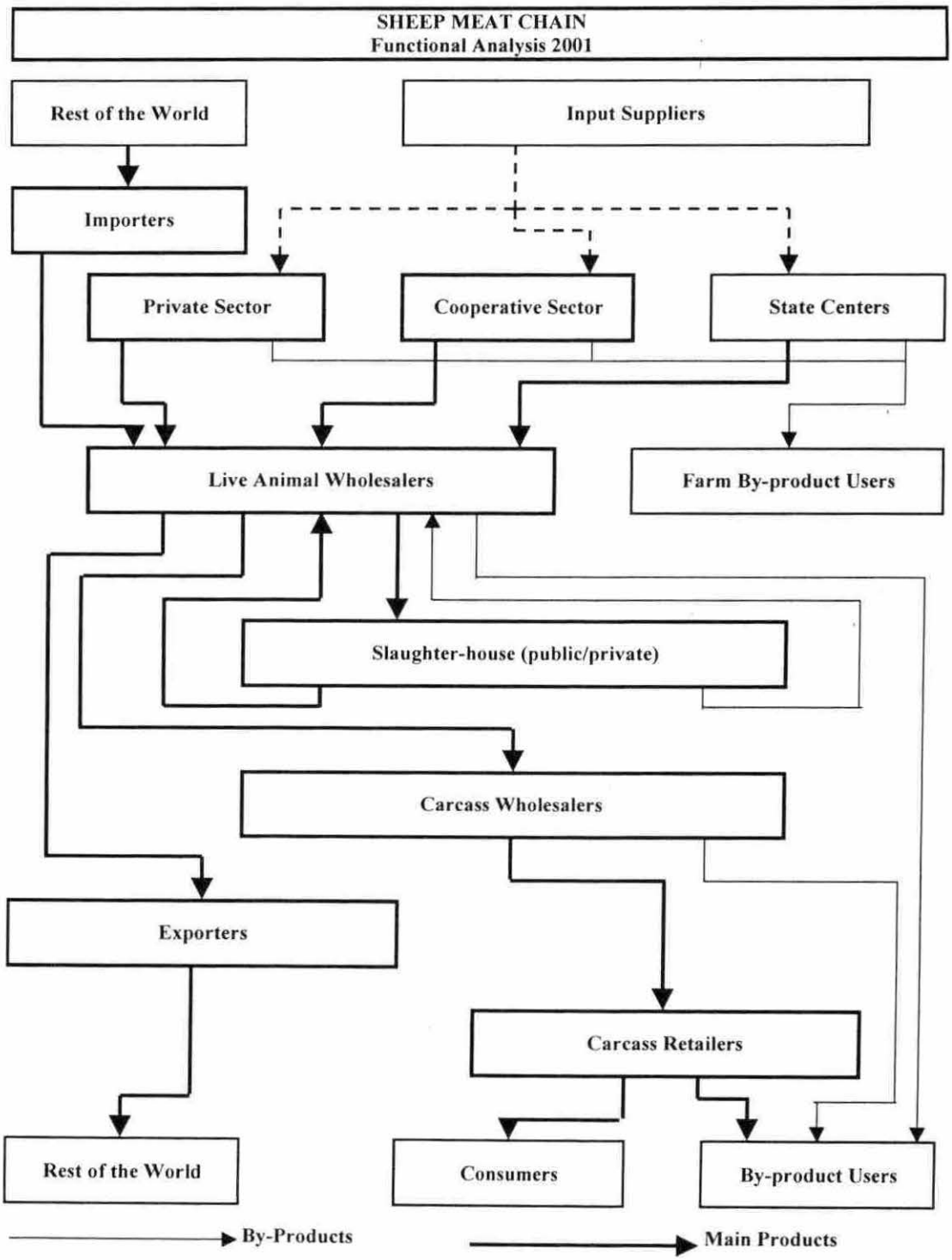
Within the realm of CNS, supply chains are considered to be composed of the actors in a business network who vertically work together to add value to customers; see, Omta, Trienekens, and Beers (2002). Therefore, supply chain management research focuses on value creation and the product flow throughout the chain from primary producer up to the consumer; see, Ibrahim (1995). Consequently, the commodity chain analysis (CCA) is an approach, based on systems analysis theory, to study the agents (e.g. farmers, processors, traders, etc) operating in the marketing channels of a certain commodity not in isolation but taking into account their linkages and interdependencies with other agents. In this context, it is to highlight that the analysis will be conducted taking into account a comparison between two periods. This means that two scenarios will be compared (a baseline scenario and a current scenario) to study the impact of changes in one variable or several variables on the agents' outcome. Moreover, to explain the methodology of the CCA, its steps will be illustrated by applying this technique to the sheep sector in Syria. Thus, the following stages are necessary to conduct the analysis:

Drawing flow charts

The charts required for the analysis are a diagram for the functional analysis and another for in/out commodities and flow percentages. Consequently, figures 2.2 and 2.3 represent the functional analysis for sheep meat and sheep milk, respectively; figures 2.4 and 2.5 show in/out commodities and flow percentages for sheep meat and sheep milk, respectively.

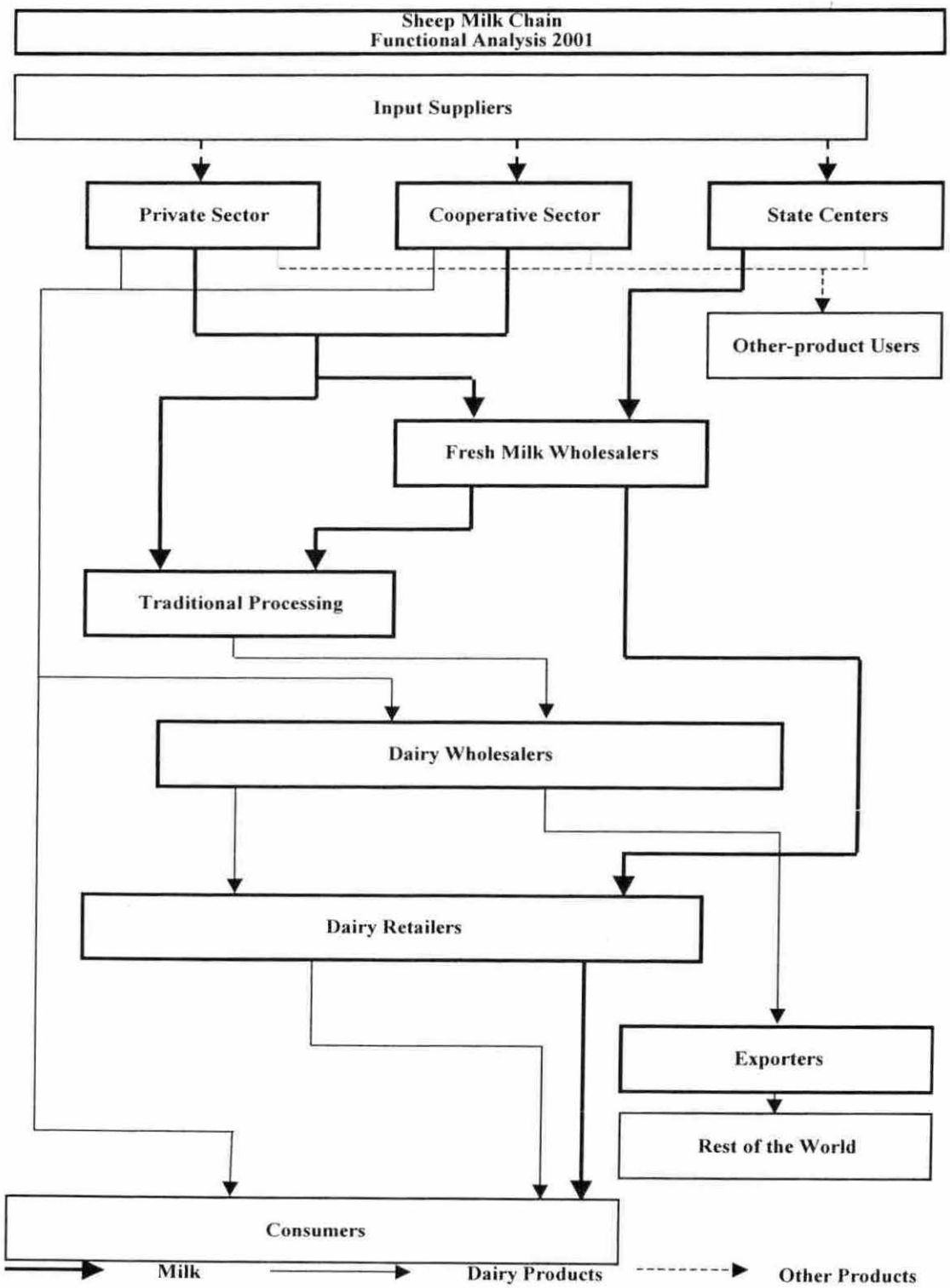
Constructing basic data tables

Tables 1-9 in Appendix A and 1- 8 in Appendix B represent the major structure of the basic data needed for the sheep meat chain and sheep milk chain analysis, respectively.



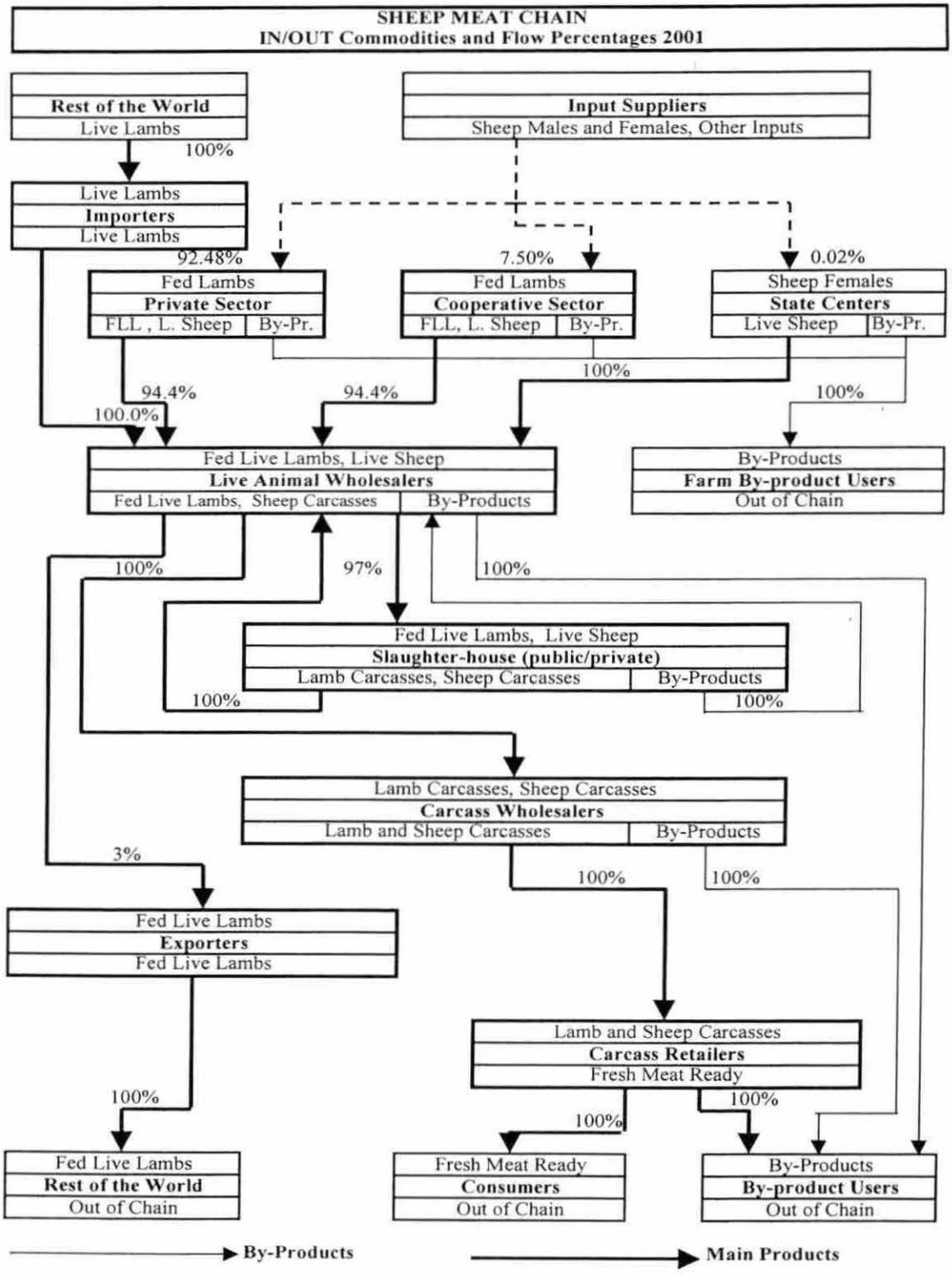
Note: Squares, not bolded, are out of chain

Figure 2.2: Functional analysis of the Syrian sheep meat chain in 2001



Note: Squares not bolded are out of chain

Figure 2.3: Functional analysis of the Syrian sheep milk chain in 2001



Note: Squares, not bolded, are out of chain
FLL: Fed Live Lambs L.Sheep: Live Sheep By-Pr.: By-Products

Figure 2.4: In/out commodities and flow percentages of the Syrian sheep meat chain in 2001

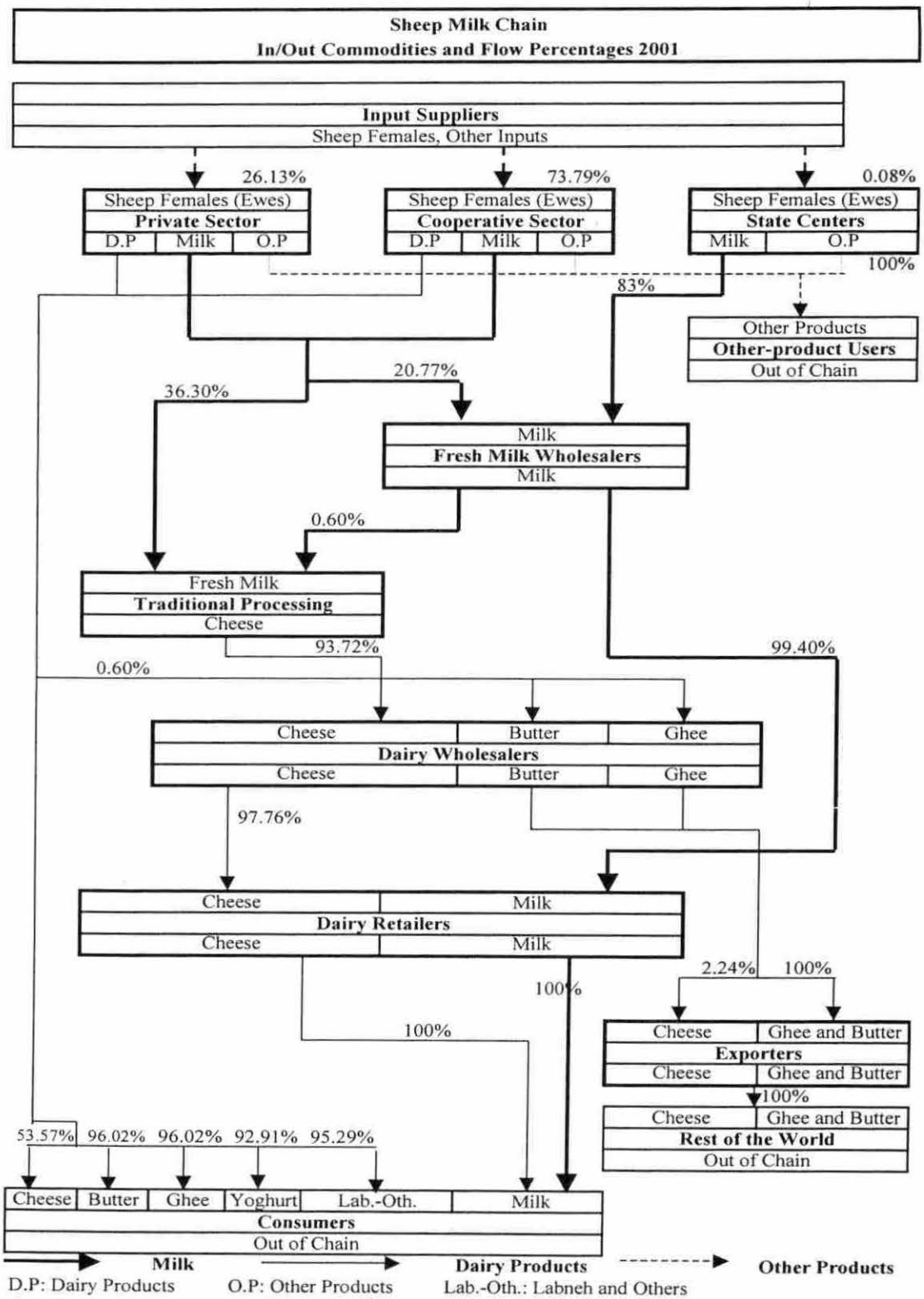


Figure 2.5: In/out commodities and flow percentages of the Syrian sheep milk chain in 2001

Calculating the farming budgets

Tables 10-12 in Appendix A and 9-12 in Appendix B show the key structure of the calculations needed for the farming budgets.

Constructing the coordination matrices

There are three types of matrices: matrix of flow percentages, matrix of flow quantities, and matrix of prices; forms and contents of these matrices are furnished in Appendix A (tables 13 through 15) and Appendix B (tables 13 through 15). In this context, the matrix of flow percentages and matrix of flow quantities will be managed through the following formulas:

Supply = Inflow from backward agents + (-) changes in stocks

Utilization = Outflow to forward agents + auto-consumption (self-consumption) + wastages & losses + (-) changes in stocks

Column total = Row total

Column total = Domestic production (farmers) + imports (rest of the world)

Row total = Final consumption (end-users) + exports (rest of the world) + losses, wastages, and stock changes

Calculating the budgets for non-farm agents

The tables are depicted in Appendix A (tables 16a through 21b) and in Appendix B (tables 16a through 20b).

Calculating a budget summary for the chain

The summary tables are shown in Appendix A (table 22) and Appendix B (table 21).

Calculating a summary table for the performance measures according to agent

Table 23 in Appendix A and table 22 in Appendix B give an overview about the performance measures of sheep meat and sheep milk, respectively.

Drawing the diagrams of the value creation

Figure 2.6 represents the value added according to the agents of the sheep meat chain and figure 2.7 illustrates the value creation of the sheep milk chain.

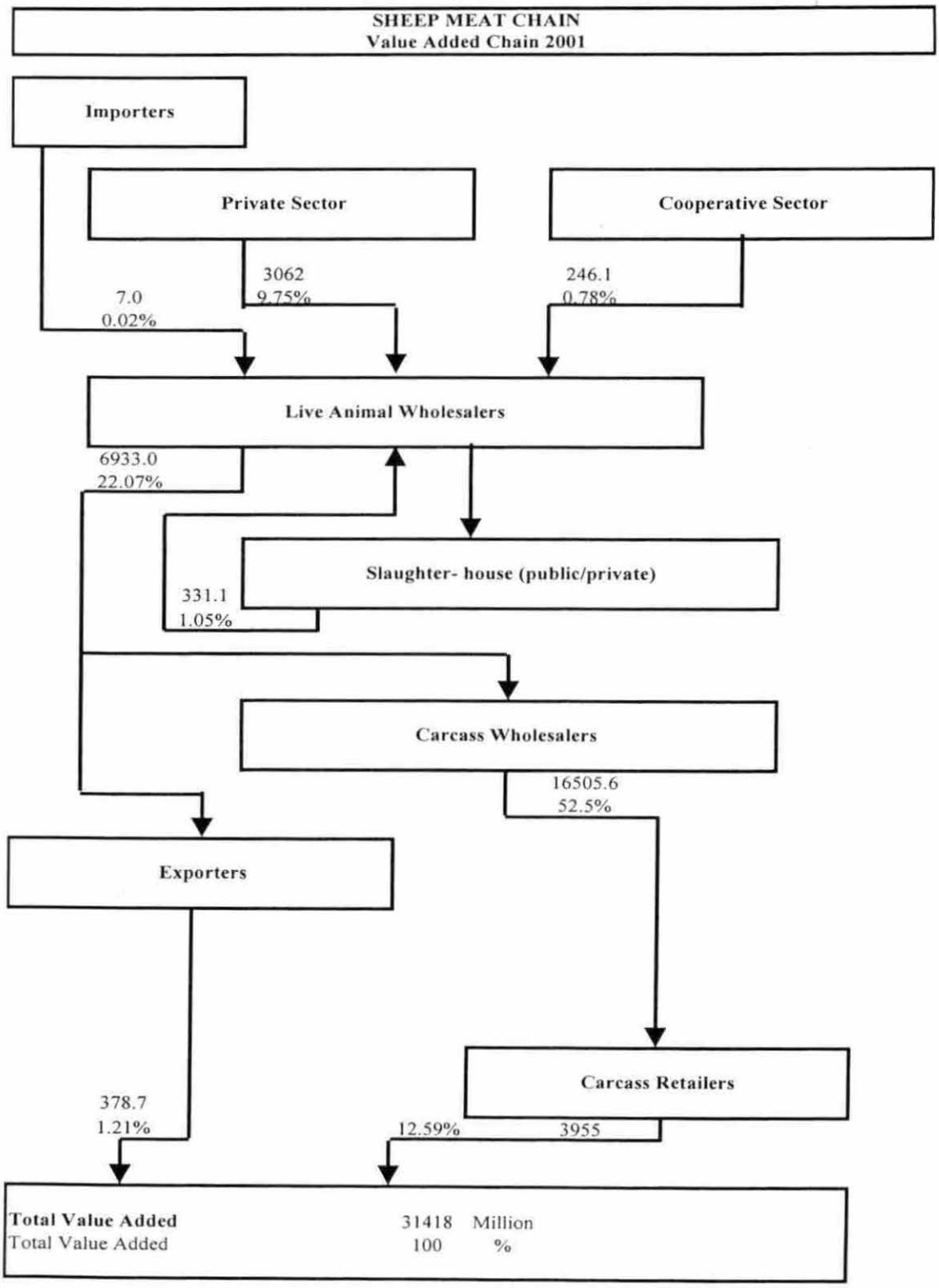


Figure 2.6: Value added chain Of Syrian sheep meat in 2001

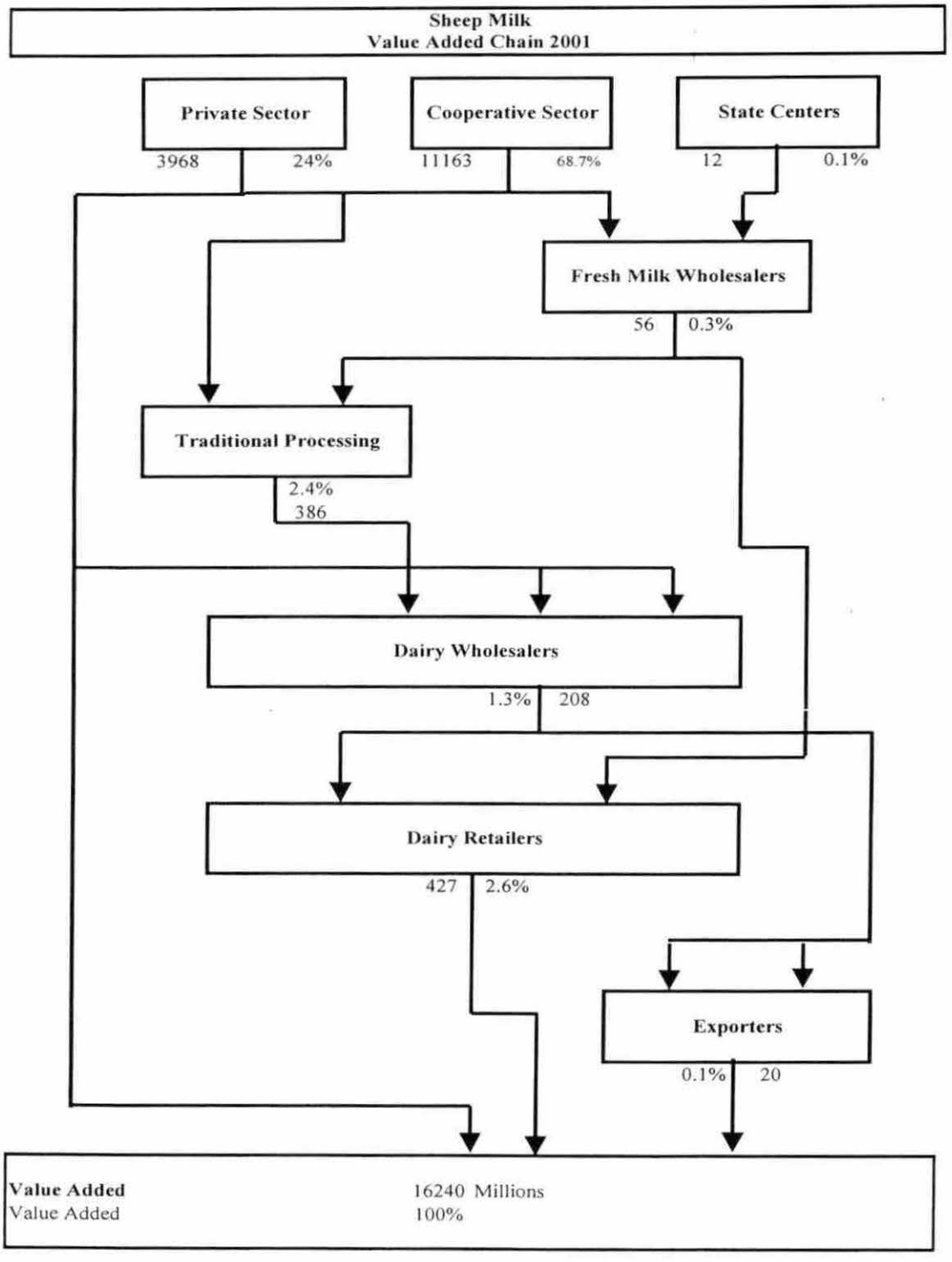


Figure 2.7: Value added chain of Syrian sheep milk in 2001

Analyzing the performance of the marketing chain

It will be conducted in chapter 3 and chapter 4.

Finally, the commodity chain analysis often suffers from theoretical and practical constraints because it doesn't give the full impact of economic changes on the national economy and can not predict the agent's behavior on price changes. Therefore, connecting the CCA with partial equilibrium analysis (benefit - cost analysis) makes this tool more efficient.

2.8. Benefit – cost analysis

The aim of benefit – cost analysis is identifying people who will be helped and those who will be hurt and quantifying the effect on them. It tries to measure how and to what extent the well–being, welfare, and happiness of the various participants in a market are affected by government intervention; see, Helmberger (1999). Thus, the estimation of supply and demand and matching those together to find the equilibrium price and quantity are considered the first important step in the analysis. The second important task is to estimate the elasticities of supply and demand in order to determine the supply and demand response. The third goal of the analysis is to identify supply and demand shifters and measure their impact. Finally, benefit – cost analysis can be used to conduct a sensitivity analysis of the market equilibrium under various assumptions. In this context, a multiple regression model is needed to estimate the supply and demand functions and to determine the impact of supply and demand shifters.

2.8.1. Multiple regression of time series

Multiple regression analysis, in highlight on Salvatore (1982), Tamhane and Dunlop (2000), Wooldridge (2003), and Boal (2003), is used for testing hypotheses about the relationship between a dependent variable (Y_i) and two or more independent variables X_{ki}. Consequently, the major two regression forms, which are important for our analysis, are the linear form and the exponential or logarithmic form. Thus, the multiple regression functions can be written as follows:

$Y_i = a_0 + a_1 * X_{1i} + a_2 * X_{2i} + \ldots + a_k * X_{ki} + e_i$ linear form

$\ln (Y_i) = a_0 + a_1 * \ln(X_{1i}) + a_2 * \ln (X_{2i}) + \ldots + a_k * \ln (X_{ki}) + e_i$ logarithmic form

Where:

Y_i – Dependent variable, X_{ki} – Independent variable, e_i – Error term, a_k – Coefficients, a_0 – Intercept, ln – Logarithm

Here, it is to highlight that X – coefficients represent the elasticities by the logarithmic form. In this context, to estimate the regression coefficients Ordinary Least Squares (OLS) is used, which implies minimizing the sum of squares residuals. Hereby, Salvatore (1982), Tamhane and Dunlop (2000), and Wooldrige (2003) are good references concerning the coefficients' interpretation, the resulting problems and their correction (e.g., multicollinearity, autocorrelation, and heteroscedasticity), and testing procedures (e.g., F-test, T-test, and P- values).

2.8.2. Supply response

The graphic presentation of a supply schedule is a supply curve. A supply schedule specifies the units of a good or service that a producer is willing to supply at alternative prices over a given period of time. Accordingly, a market supply curve is derived from each producer's supply curve by summing the units each producer is willing to supply at alternative prices. Consequently, the quantity supplied of a commodity depends on its price and several other factors. These other factors are called supply shifters. Supply shifters are: prices of competing commodities (Po), prices of inputs (Pw), prices of joint products (Pj) (e.g. wheat and straw, leather and meat etc.), technology (tech), institutions (inst) [extension services, transport facilities, market places for inputs and outputs, regulations, etc.], and conditions of the natural environment (env). Thus, the supply function can be written as follows:

$Qs = f(P(+), Po(-), Pw(-), P_j(+), tech(+), inst(+), env(+))$

Hence, applying the ceteris paribus principle, where *ceteris paribus* indicates that variables other than the price of the commodity are unchanged, the supply function can be written $Qs = f(P)$. Consequently, the change in the quantity supplied represents a movement along the supply curve due to a change in the commodity price; see, Salvatore and Diulio (1996), Heady et al. (1961), and Giovanni (1999). The change in supply, however, means that there is a shift in the supply curve.

Moreover, according to Perali (1999), for this research the following approaches can be helpful for the estimation of supply:

Production function approach

Heady et al. (1961) highlighted that the production function is the foundation of supply. Consequently, Heady and Bhide (1983) presented several supply functions for cow milk and beef including the relationship among supply, output, and input prices. However, this approach can not be currently used because the information is not available for such calculations (lack in the database).

System of equations and simultaneous equations approach

Brown and Brandt (1989) discussed a structural model of the beef industry in the United States, which consists of five behavioral equations and an identity. Another structural model was included in a study about the dynamics of supply and demand for New Zealand deer; see, Pearse, Ramaratnam, and Dake (2002). However, these approaches are also not applicable and require an improvement in the current database.

Single equation approach

The following models are important for the analysis of Syrian sheep meat and sheep milk:

Nerlovian models of supply response

Based on Perali (1999) and Nerlove (1958), it can be distinguished among the following models:

The general Nerlovian supply response model

$$q_{dt} = a_0 + a_1 * P_{et} + a_3 * Z_t + U_t$$

Where:

q_{dt} – The desired output (milk productivity or meat gain) in period t.

P_{et} – A vector of relative prices including the price of the commodity itself, prices of competing products, and factor prices (with one of these prices chosen as numeraire).

Z_t – A set of other exogenous shifters such as weather, U_t – Error term

The reduced form Nerlovian supply response model

$$q_t = b_0 + b_1 * P_{t-1} + b_2 * q_{t-1} + b_3 * q_{t-2} + b_4 * Z_t + b_5 * Z_{t-1} + e_t$$

The restricted Nerlovian supply response model

$$q_t = c_0 + c_1 * P_{t-1} + c_2 * q_{t-1} + c_3 * q_{t-2} + et$$

Where:

q_t – Output or productivity in period t, P_{t-1} – Lagged price, q_{t-1}, q_{t-1} – Lagged quantities

Z_{t-1} – Lagged supply shifters, e_t – Error term

Examples of livestock supply functions

Cow milk

$$Y_t = b_0 + b_1 * Pm_t + b_2 * Pfg_t + b_3 * Z_1 + b_4 * Z_2 + b_5 * Z_3$$

Where:

Y_t – Production of milk in million pounds in period t, Pm_t – Price of milk in cents per hundredweight in period t, Pfg_t – Price of feed grains, Z_1 – Number of Dairy Herd Improvement Associations operating on January 1, Z_2 – Pasture condition as per cent of normal, Z_3 – January 1 inventory of cows and heifers, two years old or over, in hundred thousand head, Z_1, Z_2, and Z_3 represent dairy cow numbers.

In this context, in a later study, Nerlove related milk production to a deflated lagged milk price and time, and successively added the variables milk production the previous year, total hay supply, supply of total concentrates, beef price, and hog price. Moreover, by estimating the supply, it should be distinguished between short run (fixed factors) and long run (variable factors) elasticity; see, Heady et al. (1961), Perali (1999), Nerlove (1958), and Giovanni (1999).

2.8.3. Demand estimation

The demand schedule for an individual specifies the units of a good or service that the individual is willing and able to purchase at alternative prices during a given period of time (inverse relationship). Moreover, a market demand curve is a graphic presentation of a market demand schedule, which shows the quantities of a commodity that consumers are willing and able to purchase during a period of time at various alternative prices, while holding constant everything else that affects demand (ceteris paribus); see, Salvatore (1996). Thus, demand shifters can be number of consumers (population), consumers' tastes, money incomes, and the price of related commodities. Consequently,

consumers' behaviors can be analyzed by calculating the elasticity of demand; see, Perali (1999).

Moreover, static and dynamic demand models can be used to estimate the demand parameters by both the demand systems approach and the single equation approach; see, Heady et al. (1961), Raunikar and Huang (1984), and Johnson, Hassan, and Green (1984).

Static models

According to static models, the consumer is assumed to adjust instantly to a new equilibrium when income or prices change. Thus, adjustments to habit formation and purchases of durable goods are ignored.

Example: $QD_t = G * P_t + B * X_t + UD_t$

Where: QD_t = quantity demanded, P_t = price of the commodity, X_t = set of exogenous variables affecting demand, UD_t = disturbance term, and G, B = parameters.

Dynamic models

By these models, adjustments due to habit formation, purchases of durable goods, and persistence in consumption patterns will be taken into account through various considerations:

1. Adding trend variables to the demand equations derived from static theory to account for changes in tastes and other socioeconomic factors.
2. Adding lagged variables for consumption to consider the influence of past consumption behaviors on current consumption patterns.
3. Adding lagged variables for prices and expenditure.

Example: State adjustment model

$$Q_t = A_0 + A_1 * Q_{t-1} + A_2 * DM_t + A_3 * M_{t-1} + A_4 * DP_t + A_5 * P_{t-1} + E_t$$

Where: Q_t = Consumption in time t, Q_{t-1} = Consumption in past period, D = Change, M = income, M_{t-1} = Income in past period, P_t = Price, P_{t-1} = Price in past period, E_t = Disturbance term.

Demand systems approach

The microeconomic theory of consumer behavior postulates that a consumer's choice behavior can be described as deriving from utility maximization subject to a budget constraint. Consequently, the solution to this maximization problem is a system of

demand equations restricted to several homogeneity and aggregation conditions. Moreover, there are several approaches to solve this problem, the most important of which are the Linear Expenditure System (LES), the Almost Ideal Demand System (AIDS), and the Generalized Almost Ideal Demand System (GAIDS); see, Perali (1999), Raunikar and Huang (1984), Johnson, Hassan, and Green (1984), and Little (1985). Of course, this approach is the most accurate one. However, to adapt this approach, the database of the NAPC needs to be improved to enable the implementation of this procedure.

Single equation approach

By this approach, the demand functions will be estimated in a pragmatic fashion without recourse to economic theory. A typical situation, for instance, is to estimate from time series data the income and price elasticities for a commodity in a constant elasticity demand equation such as:

$\ln Q_i = a_i + \text{Sum}\ (E_{ij} \ln P_j/P) + Ey_i * \ln Y/P + \text{Sum}\ (b_{ik} * \ln Z_k)$

Where: Q_i = Quantity purchased of good i per capita, P_i, P_j = Prices of good i and of selected other commodities j which are close substitutes or complement, Y = Total expenditure per capita, P = Consumer price index, E_{ij} = Direct and cross price elasticities, Ey_i = Expenditure elasticity, Z_k = Household characteristics, time (to account for steady changes in tastes, in the distribution of income, and in the quality of products), and other exogenous variables, b_{ik} = Elasticities of demand with respect to Z_k.

Accordingly, the use of relative prices (P_i/P) and real income (Y/P) as exogenous variables makes the demand equations homogenous of degree zero in prices and income. This insures that there is no "money illusion" in demand in the sense that it is not affected by a proportional increase in all prices and income. Moreover, this approach is designed to answer policy questions that are specific to a particular commodity or commodity group. Hence, the aim of demand estimation in the research at hand is to determine the effects of equilibrium price and international trade on the participants of the Syrian sheep sector; see, Perali (1999), and Raunikar and Huang (1984). In addition, examples of the single equation approach can be the Engel's functions (table 2.8) and meat demand functions; see, Binger and Hoffman (1998), Perali (1999), Heady et al. (1961), and Little (1985).

Table 2.8: Engel's curves

Engel's curve	Mathematical formula	Income elasticity
Linear	q = a + b*y	Ey = b*y/(a + b*y)
Double-logarithmic	lnq = a + b*lny	Ey = b
Semi-logarithmic	q = a + b*lny	Ey = b/q = b/(a + b*lny)
Logarithmic reciprocal	lnq = a – b/y	Ey = b/y = a -lnq

2.8.4. Price determination model and international trade

There are three key behavioral components of the partial equilibrium trade model. These are the demand behavior of domestic consumers (marginal willingness to pay, or marginal benefit), the supply behavior of domestic producers, and the trading behavior of foreigners who are located in the rest of the world; see, Gaisford and Kerr (2001).

Consequently, after the estimation of supply and demand, one goal of the research is to determine the equilibrium price by matching supply and demand in order to study the effect of the equilibrium situation on the agents operating in the particular chain (for example, sheep meat). Thus, the process of price determination is as follows:

$Q_d = a_0 - a_1 * P_d$ demand

$Q_s = b_0 + b_1 * P_s$ Supply

By the equilibrium: $Q_d = Q_s = Q$, and $P_d = P_s = P$ where: Q =quantity, P = Price, and a and b = constants . Consequently, solving the supply and demand equations results in the following reduced form equations:

$P = (a_0 - b_0)/(a_1 + b_1)$

$Q = (a_0 * b_1 + a_1 * b_0)/(a_1 + b_1)$

Accordingly, the equilibrium conditions can be estimated at any level and then recalculated for any other level by adding or subtracting the marketing costs and margins. Hence, figure 2.8 illustrates this process; see, Bressler and King (1970), and Key, Sadoulet, and Janvry (2000).

Another goal of the study is to test the sensitivity of the market equilibrium according to various assumptions such as changes in production and consumption in order to study the impact of these changes on the performance of the marketing channels.

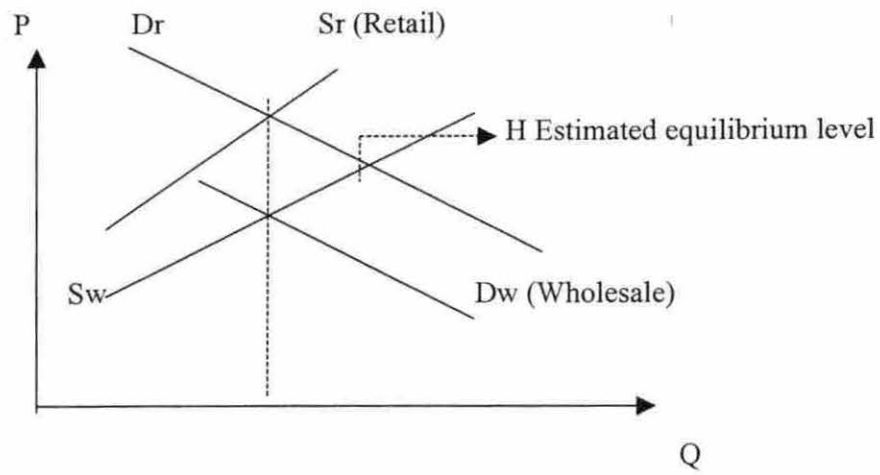


Figure 2.8: Price formation at two stages in the marketing channels

Moreover, the research is concerned with presenting the impact of international trade on the welfare of consumers and producers of the sheep meat chain regarding the reduction in tariff level because it is the single trade restriction on the sheep sector; see, Gaisford and Kerr (2001). Consequently, the Syrian government reduced currently the tariff level for agricultural products; for example, by bees and pigs the reduction is from 20% to 5%; by camels, cattle, donkeys, goats, horses, mules, and sheep the reductions is from 7% to 1%. This will reduce the dead weight loss and improve the efficiency of agricultural sector including the sheep sector.

Chapter 3

The Syrian Marketing Chain of Sheep

Marion et al. (1979) wrote:

> Agricultural economists have long been interested in vertical commodity systems: the array of firms, markets, rules, and arrangements involved in producing a commodity and moving it through to the point of consumption. Some refer to these vertical commodity systems as industries. We prefer the term sub-sector since industry is frequently used to refer to a group of firms involved in the same business at one stage in a commodity system (for example, the beef packing or food retailing industry).

Accordingly, this chapter is dedicated to a description of the structure of the sheep sector in Syria taking into account the general theoretical background of dairy and meat marketing. Thus, the sector will be studied in its both sub-sectors: sheep milk and sheep meat. Moreover, following the synthetic presentation of the methodology followed in the marketing chain analysis (chapter 2), this chapter will develop the analysis of the marketing chains belonging to the sheep sector taking into account the following concepts:

- Identification the different actors and presenting the main elements of their structure and their economic behavior.
- Implication on margins of the different actors and their contribution to the added value.
- Comparison between the performance of the sheep meat and sheep milk chains.

3.1. Overview about the sheep business

Sheep are not difficult animals to raise and more efficient than beef cattle in Syria in the conversion of forage to retail products. However, they require a higher level of management than beef cattle do. In this context, the initial investment required to begin a sheep enterprise is relatively low because expensive sheds and barns are not necessary. However, there are several factors to be considered before going into the sheep business such as:

- The start with 20-50 heads of ewes and then increasing the herd in future years (suggestion for small enterprises).
- The existence of two lambing seasons (fall and winter).

- The amount and kind of feed available, the availability of fences and buildings to protect and manage the flock, and predator control.
- The type of sheep that will work best under existing conditions.
- Pasture management and drenching to control parasites.
- Improvement of marketing alternatives through the working with other sheep producers.
- Intelligence, experience, and good management skills in order to have a profitable enterprise.

Consequently, it should be distinguished among several breeds of sheep according to the purpose (milk, meat, wool, etc.). For example, the American lamb has mild flavor meat. Syrian sheep are also famous for their good quality milk, meat, and wool, and their high milk productivity. Syrian is famous for Awassi sheep keeping, which is mostly concentrated in Albadia (Syrian steppe); see, Carlson, Greaser, and Jones (1994). Accordingly, the following facts are documented about Awassi sheep; see, www.google.com (2003):

> The Awassi evolved as a nomadic sheep breed through centuries of natural and selective breeding to become the highest milk producing breed in the Middle East. The breed is of the Near Eastern Fat-tailed type. The average ewe has single lactations over 300 liters (650 pounds) per 210 day lactation and it is not uncommon for outstanding females to have 210 day lactations above 750 liters (1625 pounds). As a comparison the lactation of the average U.S. sheep breed is about 100-200 pounds per lactation.

3.2. The actors of the sheep meat chain

The importance of meat research for human consumption was highlighted in the 38th international conference of meat science in Clermont-Ferrand France; see, Carlson, Greaser, and Jones (1994). Consequently, the importance of Syrian sheep meat results from its position as the first source of meat for human consumption and as export-oriented commodity. Hence, the need has emerged to study the marketing chain for sheep meat in order to identify the bottlenecks in the marketing chain.

Consequently, sheep breeding is distributed in 14 governorates (Hama and Ghab are included in one governorate; Assad Est and Rakka are included in one governorate; G.A.D.E.B. and Deir-Ezzor are included in one governorate) and 5 ecological zones. In this context, table 3.1 depicts the development of sheep meat production and its

distribution according to governorate in 1999; figures 3.1 and 3.2 depict the development of sheep meat production and its distribution according to governorates. Accordingly, it can be concluded that there was a steady decline in production until 1993, it has been a steady increase after 1993, and the production is mostly concentrated in Homs, Hama, Aleppo, Deir-Ezzor, and Hassaka. Moreover, according to the functional analysis in chapter 2 (figure 2.2), the following key players, which perform in a free market situation without any restrictions except for quality control, are included in the sheep meat chain:

Input suppliers

They are concerned with the delivery of farm inputs such as male lambs, credits, fertilizer, fodder concentrates, and veterinary services. Input suppliers in the sheep meat chain are the CAB, State Centers for Sheep Breeding, General Establishment for Fodder (GEF), MAAR, and the private and cooperative sector (included in farming).

The CAB provides farmers with supported credits both in kind and financial; farmers have also other sources of credits when they wish to have more liquidity.

The state Centers are considered research centers to develop Awassi breed (small share). They perform buying and selling activities according to free market mechanism (independent economic units).

The GEF is responsible for the delivery of raw fodder (grain) and self- processed fodder concentrates (feed) to the farming system according to fodder demand and free market conditions. It competes with the private fodder processors on equal footing without any support. Therefore, its role is declining regarding the fodder supply compared to the private sector firms established according to the investment law 10/1991.

MAAR provides free veterinary services for farmers (extension, vaccination, and artificial insemination) because the private sector currently has not the ability and incentive to invest in such services.

Table 3.1: Development of Syrian sheep meat production and its distribution according to governorates in 1999 000 tons

Year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Sheep Meat	114	124	113	92.1	120	131	143	148	154	177

Governorate	Sweida	Dara	Quneitra	Dam.Rural	Dam.City	Homs	Hama	Ghab	Idleb	Tartous	Lattakia	Aleppo	Assad Est	Rakka	G.A.D.E.B.	Deir-Ezzor	Hassaka	Total
1999	3.32	5.73	1.38	16.14	0.06	26.34	19.60	0.77	6.16	0.20	0.12	29.19	0.07	20.21	0.04	28.05	19.39	176.74
%	1.88	3.24	0.78	9.13	0.03	14.90	11.09	0.44	3.48	0.11	0.07	16.51	0.04	11.44	0.02	15.87	10.97	100.00

Source: MAAR and NAPC

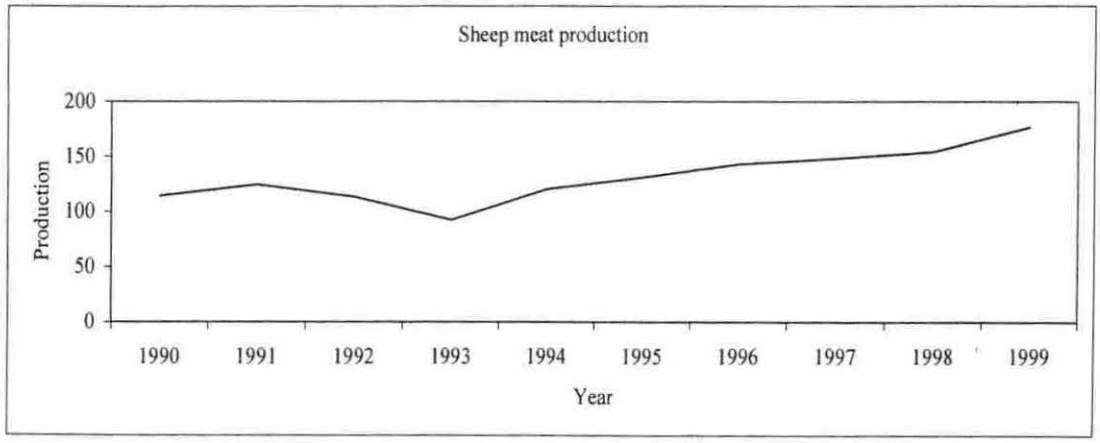


Figure 3.1: Development of sheep meat production

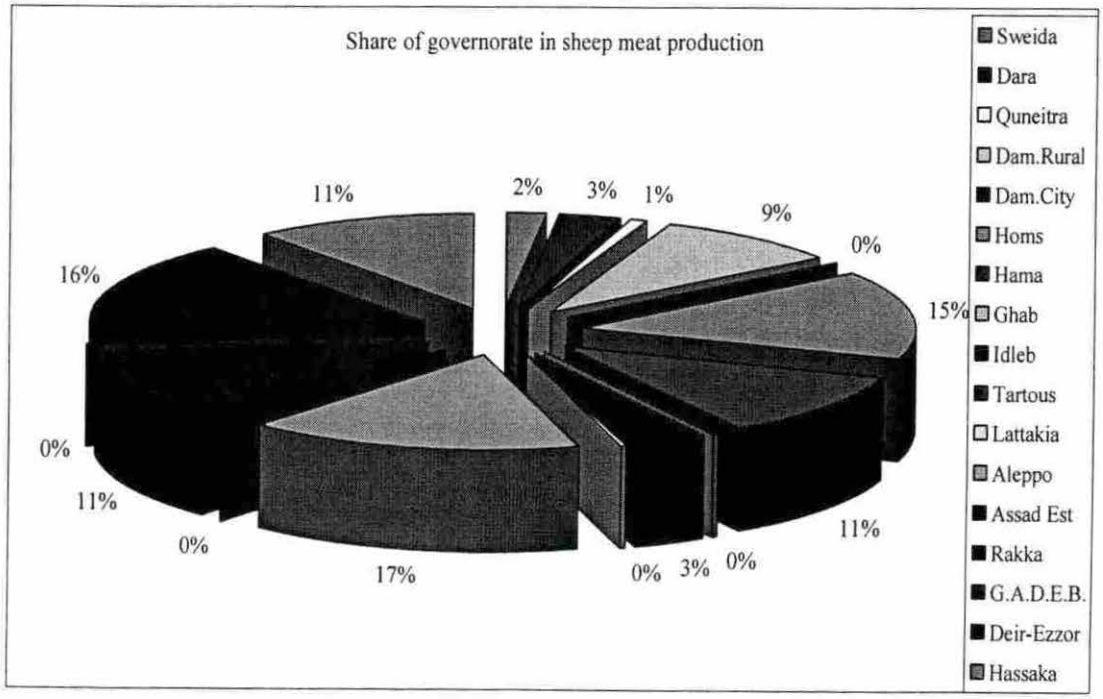


Figure 3.2: Share of governorates in sheep meat production

Animal farming

Farming activities are currently managed by the private and cooperative sectors.

The share of private sector in meat production mounted to 92.48% in 1999. Fattening (feeding) occurs in stalls; the private sector sells 94.4 % of its live sheep (the rest is considered as home consumption and waste) to live animal wholesalers according to supply and demand conditions by open market operations; the private holding number is 34,267 (1994 census). Here, it is worth mentioning that the average holding size between 10-24 heads is dominant and it is tending to be smaller. This results in non-utilization of economies of scale. In this context, the government subsidizes the private sector with veterinary services, and the governmental planning of private farms is indicative for credit purposes (no restrictions); see, Rama et al. (2001). Moreover, it is worth noting that there are no exact statistics about holding number and size.

The share of the cooperative sector in meat production reached 7.5% in 1999. Like the private sector, fattening occurs in stalls; the cooperative sector sells also 94.4 % of its live sheep to live animal wholesalers according to supply and demand conditions by open market operations and keeps some sheep for home-consumption; the cooperative holding number is 137,070 (1994 census). Here again, it is worth noting that the small size holding between 10-24 heads is dominant and it is tending to be smaller which leads to non-utilization of economies of scale. In this context, the government subsidizes the cooperative sector with veterinary services and the governmental plan is indicative (credits); however, the cooperative sector is affiliated to the General Farmers Union; see, Rama (2001). Moreover, cooperatives can be specialized and non-specialized; therefore, table 3.2 shows numbers and members of sheep fattening specialized cooperatives and their share in total specialized cooperatives; figures 3.3 and 3.4 depict members and numbers of fattening specialized sheep cooperatives in comparison to total specialized cooperatives. Accordingly, it can be concluded that their numbers and members are very small compared to total specialized.

Table 3.2: Structure of sheep fattening cooperatives according to governarates in 1999

Type of cooperative / Governarate	Total specialized Cooperatives		Fattening specialized Sheep cooperatives		Share%	
	Numbers	Members	Numbers	Members	Numbers	Members
Damascus	320	84,564	5	488	1.56	0.58
Aleppo	1,032	106,569	7	1,242	0.68	1.17
Homs	627	82,527	34	1,094	5.42	1.33
Hama	429	78,219	11	2,000	2.56	2.56
Latakia	488	85,940	0	0	0.00	0.00
Idleb	476	81,968	24	2,480	5.04	3.03
Deir-Ezzor	227	77,037	8	3,000	3.52	3.89
Hassaka	632	90,612	3	500	0.47	0.55
Rakka	413	69,936	1	92	0.24	0.13
Sweida	172	40,773			0.00	0.00
Dara	157	45,343			0.00	0.00
Tartous	353	75,939			0.00	0.00
Quneitra	69	13,212			0.00	0.00
Total	5,395	932,639	93	10,896	1.72	1.17

Source: MAAR & NAPC

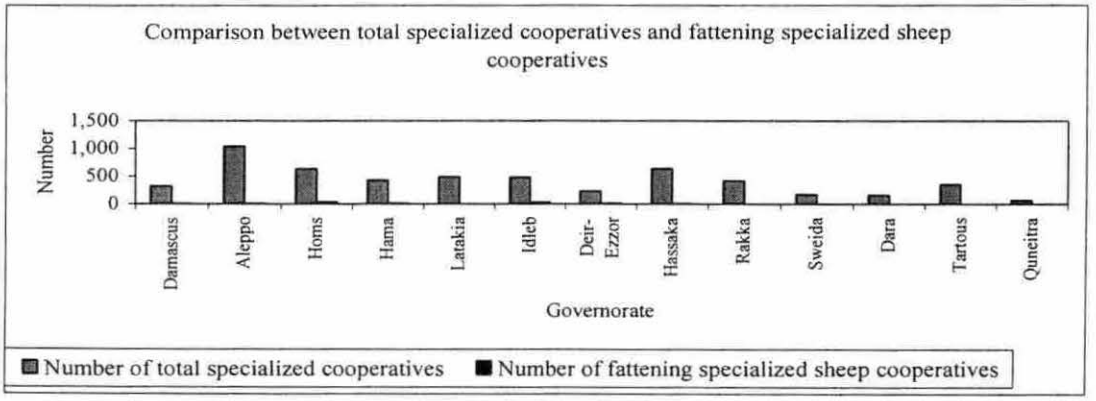


Figure 3.3: Comparison between numbers of total specialized cooperatives and fattening specialized sheep cooperatives

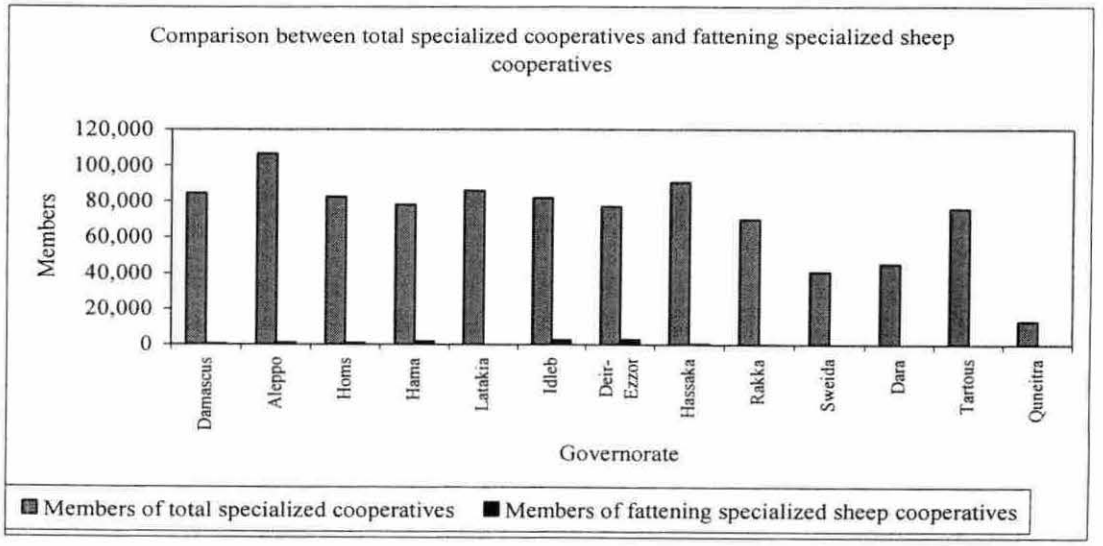


Figure 3.4: Comparison between members of total specialized cooperatives and fattening specialized sheep cooperatives

Wholesalers

They can perform the activities of live animal wholesalers, carcass wholesalers, importers, and exporters. Their size compared to developed countries is very small. Therefore, there are a large number of wholesalers who perform the same activity. Here, it is to highlight that there are no official statistics about their number.

Live animal wholesalers

Live animal wholesalers are specialized agents who purchase live sheep from private and cooperative sectors in current prices according to supply and demand conditions by open market operations. They slaughter 97 % of their live animals in private and public slaughterhouses and 3% will be sold to exporters; carcasses will be fully sold (100%) to carcass wholesalers in current prices; and the entire by-products (100%) will be sold to by-product users. Hereby, Ministry of Supply, Ministry of Local Management, and Ministry of Health control them regarding sanitary conditions.

Carcass wholesalers

Carcass wholesalers are specialized actors who buy sheep carcasses from live animal wholesalers and sell carcasses (100%) to carcass retailers in current prices according to demand and supply conditions by open market operations. Here again, Ministry of Supply, Ministry of Local Management, and Ministry of Health control them regarding sanitary conditions. Consequently, it is to highlight that the transportation of sheep carcasses is inadequate, and therefore, an improvement of transportation conditions (cool transportation and healthy transport) is needed.

Importers

They are specialized in this activity. Hence, they buy live sheep from the foreign market in current prices and sell those (100%) to live animal wholesalers in current prices by open market operations. Moreover, their role is limited to the small quantities imported from abroad and sold in the domestic market. Therefore, their influence on the chain performance is expected not to expand because of domestic consumers' preferences, which prefer domestic sheep meat. In this context, the share of imported sheep meat is 0.095%.

Exporters

They are specialized agents who buy live sheep from live animal wholesalers and export those (100%) to foreign market according to supply and demand conditions. Consequently, their impact on the chain is increasing due to the export-oriented chain. In this context, the share of exported sheep meat is 2.84%.

Slaughterhouses

Slaughterhouses are key actors in the chain. They can be private or public. Both kinds of slaughterhouses provide paid slaughter services. Public slaughterhouses played a great role in the past because they were responsible for slaughtering and distribution of sheep carcasses to retail markets and carcass retailers. Currently, private slaughterhouses compete strongly with public ones. Therefore, the public slaughterhouses work inefficiently and their role is declining dramatically regarding the slaughtering and distribution activities. Finally, Ministry of Health, MSIT, and Ministry of Local Management control the sanitary conditions; and more statistics are needed about these agents.

Carcass retailers

They buy sheep carcasses from carcass wholesalers in current prices and sell ready meat (100%) to consumers in current prices and by-products (100%) to meat by-product users (bones, etc.). Hereby, they perform their specialized activities either in their small shops or in organized central markets (Suk Al-Hal), which are controlled for sanitary conditions by Ministry of Supply and Ministry of Health. Moreover, Syrian meat retailers are very small in nature compared to developed countries. Therefore, they are so many. Sometimes, they buy live sheep from live animal wholesalers in undetermined limited quantities and process sausage and hamburger. In addition, they sell the sheep meat in various forms and grades to consumers (with bones and without bones according to fat content). Again here, it is to highlight that the transportation conditions (cool transportation and healthy transport) of sheep carcasses are inadequate and need further improvement; and more statistics are needed about these agents.

End – users

They are considered as very important agents to improve the performance of the chain. End-users involve farm by-product users, meat by-product users (bones, leather, etc.), rest of the world, and domestic consumers.

Governmental institutions

The governmental institutions involved in the sheep meat chain are the MAAR and its institution, MSIT and its institutions, Ministry of Economy and External Trade (MEET), and General Farmers Union (GFU) and its institutions. They have the task to improve the performance of the sheep meat chain.

International Arrangements of the Meat chain

Table 3.3 shows the share of some world sheep meat producers. Thus, it can be concluded that the major sheep meat producer is Australia including New Zealand; Syria has a reasonable share compared to the production of other countries; and the Syrian share is increasing.

Table 3.3: Share of some world sheep meat producers — Unit: carcass weight

Country	Carcass Weight kg/animal	Production 1000 MT			Share in production %		
		1999	2000	2001	1999	2000	2001
World	16	7,448	7,624	7,532			
Australia	20	629	681	663	8.45	8.93	8.80
New Zealand	18	517	539	562	6.94	7.07	7.46
Europe	15	1,248	1,246	1,141	16.76	16.34	15.15
Asia	15	3,026	3,111	3,115	40.63	40.81	41.36
United States	30	112	107	103	1.50	1.40	1.37
France	18	132	133	135	1.77	1.74	1.79
Germany	20	44	45	44	0.59	0.59	0.58
United Kingdam	20	361	359	258	4.85	4.71	3.43
Turkey	16	313	313	313	4.20	4.11	4.16
Syria	18	177	184	195	2.38	2.41	2.59

Source: FAO Production Yearbook 2001

Consequently, some important structural changes in the international meat sector will be presented.

United States

Kohls and Uhl (2002) described the structural changes in the American meat sub-sector as a continuous process driven through decentralization, integration, specialization in cattle feeding, the growth of supermarkets and chain stores, improved transportation, improved grading, improved market information, and improved product quality.

Australia and New Zealand

New Zealand lamb farmers' behaviors are expected to change from an adversarial market environment to more coordinated activities in order to improve the delivery to the costumers of the food supply chain. Moreover, the Activity – Based Costing (ABC) approach was applied to a series of representative farms in order to perform adequate price setting for vertically coordinated participants. In addition, the Australian meat industry is characterized through high share of contracting and a great retail chains' power; see, Trienekens and Zuurbier (2000), and Hayenga et al.(2000).

Others

In Denmark, farm cooperatives dominate the entire breeding, feed, slaughter, and distribution system and increase their share through mergers; Canadian marketing boards dominate and contracting and merger and acquisition are features of the Canadian meat industry; in Netherlands, food safety and control programs are introduced in the meat supply chain; in North America, beef producers agreed that there was a need for increased cooperation in the beef industry both vertically and horizontally; finally, increased consolidation and competition are expected in the German and Dutch meat supply chain; see, Trienekens and Zuurbier (2000), and Hayenga et al.(2000).

Main finding: Concluding remarks regarding the sheep meat chain

In spite of the reasonable prices and the export ability of the Syrian sheep meat chain, there are several opportunities to increase the efficiency of the supply chain compared with international supply chains and arrangements such as improving the marketing

information especially agents' based information, encouraging the reorganization of cooperatives and farm size, encouraging the processing activities to enter the industry in order to create additional value added, improving the quality of meat transportation, promoting more diversified meat industry and more export orientation, and applying the Activity- Based Costing approach (ABC). Thus, adjustments to international market requirements will be made. Moreover, there are no restrictions on the sheep sector in Syria resulting from the planning activities. Consequently, the profitability of the sheep sector will increase in the near future through the strong market orientation of the government for all the activities involved in the marketing of agricultural products.

3.3. The actors of the sheep milk chain

Syrian sheep milk is the second source of milk for human consumption after cattle milk. However, it is the main source in Albadia. In addition to sheep meat, it is considered a main nutritional source (especially animal protein) for humans in Syria. Moreover, sheep milk is a very sensitive and perishable product. Therefore, it will be mostly transformed to other products such as ghee, butter, cheese, and yogurt to avoid waste. In this context, sheep milk production is performed in 14 governorates. Consequently, table 3.4 furnishes the development of sheep milk production and its derivatives according to governorates in 1999; figures 3.5, 3.6, 3.7, and 3.8 depict the distribution of sheep milk, milk derivatives, milk productivity, and milk productivity according to governorates in 1999, respectively. Accordingly, the following results can be concluded:

- Increased fresh milk consumption.
- Decreased milk productivity.
- Differences in milk productivity among governorates (highest in Lattakia and Tartous and lowest in Deir-Ezzor).

Moreover, according to the functional analysis in chapter 2 (figure 2.3), the key players in the sheep milk chain are the input suppliers, animal farming, wholesalers, retailers, end-users, and governmental institutions. These agents work in a competitive environment without any restrictions except for quality control.

Table 3.4: Development of sheep milk use

Year	Total Milk	Consumed Fresh		Processed						Number of sheep			Productivity
						Ghee	Butter	Cheese	Yogurt	Milked	N.Milked	Total	
	ton	ton	%	ton	%	6%	8%	20%		Thousand heads			kg/head
1990	497,127	69,222	14	427,905	86	9,462	1,776	42,043	48,344	8,928	5,581	14,509	55.68
1991	513,219	62,716	12	450,503	88	9,897	1,050	48,236	53,445	9,498	5,695	15,194	54.03
1992	512,076	66,213	13	445,863	87	9,627	1,061	48,547	51,841	9,275	5,390	14,665	55.21
1993	436,713	87,269	20	349,444	80	4,818	2,309	32,313	90,615	6,396	3,750	10,147	68.28
1994	395,447	64,385	16	331,062	84	6,063	1,696	36,553	45,043	7,144	4,112	11,257	55.35
1995	453,843	67,005	15	386,838	85	7,713	1,791	35,478	48,094	7,820	4,255	12,075	58.04
1996	498,728	93,958	19	404,770	81	6,841	1,039	42,096	86,420	8,507	4,613	13,119	58.63
1997	523,755	82,584	16	441,171	84	8,538	1,125	50,241	56,437	8,980	4,849	13,829	58.32
1998	581,939	100,655	17	481,284	83	7,731	1,585	54,763	83,789	10,074	5,350	15,425	57.76
1999	445,913	72,874	16	373,039	84	6,853	1,285	40,471	58,798	8,993	5,005	13,998	49.58
Distribution according to governarates in 1999													
Sweida	9,247	747	8	8,500	1	367	31	304	615	201	61	262	45.94
Dara	16,881	2,009	12	14,872	1	588	38	853	718	295	158	453	57.16
Quneitra	3,697	333	9	3,364	1	36	59	42	1,840	62	47	109	60.01
Dam.Rural	40,558	7,881	19	32,677	1	72	23	5,698	5,298	759	518	1,277	53.41
Dam.City	179	179	100	0	0	0	0	0	0	3	2	5	59.73
Homs	69,253	9,297	13	59,956	1	1,747	65	4,562	9,300	1,154	930	2,084	60.00
Hama	59,275	3,122	5	56,153	1	858	22	6,928	10,083	997	554	1,552	59.44
Ghab	2,490	562	23	1,928	1	17	10	286	220	41	20	61	61.01
Idleb	23,010	2,065	9	20,945	1	151	62	2,668	5,521	355	132	487	64.76
Tartous	779	630	81	149	0	2	2	18	7	9	6	16	83.38
Lattakia	514	514	100	0	0	0	0	0	0	5	4	9	100.21
Aleppo	90,126	17,746	20	72,380	1	890	226	7,554	20,383	1,617	693	2,310	55.74
Assad Est.	0	0		0		0	0	0	0	4	2	5	0.00
Al-Rakka	50,521	8,955	18	41,566	1	769	432	5,136	0	1,040	560	1,600	48.59
G.A.D.E.B.	239	239	100	0	0	0	0	0	0	5	8	13	45.93
Deir-Ezzor	29,025	3,482	12	25,543	1	610	116	2,554	2,323	1,445	775	2,220	20.09
Al-Hassaka	50,119	15,113	30	35,006	1	747	199	3,868	2,490	1,001	534	1,535	50.09
Total	445,913	72,874	16	373,039	1	6,854	1,285	40,471	58,798	8,993	5,005	13,998	49.58

Source: MAAR & NAPC

N.Milked: Non-Milked

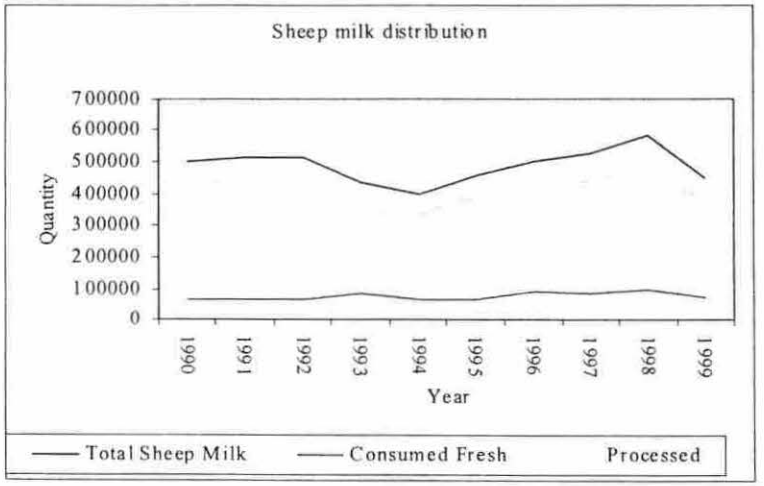


Figure 3.5: Sheep milk distribution

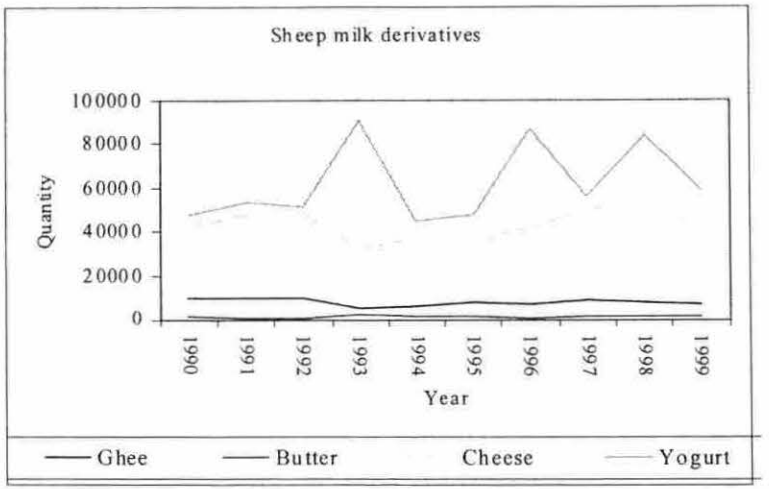


Table 3.6: Sheep milk derivatives

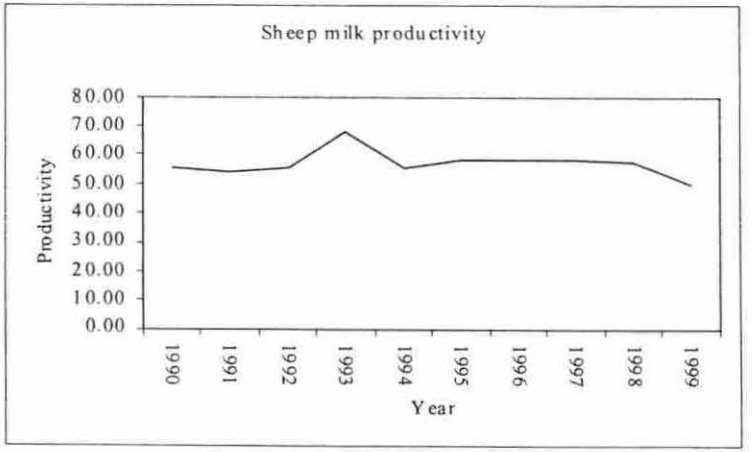


Figure 3.7: Sheep milk productivity

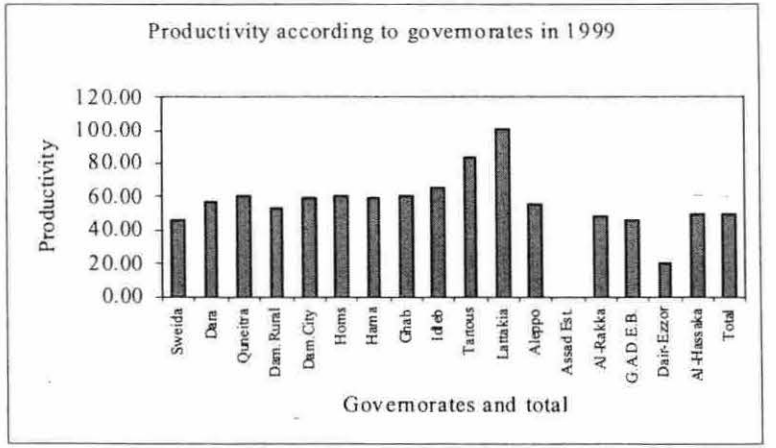


Figure 3.8: Productivity according to governorates

Input suppliers

They are responsible for the delivery of farm inputs such as female lambs, credits, fertilizer, raw fodder, and fodder concentrates. Therefore, the input suppliers in the sheep milk chain are the CAB, State Centers for Sheep Breeding, General Establishment for Fodder (GEF), MAAR, and the private and cooperative sector (included in farming). In this context, they have the same functions as in the sheep meat chain.

Animal farming

The private sector, the cooperative sector, and the state centers represent the production activities in the sheep milk chain.

The private sector accounts for 26.16 % of milk production. The number of its members is 34,267 (1994 census) and the average herd is between 10-24 heads. This means that the small holding size is dominant, which leads to non-utilization of economies of scales. Consequently, farmers keep the required milk quantity for self-consumption and sell the fresh milk to fresh milk wholesalers (20.77%) and to traditional processing units (31.03%) at current prices according to supply and demand conditions by open market operations. Moreover, the private sector produces dairy products such as ghee, butter, cheese, yogurt, labneh, and others (labneh without fat and Kariesh). However, the production methods are inadequate regarding quality standards. Again, after keeping the required quantities of milk derivatives for human consumption, the farmers sell the processed products to consumers (53.57% of cheese, 96.02% of butter, 96.02% of ghee, 92.91% of yogurt, and 95.29% of labneh and others) and to dairy wholesalers (0.60%) at current prices. Here, it is worth noting that the government subsidizes the farmers with veterinary services, but it does not plan the production (indicative planning) and there are no accurate statistics about number of holdings and holding size.

The cooperative sector accounts for 73.79% of milk production. The number of its members is 137,070 (1994 census) and the average herd is between 10-24 heads. This small holding size leads to non-utilization of economies of scales. Consequently, some of the milk remains in the farm for self-consumption and the rest is sold to fresh milk wholesalers and traditional processing units at current prices (the same percentages as the private sector and the same conditions). Farmers produce also ghee, butter, cheese, yogurt, labneh, and others (labneh without fat and kariesh), but the production is inadequate.

Again, after keeping the required quantities for home consumption, the rest is sold to consumers and dairy wholesalers at current prices (the same percentages as private sector and the same conditions). Here also, the government subsidizes the cooperatives with veterinary services, but does not plan the production (indicative for credit purposes). However, there are affiliates with the General Farmers Union. Consequently, cooperatives can be specialized and non-specialized. Hence, table 3.5 shows the numbers and members of specialized animal keeping sheep cooperatives compared to total specialized; figures 3.9 and 3.10 depict the share of sheep specialized animal keeping cooperatives in total specialized cooperatives regarding numbers and members.

Finally, the state centers account for 0.08% of milk production. They produce according to the plan of Ministry of Agriculture and function as research centers for sheep. Moreover, the productivity in these centers is low in comparison to both private and cooperative sectors. Consequently, there are 10 centers, which are distributed in Albadia in the various governorates. They sell 83% of the milk to fresh milk wholesalers at current prices; the rest remains for self-consumption after eliminating a certain percentage as waste.

Wholesalers

Wholesalers of the sheep milk chain perform the activities of fresh milk wholesalers, dairy wholesalers, and dairy exporters. Here, it is to highlight that the general economic conditions (economic environment) for both the wholesalers of the sheep milk chain and the sheep meat chain are alike. Moreover, they are very small compared to international wholesalers and there are no official statistics about their number.

Fresh milk wholesalers

Fresh milk wholesalers are specialized agents who buy milk from farming and sell 0.6% of the milk to traditional processing units and 99.4% to dairy retailers at current prices by open market operations. Here, it is worth noting that the transportation of milk is inadequate because of the non-cool transportation and the small transportation containers. This will increase the microbiological capacity and decrease the processing ability. Moreover, milk production is widely scattered, which inconveniences milk collection.

Table 3.5: Share of animal keeping sheep cooperatives according to governorates in 1999

Kind of cooperative / Governorate	Total specialized Cooperatives		Animal keeping Sheep cooperatives		Share%	
	Numbers	Members	Numbers	Members	Numbers	Members
Damascus	320	84,564	10	1,522	3.13	1.80
Aleppo	1,032	107,063	78	6,711	7.56	6.27
Homs	627	82,033	71	8,098	11.32	9.87
Hama	429	78,218	8	5,485	1.86	7.01
Latakkia	488	85,940	0	0	0.00	0.00
Idleb	475	81,468	27	3,700	5.68	4.54
Deir-ezzor	227	75,623	0	0	0.00	0.00
Hassaka	632	104,485	60	9,529	9.49	9.12
Rakka	413	69,936	73	8,604	17.68	12.30
Sweida	172	40,773	33	4,872	19.19	11.95
Dara	156	45,289	44	7,747	28.21	17.11
Tartous	353	75,939	0	0	0.00	0.00
Quneitra	69	13,212	0	0	0.00	0.00
Total	5,393	944,543	404	56,268	7.49	5.96

Source: MAAR & NAPC

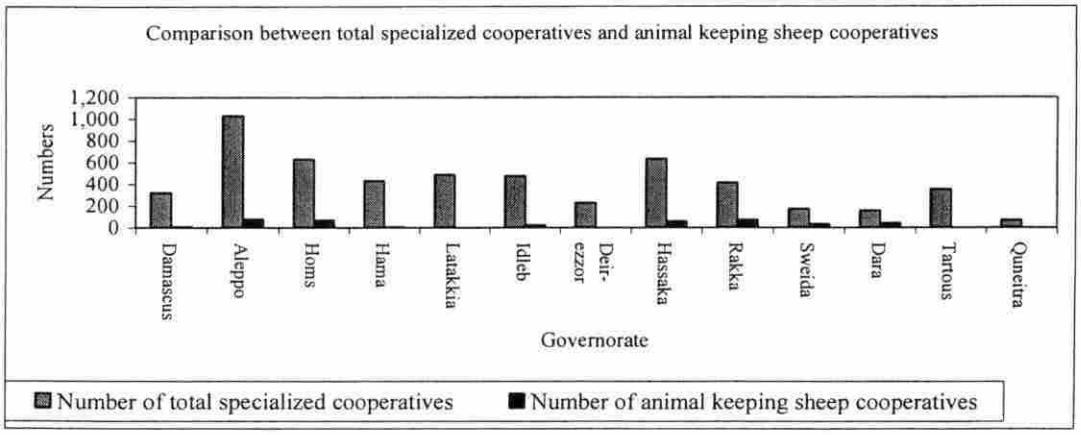


Figure 3.9: Comparison between the numbers of total specialized cooperatives and the numbers of animal keeping sheep cooperatives

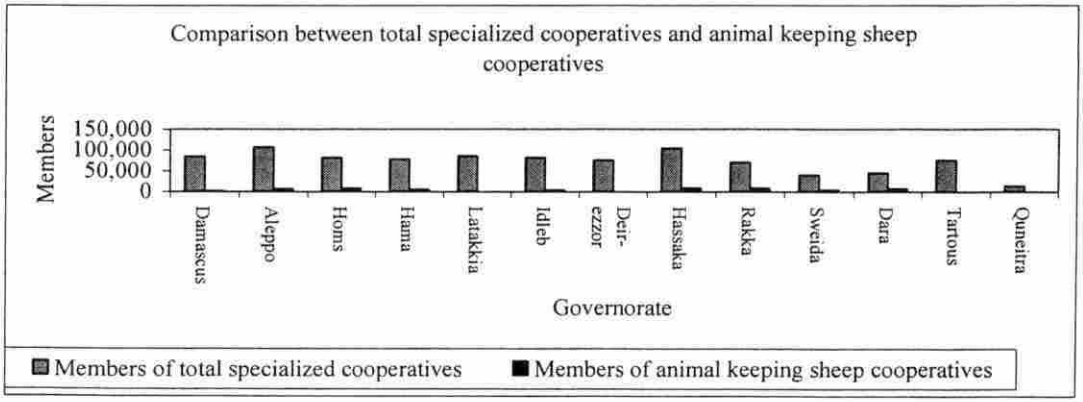


Figure 3.10: Comparison between the members of total specialized cooperatives and the members of animal keeping sheep cooperatives

Therefore, it is very important to transport the milk in big cooled containers and to collect the milk in collection centers.

Dairy wholesalers

Dairy wholesalers are specialized agents who purchase cheese from traditional processing units and ghee and butter from private and cooperative sectors at current prices by open market operations, and sell their products to dairy retailers (97.76% of cheese) and exporters (2.24% of cheese and 100% ghee and butter) also at current prices by open market operations.

Dairy exporters

Dairy exporters are specialized in their activities; they purchase cheese, ghee, and butter from dairy wholesalers at current prices by open market operations and sell their products (100%) in the foreign markets at current prices. Consequently, it is expected that their role will increase because of the export-oriented chain.

Traditional processing

Traditional processing units can have a great role in preventing milk losses in the chain. They purchase fresh milk from fresh milk wholesalers, private sector, and cooperative sector at current prices by open market operations and sell 93.72% of their products to dairy wholesalers at current prices. Consequently, they produce only white cheese and are specialized in this activity. Here, it is worth mentioning that traditional processing is inadequate compared to the industrial one. It is also lacking in product diversification, which results in poor performance. However, it has been recognized that high quality products can be produced. Therefore, realizing this objective requires strengthening the extension service and providing the rural industry with credits. Moreover, it is to highlight that there are no statistics about the number of traditional processing units.

Consequently, after the increasing entry of the private sector in the dairy industry, some firms began to process sheep milk for export or to use it for quality improvement of other products. This tendency can be promoted to increase the efficiency of the sheep milk chain.

Dairy retailers

Dairy retailers are normally not specialized. However, a limited number of retailers has been begun to specialize especially in big cities. Consequently, they buy milk from fresh milk wholesalers and dairy products from dairy wholesalers at current prices by open market operations and sell their products (100%) to consumers also at current prices. In this context, it is worth noting that statistics about their number are not available. Finally, they operate in the same economic environment governing the sheep meat retailers (large number of small retailers, competitive environment, no restrictions) and can be considered as minuscule compared to international retailers.

End-users

The end-users of the milk chain are domestic consumers and the rest of the world.

Governmental institutions

They are the same as in the sheep meat chain. However, these institutions play a more important role (especially quality control) than that of the sheep meat chain because milk and its derivatives are very sensitive to environmental changes and inefficiencies in one stage usually affect the performance of the other stages to a great extent; for example, a high microbiological capacity of milk at farm level leads to inadequate product at traditional processing level. Therefore, expanding the quality control to include farms will realize enormous improvement in the performance of the chain.

International Arrangements of the Milk Chain

Table 3.6 depicts the share of some sheep milk producing countries in world production. Accordingly, it is to conclude that the Syrian share of world production is increasing. Consequently, some structural changes in the supply chain of milk in the United States will be presented in order to make suggestions for improving the Syrian sheep milk chain; see, Kohls and Uhl (2002).

United States

There are enormous changes in the American dairy industry, which can be described as follows:

Table 3.6: Share of some world sheep milk producers 1999 - 2001

Country	Production 1000 MT			Share %		
	1999	2000	2001	1999	2000	2001
World	8,030	8,004	7,808			
Europe	2,825	2,885	2,828	35.18	36.04	36.22
Asia	3,513	3,451	3,269	43.75	43.12	41.87
France	244	247	250	3.04	3.09	3.20
Turkey	785	785	785	9.78	9.81	10.05
Syria	446	446	483	5.55	5.57	6.19

Source: FAO Production Yearbook 2001

- Increasing technological changes and milk productivity.
- Maintaining the important role of cooperatives in dairy marketing.
- Shaping the modern dairy industry through integration and mergers.
- Conducting of processing activities through food distributors.
- Reducing the role of government in dairy pricing.
- Improving the transportation and collection of milk.
- Expanding the diversification of the industry.

Main finding: Concluding remarks for the sheep milk chain

Compared with international changes, the performance of the Syrian sheep milk chain can be substantially improved by adapting to international changes and to the needs of international markets. This can be achieved through the building of an adequate agent-based data, transporting of milk in big cooled containers, collecting of milk in cool assembly centers, strengthening the extension services for an adequate and diversified processing, providing the rural industry with credits, and reorganizing the holding size and cooperatives.

3.4. Comparison between the performances of the chains

Adequate supply chain management leads to adequate performance of the actors operating in the chain. Thus, to compare the performance of the sheep meat chain with the performance of the sheep milk chain, input and output measures can be calculated. As representative for input indicators, the costs were calculated both for the total chain and for each agent's group. As representatives for output indicators, revenues, gross margin or

profit, and value added were calculated both for the total chain and for each agent's group. However, these measures were calculated in absolute values, which are not adequate for the comparison of both chains. Therefore, relative measures relating output to input were calculated to conduct the comparison. The data needed, the procedure followed by the calculations, and the resulting calculation sheets are available in detail in Appendix A and Appendix B. Here, only a brief summary will be presented. Consequently, table 3.7 summarizes the financial measures of the sheep meat chain taking into account two alternatives; figure 3.11 compares the agents' share in value added of the sheep meat chain between two scenarios; table 3.8 represents the same measures for the sheep milk chain; figure 3.12 depicts a comparison between the agents' share in value added of the sheep milk chain; table 3.9 compares the relative measures of both chains; figure 3.13 depicts the comparison among the agents' relative measures. In this context, it is to highlight that the calculations were done in baseline and current cells in order to make scenarios. Yet, both results (baseline and current) are similar. However, they will differ after evaluating different scenarios (chapter 4). Thus, according to these tables and figures, the major value creators of the sheep meat chain are live animal wholesalers, carcass wholesalers, and carcass retailers. In the sheep milk chain, however, the major value creators are the private and cooperative sectors. Moreover, assuming that the long-run return rate to capital is 9% (national return rate in Syria) and evaluating the performance according to the relative measures (revenue/cost and value added/cost), the following conclusions can be made:

1. Both chains are performing well; however, the performance of the milk chain is better than that of the meat chain.
2. Poor performance in the sheep meat chain refers to the activities of carcass retailers and slaughterhouses. Therefore, there is a need to improve these activities.
3. Poor performance in the sheep milk chain is related to fresh milk wholesalers. Therefore, an improvement of this activity is needed.

Table 3.7: Agents' share in revenue, cost, gross margin, and value added of the sheep meat chain 2001

Measure	Revenue				Cost				Gross Margin			
	Baseline		Current		Baseline		Current		Baseline		Current	
Agent	Value Mill.S.p	%	Value Mill.S.p	%	Value Mill.S.p	%	Value Mill.S.p	%	Value Mill.S.p	%	Value Mill.S.p	%
Private Sector	32,154	14.39	32,154	14.39	32,112	16.42	32,112	16.42	43	0.15	43	0.15
Cooperative Sector	2,717	1.22	2,717	1.22	2,722	1.39	2,722	1.39	-5	-0.02	-5	-0.02
Live Animal Wholesalers	42,535	19.04	42,535	19.04	35,716	18.27	35,716	18.27	6,818	24.46	6,818	24.46
Carcass Wholesalers	53,033	23.74	53,033	23.74	36,580	18.71	36,580	18.71	16,453	59.03	16,453	59.03
Carcass Retailers	57,023	25.53	57,023	25.53	53,114	27.17	53,114	27.17	3,909	14.02	3,909	14.02
Slaughter-houses	34,464	15.43	34,464	15.43	34,191	17.49	34,191	17.49	273	0.98	273	0.98
Importers	25	0.01	25	0.01	18	0.01	18	0.01	7	0.02	7	0.02
Exporters	1,437	0.64	1,437	0.64	1,061	0.54	1,061	0.54	376	1.35	376	1.35
Total	223,389	100.00	223,389	100.00	195,515	100.00	195,515	100.00	27,874	100.00	27,874	100.00

Table 3.7: (Continued)

Measure	Value Added			
	Baseline		Current	
Agent	Value Mill.S.p	%	Value Mill.S.p	%
Private Sector	3,062	9.75	3,062	9.75
Cooperative Sector	246	0.78	246	0.78
Live Animal Wholesalers	6,933	22.07	6,933	22.07
Carcass Wholesalers	16,506	52.54	16,506	52.54
Carcass Retailers	3,955	12.59	3,955	12.59
Slaughter-houses	331	1.05	331	1.05
Importers	7	0.02	7	0.02
Exporters	379	1.21	379	1.21
Total	31,418	100.00	31,418	100.00

Source: Author calculations according to MAAR and NAPC data

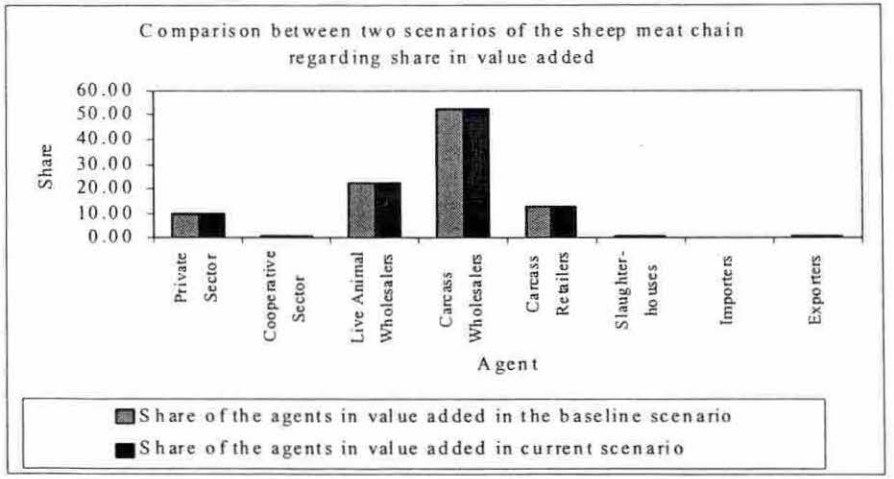


Figure 3.11: Comparison the agents' share in value added of the sheep meat chain in two scenarios

Table 3.8: Agents' share in revenue, cost, gross margin, and value added of the sheep milk chain 2001

Measure	Revenue				Cost				Gross Margin			
	Baseline		Current		Baseline		Current		Baseline		Current	
Agent	Value Mill.S.p	%	Value Mill.S.p	%	Value Mill.S.p	%	Value Mill.S.p	%	Value Mill.S.p	%	Value Mill.S.p	%
Private Sector	7,357	21.55	7,357	20.32	4,657	19.97	4,657	18.38	2,699	25.31	2,699	24.85
Cooperative Sector	20,775	60.87	20,775	57.38	13,435	57.59	13,435	53.01	7,340	68.62	7,340	67.59
State Centers	24	0.07	24	0.07	15	0.06	15	0.06	9	0.08	9	0.08
Fresh Milk Wholesalers	926	2.26	926	2.56	876	3.04	876	3.45	50	0.41	50	0.46
Dairy Wholesalers	1,991	4.16	1,991	5.50	1,950	5.78	1,950	7.69	42	0.33	42	0.38
Dairy Retailers	3,294	7.25	3,294	9.10	2,870	8.98	2,870	11.32	424	3.16	424	3.90
Exporters	75	0.17	75	0.21	56	0.18	56	0.22	20	0.15	20	0.18
Traditional Processing	1,763	3.67	1,763	4.87	1,487	4.41	1,487	5.87	277	1.94	277	2.55
Total	36,205	100.00	36,205	100.00	25,344	100.00	25,344	100.00	10,860	100.00	10,860	100.00

Table 3.8: (Continued)

Measure	Value Added			
	Baseline		Current	
Agent	Value Mill.S.p	%	Value Mill.S.p	%
Private Sector	3,968	24.44	3,968	24.44
Cooperative Sector	11,163	68.74	11,163	68.74
State Centers	12	0.07	12	0.07
Fresh Milk Wholesalers	56	0.34	56	0.34
Dairy Wholesalers	208	1.28	208	1.28
Dairy Retailers	427	2.63	427	2.63
Exporters	20	0.12	20	0.12
Traditional Processing	386	2.37	386	2.37
Total	16,240	100.00	16,240	100.00

Source:Author calculations according to MAAR & NAPC data

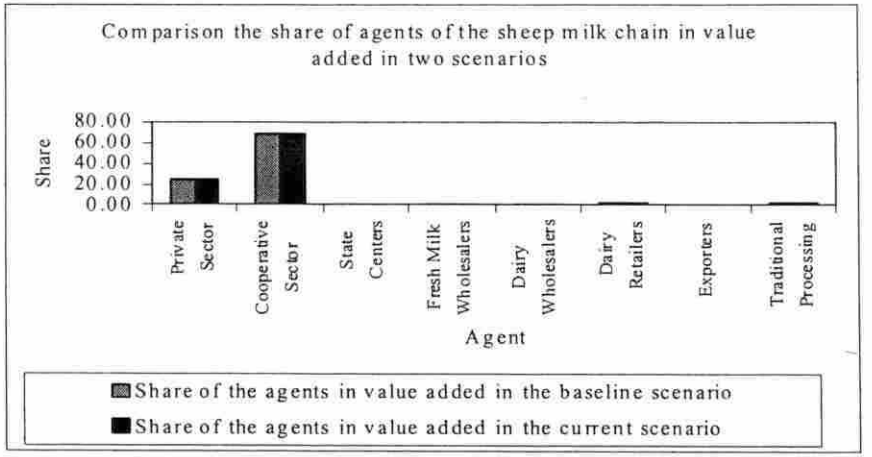


Figure 3.12: Comparison the agents' share in value added of the sheep milk chain in two scenarios

Table 3.9: Comparison between the relative measures of the sheep meat chain and the sheep milk chain 2001

Indicator	Relative Indicators of Sheep Meat				Indicator	Relative Indicators of Sheep Milk			
	Revenue / Cost		Value Added / Cost			Revenue / Cost		Value Added / Cost	
	Baseline	Current	Baseline	Current		Baseline	Current	Baseline	Current
Agent	%	%	%	%	Agent	%	%	%	%
Private Sector	100.1	100.1	9.5	9.5	Private Sector	158	158	85.2	85.2
Cooperative Sector	99.8	99.8	9.0	9.0	Cooperative Sector	154.6	154.6	83.1	83.1
Live Animal Wholesalers	119.1	119.1	19.4	19.4	State Centers	158.7	158.7	77.9	77.9
Carcass Wholesalers	145.0	145.0	45.1	45.1	Fresh Milk Wholesalers	105.7	105.7	6.4	6.4
Carcass Retailers	107.4	107.4	7.4	7.4	Dairy Wholesalers	102.1	102.1	10.7	10.7
Slaughter-houses	100.8	100.8	1.0	1.0	Dairy Retailers	114.8	114.8	14.9	14.9
Importers	138.3	138.3	38.8	38.8	Exporters	135.2	135.2	35.4	35.4
Exporters	135.4	135.4	35.7	35.7	Traditional Processing	118.6	118.6	25.9	25.9
Total	114.3	114.3	16.1	16.1	Total	142.9	142.9	64.1	64.1

Source: Author calculations according to MAAR & NAPC data

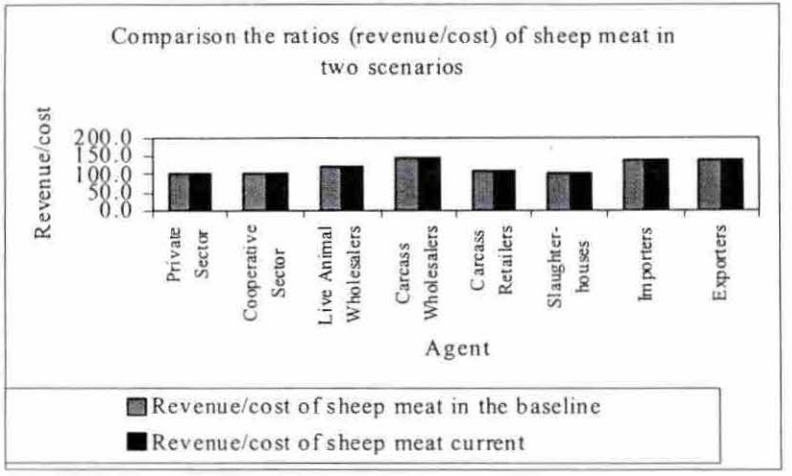


Figure 3.13: Panel A (Sheep meat-Revenue/cost)

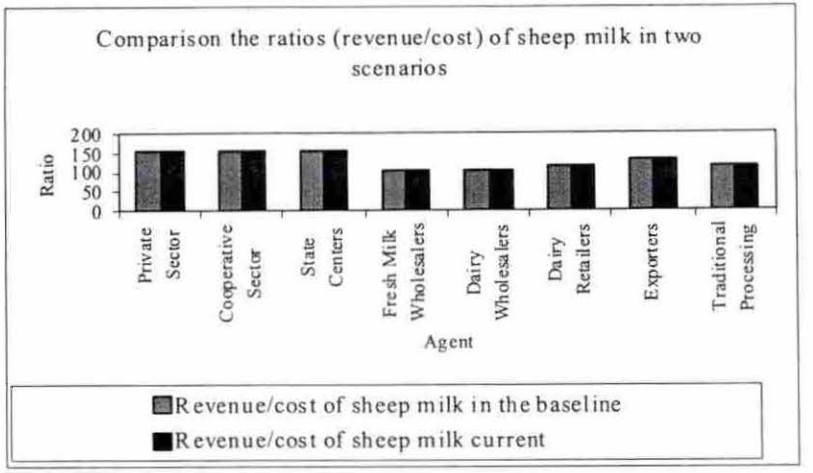


Figure 3.13: Panel B (Sheep milk-Revenue/cost)

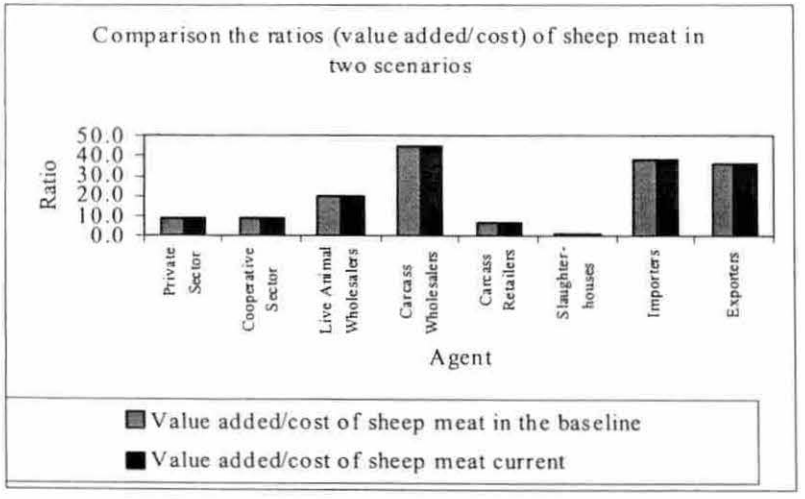


Figure 3.13: Panel C (Sheep meat-Value added/cost)

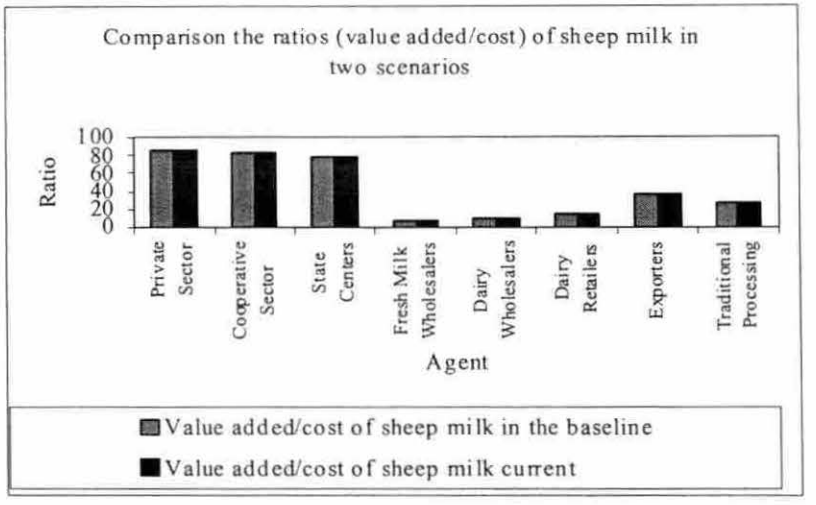


Figure 3.13: Panel D (Sheep milk-Value added/cost)

Figure 3.13: Comparison the relative measures of the sheep meat chain and the sheep milk chain 2001

Chapter 4

Policy Implications on the Syrian Sheep Sector

The focus of this chapter is the determination of a partial equilibrium model including the following components:

- Estimating of supply and demand for sheep meat taking into account the choice among various alternatives.
- Estimating the sheep meat equilibrium price and its effects on the agents of the sheep meat chain.
- Testing the sensitivity of the market equilibrium by the formation of various policy options.
- Estimating of supply and demand for sheep milk

4.1. Estimation of sheep meat supply

The data used in the supply estimation of sheep meat are time series statistics collected from the official records of MAAR, NAPC, and Central Bureau of Statistics (CBS). In this context, in highlight on Nerlove models for supply response, the state adjustment model, Heady et al. (1961), and others (see, chapter 2), the data should involve the major factors affecting the Syrian sheep meat supply including the sheep meat production, sheep meat wholesale price, fodder concentrate price, rainfall, and consumer price index. The prices of other red meat products (especially beef and pork) and of white meat (especially chicken) were ignored because of their absence or scarcity in sheep meat production areas. Accordingly, the production statistics (quantities and numbers) are annual census data collected by random sampling (Directorate of Statistics in MAAR) at farm level and aggregated to governorate and national level. Regarding animal production, additional guidelines belonging to MAAR including growth rates, birth rates, stock changes, and etc. will be used; prices, however, are collected daily according to the periodical reports of Directorate of Economics and aggregated to weekly, monthly, quarterly, and annual data taking into account a weighting procedure; rainfalls are also collected daily according to the periodical reports of Directorate of Artificial Rainfall taking into account the various governorates and ecological zones (rainfall stations) and aggregated to governorate and national level; finally, consumer price indices are

published by CBS's official statistics. In this context, the consumer price index was corrected taking into account the weights of the different base periods in order to calculate the deflated financial values to avoid money illusion.

Accordingly, it is expected that the Syrian sheep meat supply will be effected by the lagged sheep meat production (q_{t-1}), lagged sheep meat wholesale price (P_{t-1}), lagged fodder concentrate price (PF_{t-1}), difference in sheep herd between two successive periods (DN_t), difference in sheep meat wholesale price between two successive periods (DP_t), difference in fodder concentrate price between two successive periods (DPF_t), and difference in rainfall between two successive periods (DR_t). Consequently, the lagged sheep meat production can have a positive or negative impact on the production in the following year according to the environmental and economical conditions prevailing in previous year (Nerlove and farmers' production decision in past year); lagged sheep meat wholesale price is positively related to the supply level because higher prices mean more benefit to producers (supply increase), whereas low prices lead to less profit (supply reduction); lagged fodder concentrate price, however, is negatively correlated with supply because fodder concentrate has a high share in production costs. Thus, high fodder prices lead to cost increase (less benefit) and as a result to production decrease, while low fodder prices have the inverse effects; difference in sheep herd has a positive relationship with supply level because big differences mean a high level of production, whereas small differences add less to the supply of sheep meat; differences in sheep meat wholesale prices and fodder concentrate prices are negatively related to the supply level because big differences in prices mean instability, which discourages farmers, whereas, small price differences lead to stable marketing conditions, which encourage producers to supply more; moreover, rainfall is inversely related to production pattern because a good year encourages farmers to keep the flock, whereas a bad year enforces farmers to break down the herd. Thus, following this discussion, the supply model can be written as follows:

$$Ys^{\wedge} = f(q_{t-1\ (+/-)}, P_{t-1\ (+)}, PF_{t-1\ (-)}, DN_{t\ (+)}, DP_{t\ (-)}, DPF_{t\ (-)}, DR_{t\ (-)})$$

Where: $Ys^{\wedge}$ = Fitted sheep meat supply.

Consequently, table 4.1 (page 81) shows alternative supply models for sheep meat and their hypothesis testing (1980-2001). Accordingly, based on the criteria goodness of fit (R square), adjusted R square, T – Statistic (5% level), P-Value (all coefficients are statistically significant), autocorrelation (no auto-correlation), and heteroskedasticity test

(homoskedastic), model 4 is the best alternative. Thus, the supply function of sheep meat will take the form:

$$Ys^{\wedge} = 87.97 + 0.2932 * q_{t-1} + 0.0006 * P_{t-1} - 0.0052 * PF_{t-1} + 0.0072 * DN_t - 0.0011 * DP_t$$

In addition, the regression and testing results of the chosen model are presented in Appendix D. Moreover, from the supply equation above, it can be concluded that the signs and relative magnitude of the regression coefficients are as expected except rainfall and difference in fodder prices, which may need longer time series data or seasonal supply estimation models to assist their impact. Thus, a positive relationship is present among the sheep meat supply, lagged sheep meat production, lagged sheep meat wholesale price, and difference in sheep herd. A negative relationship, however, is present with the lagged fodder concentrate price and the difference in sheep meat wholesale price. In this context, according to adjusted R square and R square, the equation explains 89.02 – 91.77 % of the total variations in sheep meat output (high degree). The equation means also that 1% increase in lagged sheep meat production, lagged sheep meat wholesale price, lagged fodder concentrate price, difference in sheep herd, and difference in sheep meat wholesale price leads to 0.2932 % increase, 0.0006 % increase, 0.0052 % decrease, 0.0072 increase, and 0.0011 % decrease in the supply of sheep meat, respectively. These coefficients are all statistically significant at the 5% level (table 4.1 model 4). Hence, table 4.2 (page 83) summarizes the fitted sheep meat supply values taking into account the possibility of making scenarios when there are changes in the supply functions; figure 4.1 (page 84) depicts the linear sheep meat supply compared to sheep meat supply CP and actual sheep meat production; figure 4.2 (page 84) depicts the sheep meat supply in the baseline scenario to be used as benchmark, figure 4.3 (page 84) shows the sheep meat supply in the current scenario to enable keeping truck on the changes in sheep meat supply; figure 4.4 (page 85) visualizes the inverse sheep meat supply in the baseline as a comparison benchmark, figure 4.5 (page 85) furnishes the inverse sheep meat supply in the current scenario to follow up the changes in supply.

In this context, the average price elasticity of sheep meat supply is 0.2871 in the short run and 0.2873 in the long run. This means that the sheep meat supply is rigid to price changes in the short and long run. However, it is more elastic in the long run.

Table 4.1: Summary for the comparison among various supply estimation models 1980-2001

	Coefficient	Standard Error	T Statistic	P Value	Multiple R	R Square	Adjusted R Square
Model 1: Three variables linear							
Constant term	62.2144	17.9009	3.4755	0.0029			
Lagged sheep meat production	0.4981	0.1479	3.3677	0.0037	0.9053	0.8196	0.7878
Lagged sheep meat wholesale price	0.0005	0.0002	2.8778	0.0104			
Lagged fodder price	-0.0064	0.0027	-2.3941	0.0285			
Model 2: Four variables linear							
Constant term	80.513815	18.8788	4.2648	0.0006			
Lagged sheep meat production	0.3956401	0.1457	2.7154	0.0153			
Lagged sheep meat wholesale price	0.0005074	0.0002	2.9501	0.0094	0.9250	0.8556	0.8195
Lagged fodder price	-0.0047	0.0026	-1.7911	0.0922			
Difference in sheep meat price	-0.001053	0.0005	-1.9977	0.0630			
Model 3: Four variables logarithmic							
Constant term	1.9522	0.5332	3.6612	0.0021			
Lagged sheep meat production	0.4057	0.1474	2.7516	0.0142			
Lagged sheep meat wholesale price	0.1710	0.0771	2.2186	0.0413	0.9264	0.8582	0.8228
Lagged fodder price	-0.0720	0.0586	-1.2287	0.2370			
Difference in sheep meat price	-0.0327	0.0124	-2.6332	0.0181			
Model 4: Five variables linear							
Constant term	87.9715	14.8894	5.9083	0.00003			
Lagged sheep meat production	0.2932	0.1176	2.4926	0.02486			
Lagged sheep meat wholesale price	0.0006	0.0001	4.5908	0.00035	0.9580	0.9177	0.8902
Lagged fodder price	-0.0052	0.0021	-2.5569	0.02190			
Difference in the number of sheep herd	0.0072	0.0021	3.3625	0.00427			
Difference in sheep meat price	-0.0011	0.0004	-2.7534	0.01479			
Model 5: Six variables linear							
Constant term	94.1749	16.1069	5.8469	0.00004			
Lagged sheep meat production	0.2483	0.1258	1.9742	0.06843			
Lagged sheep meat wholesale price	0.0007	0.0002	4.6076	0.00041			
Lagged fodder price	-0.0062	0.0023	-2.7444	0.01582	0.9609	0.9232	0.8903
Difference in the number of sheep herd	0.0077	0.0022	3.5082	0.00348			
Difference in sheep meat price	-0.0012	0.0004	-2.8538	0.01275			
Difference in fodder price	-0.0028	0.0028	-1.0071	0.33099			
Model 6: Six variables linear							
Constant term	85.6485	16.9752	5.0455	0.0002			
Lagged sheep meat production	0.3107	0.1330	2.3369	0.0348			
Lagged sheep meat wholesale price	0.0006	0.0001	4.4578	0.0005			
Lagged fodder price	-0.0055	0.0022	-2.4514	0.0280	0.9583	0.9183	0.8833
Difference in the number of sheep herd	0.0069	0.0024	2.8012	0.0141			
Difference in sheep meat price	-0.0011	0.0005	-2.3126	0.0365			
Difference in rainfall	0.0100	0.0312	0.3210	0.7529			
Model 7: Seven variables linear							
Constant term	94.3298	19.5242	4.8314	0.0003			
Lagged sheep meat production	0.2471	0.1506	1.6407	0.1248			
Lagged sheep meat wholesale price	0.0007	0.0002	4.4078	0.0007			
Lagged fodder price	-0.0062	0.0024	-2.6034	0.0219	0.9609	0.9232	0.8819
Difference in the number of sheep herd	0.0078	0.0027	2.9262	0.0118			
Difference in sheep meat price	-0.0012	0.0005	-2.4569	0.0288			
Difference in fodder price	-0.0029	0.0031	-0.9166	0.3761			
Difference in rainfall	-0.0005	0.0334	-0.0154	0.9880			
Model 8: Four variables linear with expected values							
Constant term	57.9264	13.4196	4.3166	0.0005			
Expected sheep meat production	0.5052	0.1048	4.8208	0.0002			
Expected sheep meat wholesale price	0.0006	0.0001	4.2981	0.0006	0.9401	0.8839	0.8548
Expected fodder price	-0.0074	0.0023	-3.2838	0.0047			
Difference in rainfall	0.0478	0.0290	1.6520	0.1180			

Source: Author calculations according to MAAR & NAPC data

Table 4.1: Continued

	Squared Residuals e^2	Durbin Watson Calculated	Durbin Watson required dl	du	Goldfeld- Quant F- Test F Calculated	F Required
Model 1: Three variables linear						
Constant term Lagged sheep meat production Lagged sheep meat wholesale price Lagged fodder price	2216	2.07	1.026 Reject Autocorrelation	1.669	0.8750 Accept Homoskedasticity	6
Model 2: Four variables linear						
Constant term Lagged sheep meat production Lagged sheep meat wholesale price Lagged fodder price Difference in sheep meat price	1774	2.27	0.927 Inconclusive	1.812	0.5414 Accept Homoskedasticity	9
Model 3: Four variables logarithmic						
Constant term Lagged sheep meat production Lagged sheep meat wholesale price Lagged fodder price Difference in sheep meat price	2023	2.02	0.927 Reject Autocorrelation	1.812	0.5414 Accept Homoskedasticity	9
Model 4: Five variables linear						
Constant term Lagged sheep meat production Lagged sheep meat wholesale price Lagged fodder price Difference in the number of sheep herd Difference in sheep meat price	1012	1.987	0.829 Reject Autocorrelation	1.964	1.6720 Accept Homoskedasticity	19
Model 5: Six variables linear						
Constant term Lagged sheep meat production Lagged sheep meat wholesale price Lagged fodder price Difference in the number of sheep herd Difference in sheep meat price Difference in fodder price	943	1.755	0.732 Inconclusive	2.124	2.9881 Accept Homoskedasticity	161.45
Model 6: Six variables linear						
Constant term Lagged sheep meat production Lagged sheep meat wholesale price Lagged fodder price Difference in the number of sheep herd Difference in sheep meat price Difference in rainfall	1004	2.028	0.732 Inconclusive	2.124	0.5077 Accept Homoskedasticity	161.45
Model 7: Seven variables linear						
Constant term Lagged sheep meat production Lagged sheep meat wholesale price Lagged fodder price Difference in the number of sheep herd Difference in sheep meat price Difference in fodder price Difference in rainfall	943	1.7524	0.637 inconclusive	2.290		
Model 8: Four variables linear with expected values						
Constant term Expected sheep meat production Expected sheep meat wholesale price Expected fodder price Difference in rainfall	1427	1.827	0.927 Reject Autocorrelation	1.812	3.4855 Accept Homoskedasticity	9.28

Source: Author calculations according to MAAR & NAPC data

Table 4.2: Estimating of sheep meat supply 1980-2001

Year	Sheep Meat Production	Lagged Sheep Meat Production	Lagged Sheep Meat Wholesale Price	Lagged Fodder Concentrate Price	Difference In number Of sheep Herd	Difference in Price	Sheep Meat Supply Estimated		Sheep Meat Supply CP Estimated	
							Baseline	Current	Baseline	Current
	000 tons	000 tons	Sp/ton	Sp/ton	000 head	Sp/ton	000 tons	000 tons	000 tons	000 tons
1981	108	104	16,114	743	306	3,537	123	123	120	120
1982	123	108	19,084	1,442	315	4,477	122	122	122	122
1983	142	123	19,294	713	325	195	135	135	122	122
1984	148	142	19,187	736	-33	392	137	137	122	122
1985	138	148	19,133	735	190	2,609	138	138	122	122
1986	129	138	19,262	721	676	10,268	130	130	122	122
1987	126	129	27,329	766	1,000	14,571	130	130	127	127
1988	137	126	41,642	1,011	1,022	11,568	141	141	136	136
1989	146	137	50,409	2,076	320	12,164	138	138	142	142
1990	159	146	75,352	3,546	498	704	163	163	158	158
1991	145	159	99,083	8,257	685	15,596	142	142	173	173
1992	143	145	103,306	6,570	-529	9,421	148	148	176	176
1993	139	143	112,727	5,868	-1,518	14,917	144	144	182	182
1994	154	139	112,737	5,182	-1,890	8,416	151	151	182	182
1995	188	154	107,779	4,610	818	6,994	176	176	179	179
1996	183	188	103,971	4,176	1,044	2,288	193	193	176	176
1997	190	183	98,710	3,880	710	1,689	188	188	173	173
1998	197	190	99,853	3,859	1,596	998	198	198	174	174
1999	168	197	100,306	3,838	-1,427	553	179	179	174	174
2000	184	168	99,250	3,777	-493	440	177	177	173	173
2001	173	184	93,709	3,500	-1,143	7,292	167	167	170	170

Source: MAAR & NAPC & Author calculation
CP: Ceteris Paribus (Other variables are equal)

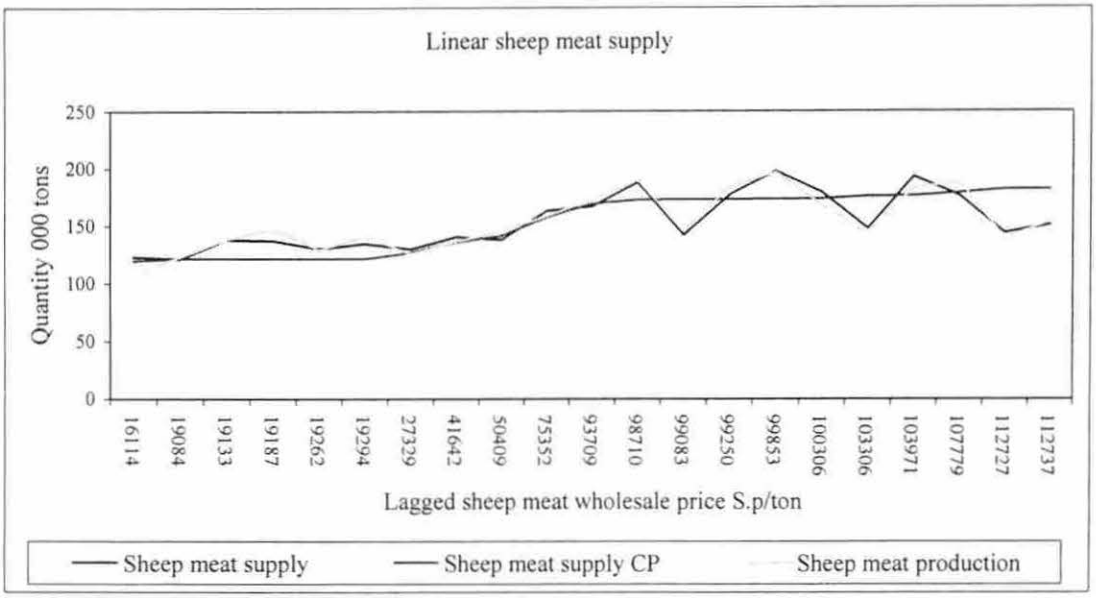


Figure 4.1: Linear sheep meat supply

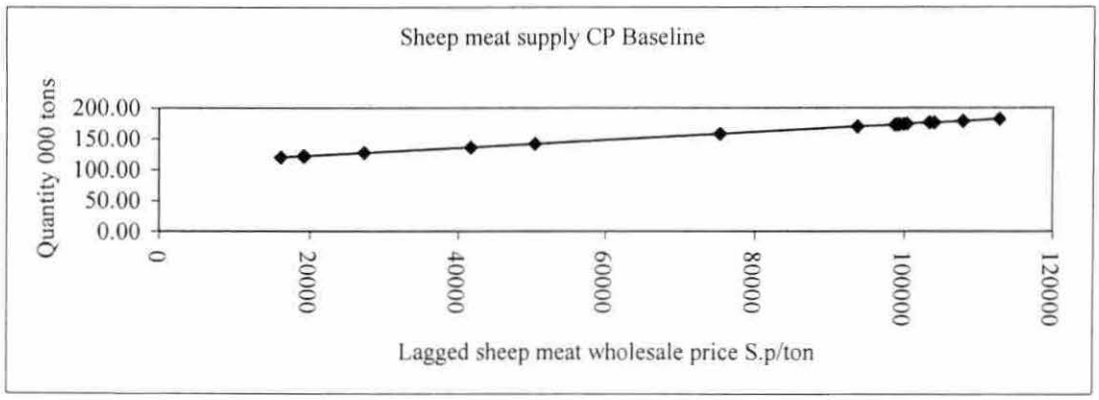


Figure 4.2: Sheep meat supply CP in the baseline

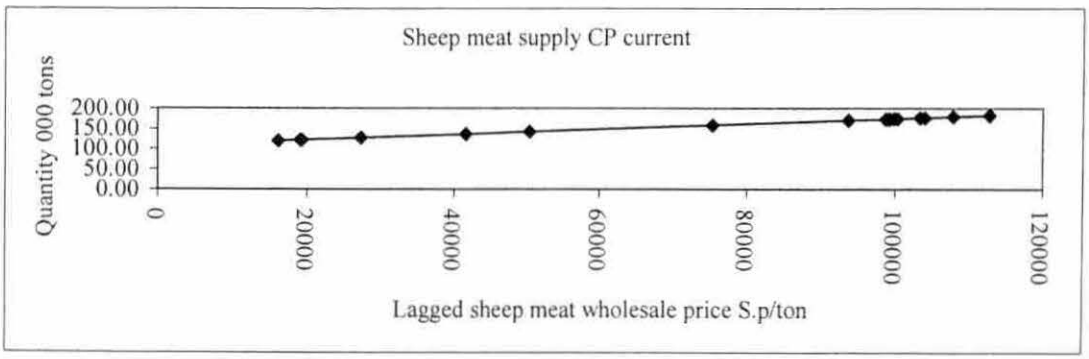


Figure 4.3: Current sheep meat supply CP

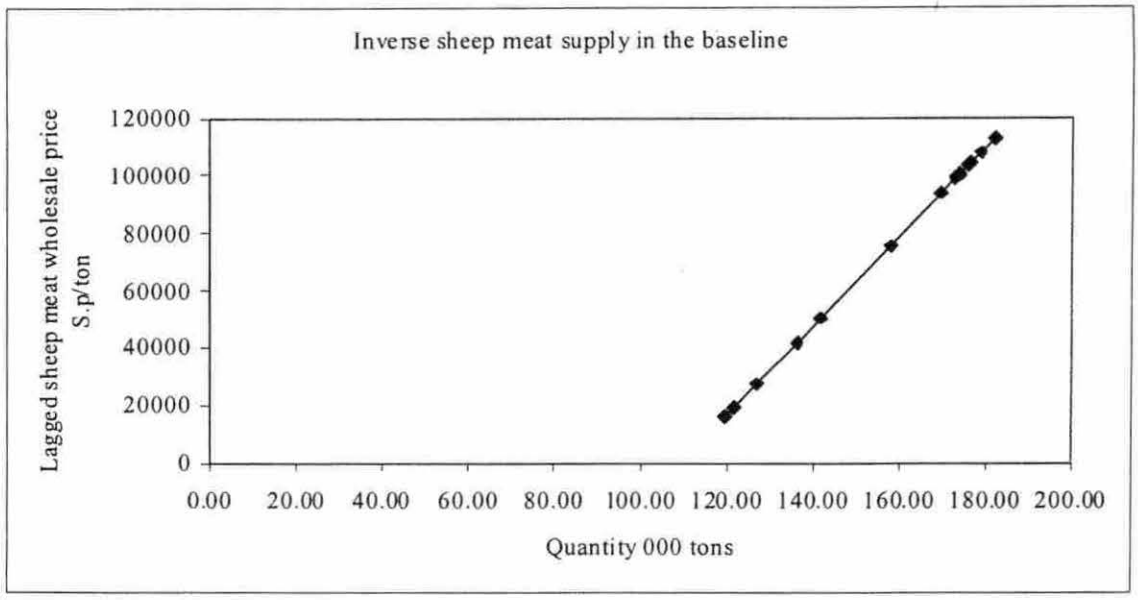


Figure 4.4: Inverse sheep meat supply in the baseline

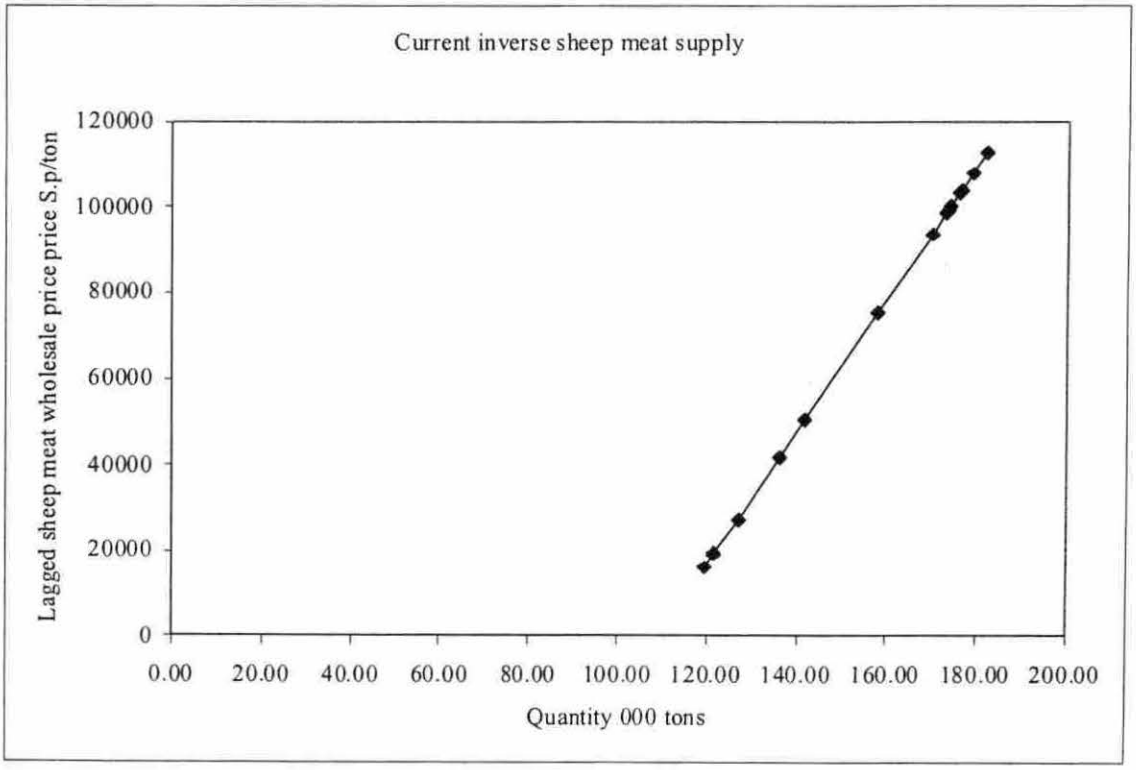


Figure 4.5: Current inverse sheep meat supply

Finally, it seems that a single equation was used to estimate the sheep meat supply. In fact, however, a system of equations was used because other formulas will be used to estimate animal production.

Main finding

More accurate data will enable the use of more advanced econometric methods by the estimation of sheep meat supply. Therefore, it is necessary to develop the current database in order to conduct more accurate supply analysis.

4.2. Estimation of sheep meat demand

Before demand estimation of sheep meat an overview about consumers' behaviors and the behavioral relationship between expenditure and consumption will be presented taking into consideration Engel's functions.

4.2.1. Consumers' behaviors and sheep meat Engel's curves

Among the important aspects of consumption behavior that have attracted the attention of economists are consumer demand and Engel's curves; see, Johnson, Hassan, and green (1984). Accordingly, Piggoh N.E. and Wright V. (1992) discussed the topics related to presence or absence of structural changes in meat demand, which are considered as critical issues to marketing decision making of red and white meat. Consequently, there are two theories. One theory postulates that preferences remained stable. The other alternative is based on the notion that consumers' preferences have changed. The reason for these changes is usually cited as consumers having increased dietary consciousness, with white meats being perceived to be healthier than red meat. Another reason is that changing lifestyles are causing consumers to demand more convenience or value-added to be associated with food products and poultry is seen to have more value-added potential. Therefore, it is apparent that non-price variables such as variety, convenience, and promotion potentially are significant influences on meat demand. However, collecting time series data that measure such variables is not a simple task and is likely to be expensive in terms of resources and time. In spite of these difficulties, such endeavors may further develop present thinking and lead to a better understanding of changing consumption patterns and the underlying forces.

In this context, the analysis of the behavioral relationship between per capita meat expenditure (sheep meat) and per capita disposable income is a crucial step. Thus, this relationship can be tested if it is related to economic theory (Engel's law) or not. Engel's law stated:" The smaller the family income, the greater the proportion of the income spent on food; or in other words, the larger the family income, the smaller the proportion of the income spent for food"; see, Fan (1949). Consequently, table 4.3 (page 94) includes the data needed to calculate the share of sheep meat expenditure in total expenditure; figure 4.6 (page 94) depicts the share of sheep meat expenditure in total expenditure, which confirms the income-expenditure theory; table 4.4 (page 95) includes the data for the calculation of Engel's curves and figure 4.7 (page 95-96) depicts the linear, double-log, and semi-log forms of Engel's curves. Accordingly, the average income elasticity of demand is -0.086 for the linear form, -0.0714 for the double-log form, and – 0.0720 for the semi-log form, which means that sheep meat is an inferior good. This finding is justified because sheep production areas have an over-consumption of sheep meat.

4.2.2. Choice of sheep meat demand model

Cashin Paul (1991) presented a model to estimate the Australian demand for meat including fresh pork, beef, lamb, chicken, veal, ham, and bacon using a demand system approach; Eales and Unnvehr (1992), and Wahl, Mittelhammer, and Hayes (1992) highlighted the use of an inverse demand system to determine the meat demand; Fan Shou-Ching (1949) estimated the demand for lamb in the United States through the following equation:

$$X_{5(t)} = b_0 + b_1 * X_{6(t)} + b_2 * X_{1(t)} + b_3 * X_{3(t)} + b_4 * X_{7(t)} + \ldots.$$

Where: $X_{5(t)}$ = Lamb retail price, $X_{6(t)}$ = Annual per capita consumption of lamb (-), $X_{1(t)}$ = Beef retail price (+), $X_{3(t)}$ = Pork retail price (+), $X_{7(t)}$ = Disposable personal income per capita (+), b_0, b_t = coefficients.

From the equation above, it can be concluded that sheep meat retail price and annual per capita consumption are inversely related according to the law of demand, which implies higher consumption rates at low prices and decreased consumption at increasing prices and that a positive relationship exists among sheep meat retail price, prices of substitute commodities, and income per capita. Higher prices of substitute products and income lead to higher retail prices of sheep meat, and vise versa.

In Syria, however, pork, beef, and other meat prices can be ignored because of the absence or scarcity of these products in sheep production areas. In addition, Syrian consumers do not like to substitute sheep meat in their food with other kinds of meat (i.e., sheep meat is included in certain kinds of foods; beef also has its special foods).

In this context, Syrian sheep meat consumption was calculated through the following formula according to the commodity balance of sheep meat:

Consumption = Production + Imports – Exports

Accordingly, the demand for sheep meat was estimated by six alternatives. The first two were conducted without any correction; the others were estimated with correction either by the difference method or by adding a trend component. Therefore, the estimated last four models can be considered as dynamic models. Hence, table 4.5 (page 97) includes the estimation and the statistical testing; in addition, more detailed calculations are included in Appendix D. Consequently, the best results were achieved by model 5 (according to the measures goodness of fit and statistical tests), which is linear and includes consumption per capita, private expenditure per capita, and a time trend. Accordingly, the demand model for sheep meat will have the following form:

$Pd^{\wedge}_t = 709789.59 - 54124.51 * X_{1t} + 6.57 * X_{2t} - 4927.45 * t$

Where:

$Pd^{\wedge}_t$ = Fitted price, X_{1t} = Consumption per capita, X_{2t} = Private expenditure per capita,

t = time trend.

Consequently, it can be concluded that an inverse relationship is present between sheep meat retail price (inverse demand) and both consumption per capita and time trend. A positive relationship, however, is prevailing between sheep meat retail price and private expenditure per capita. This means that the signs and relative magnitude of regression coefficients coincide with the expectations. Moreover, from table 4.5 (page 97), it can be elicit that all coefficients are statically significant at the 5 % significance level and that 96.88-97.35% (R square and adjusted R square) of the variations in sheep meat retail price are explained through the demand equation. Thus, 1% increase in consumption per capita leads to a decrease of the sheep meat retail price by 54124.5%, whereas 1% increase in private expenditure per capita results in an increase of the sheep meat retail price by 6.57%; in this context, the time trend has a decreasing effect on the sheep meat retail price. In addition, table 4.6 (page 99) includes the calculated demand in baseline

and current scenarios in order to make policy options (now both scenarios are similar); figure 4.8 (page 99) depicts the current Syrian inverse sheep meat demand in comparison with the actual data and ceteris paribus sheep meat demand; figure 4.9 (page 100) depicts the CP alternatives (baseline and current).

Hence, the price elasticity of demand is -0.131599 in the short run and -0.131600987 in the long run. This means that sheep meat demand is rigid to price changes both in the short and long run. However, in the long run the demand is slightly more elastic.

Finally, the availability of the data is a necessary condition to make more accurate and expanded demand estimation. Thus, the database for animal production needs to be improved and expanded.

4.3. Price determination model and sensitivity analysis

Price will be determined through matching supply and demand. Accordingly, equilibrium price and quantity will be identified. To do this process, the demand function was recalculated to get the total demand in 000 tons (R square =0.995794, adjusted R square = 0.995052, t-statistic indicates that all coefficients are highly significant). Consequently, the total demand function has the following form:

$q_t = 114.847 - 0.0002 * P_t + 0.0001 * y_t + 3.3312 * t$

Where: q_t = Total sheep meat demand, P_t = sheep meat retail price, y_t = private expenditure, and t = time trend.

From the above-mentioned model, it can be concluded that there is an inverse relationship between sheep meat demand and sheep meat retail price. A positive relationship, however, is prevailing among sheep meat demand, private expenditure, and time trend. In this context, the price elasticity of demand is – 0.08488 in the short run and – 0.08489 in the long run.

Consequently, the formulas in 2.8.4 were applied. As a result, the equilibrium price was P* = 139023 S.p/ton (P* = 69511 S.p/ton deflated) and the equilibrium quantity = 154 thousand ton. However, after considering the marketing margins, the equilibrium price will be at retail level =156330 S.p/ton = 78165 Sp/ton deflated, and at wholesale level = 121716 S.p/ton = 60858 Sp/ton deflated. Hence, table 4.7 (page 101) includes the estimated supply and demand values and figure 4.10 (page 101) depicts the equilibrium of sheep meat. Now, these equilibrium prices can be applied on the sheep meat chain to

study their effects. Thus, applying the equilibrium prices on the sheep meat chain is presented in table 4.8 (page 102) and figures 4.11 and 4.12 (page 102-103). Accordingly, the benefited activity is carcass retailer and the losers are live animal wholesalers and carcass wholesalers. This also affected the share of the agents in value added. In this context, at retail level the price decreased from 278 S.p/kg to 230 S.p/kg (48 S.p/kg or 17.3%); however, in the same time the price spread between carcass wholesaler and carcass retailer increased from 76 S.p/kg to 80 S.p/kg (4 S.p/kg or 5.3%); therefore, the value added of carcass retailers increased from 3,954.6 Mill.S.p to 7,770.9 Mill.S.p causing their share in value added to increase from 21.6% in the baseline scenario to 36% in the current scenario (equilibrium). Moreover, at live animal wholesaler level the price decreased from 139 S.p/kg to 121 S.p/kg (18 S.p/kg or 12.9%) causing the agent's volume of value added and its share to decrease from 6,933 Mill.S.p (22.1%) to 2,207.3 Mill S.p (10.2%); at carcass wholesaler level the price decreased from 202 S.p/kg to 150 S.p/kg (52 S.p or 25.7%) and the price spread from 63 S.p/kg to 29 S.p/kg causing the agent's value added and its share to decrease from 16,505.6 Mill.S.p(52.5%) to 7,579.2 Mill.S.p (35.1%). Consequently, the share of the other agents in value added also changed as table 4.8 shows. Here, it is worth noting that only the trade level was considered. However, in practice, normally all prices move together in the same time that the price decrease will be compensated through larger trade volume. Moreover, the export orientation and the globalization of the chain will lead to more reasonable prices that all agents will be better off.

In addition, sensitivity analysis means reevaluation with the assumption that some negative or positive changes (or both) will occur. Negative changes could be cost increase, price decrease, production decrease, and etc. Positive changes could be cost decrease, price increase, production increase, and etc. Thus, table 4.9 (page 104) includes various combinations of production (5%, 10%, and 15%) and consumption (5%, 10%, and 15%) increases scenarios and their effects on the equilibrium price; production increase can be achieved through supply side polices such as improved technology (biotechnology achievements such as embryo planting and high yielding breeds) and improved governmental services (veterinary services, artificial insemination, and reducing wastes and death rates); consumption can increase through demand side effects and policies such as population growth, income growth, and agreements with the European union.

Accordingly, figure 4.13 (page 104) depicts the sheep meat equilibrium in the baseline and the current (5% production increase and 10% consumption increase simultaneously) scenarios. Applying this scenario caused the equilibrium price to increase from 69,511 S.p (deflated) to 83,357 S.p (20% increase). This in turn, will increase the equilibrium quantity (Figure 4.13). Finally, from table 4.9, it can be concluded that enhancing the supply side and neglecting the demand side will cause a price decrease, whereas stimulating the demand side will bid up the price. Thus, a balanced growth of both sides will lead to an optimal value chain, which maximizes the benefit of all participants from viewpoint of the chain as a whole.

4.4.Estimation of supply and demand for Syrian sheep milk

This section is concerned with a preliminary estimation of sheep milk supply and demand to be used as starting point for more accurate estimation. In this context, the data sources and sampling procedures are the same as sheep meat.

Syrian sheep milk supply

The guidelines presented in chapter 2 about supply estimation were practiced on Syrian sheep milk. Moreover, the regression results are presented in Appendix D. However, the results can be summarized as follows:

$$Y_i^{\wedge} = 102.96 - 0.1675 * X_1 + 0.0531*X_2 + 0.0110*X_3 - 0.0146*X_4$$

Where:

$Y_i^{\wedge}$ - Fitted sheep milk supply.

X_1- Lagged sheep milk production (-), $SEb^{\wedge} = 0.098$, $t = -1.773$ (insignificant)

$SEb^{\wedge}$ - Standard error of X-coefficient, t – t statistic.

X_2 – Number of milked sheep females (+), $SEb^{\wedge} = 0.005$, $t = 11.441$ (significant).

X_3 – Lagged sheep milk wholesale price (+), $SEb^{\wedge} = 0.004$, $t= 3.029$ (significant).

X_4 – Lagged fodder price (-), $SEb^{\wedge}= 0.005$, $t = -3.055$ (significant).

From the equation above, it can be concluded that all coefficients are statistically significant at the level 5% of significance (coincide with the expected signs and magnitude) except lagged sheep milk production. These regression coefficients have the same interpretation as sheep meat supply and demand parameters. In this context, the

regression summary output includes the following parameters: Durbin Watson = 2.219 (inconclusive), Goldfeld – Quant test = 1 (no heteroskedasticity), R square = 0.9464 (high degree of explanation), and Adjusted R square = 0.9331 (high degree of explanation).

Hence, the linear specification was best fitted with the Syrian sheep milk supply. Consequently, the short run elasticity is 0.1222(rigid) and the long run elasticity is 0.1235 (rigid); table 4.10 (page 105) includes the required data and the estimated sheep milk supply; figures 4.14 (page 105) depicts the comparison between Syrian sheep milk supply and production of sheep milk; figure 4.15 (page 106) depicts the sheep milk supply and its inverse.

Finally, to conduct accurate supply estimation, the database for the Syrian livestock should be improved and expanded. Here, it is to highlight that a correction for the consumer price index was made. Then, all financial values were deflated with the consumer price index to avoid the impact of money illusion.

Syrian sheep milk demand

The state adjustment model gave the best results in highlight on the existence of lagged prices relationships; see, Johnes, Purcell, and Mc Guirk (1993). Consequently, the results of the estimation are shown in table 4.11 (page 107) and depicted in figures 4.16 (page 107), which compares sheep milk demand and consumption; figure 4.17 (page 108) furnishes the Syrian sheep milk demand and its inverse. Moreover, the results can be summarized as follows (more details are included in Appendix D):

$$Q_t^{\wedge} = B_0^{\wedge} + B_1^{\wedge} * X_1 + B_2^{\wedge} * X_2 + B_3^{\wedge} * DX_2 + B_4^{\wedge} * X_3 + B_5^{\wedge} * DX_3$$

Where:

$Q_t^{\wedge}$ - Demand of sheep milk.

$B_0^{\wedge}$ - intercept = 131.4853 (+), t = 2.3551 (significant).

$B_1^{\wedge}$ - Coefficient of lagged sheep milk consumption = 0.7313 (+), t = 4.849 (significant).

X_1 – Lagged sheep milk consumption.

$B_2^{\wedge}$ - Coefficient of lagged sheep milk retail price = -0.0119 (-), t = -4.6344 (significant).

X_2 – Lagged sheep milk retail price.

$B_3^{\wedge}$ - Coefficient of the difference of retail prices for two successive periods = -0.0371 (-), t = -4.8895 (significant).

DX_2 – Difference of retail prices between two successive periods.

B_4^ - Coefficient of lagged expenditure per capita = 0.0044 (+), t = 2.2026 (significant).

X_3 – Lagged expenditure per capita.

B_5^ - Coefficient of the difference of expenditure per capita between two successive periods = 0.0376 (+), t = 11.363 (significant).

DX_3 – Difference of expenditure per capita between two successive periods.

From the equation above, it can be concluded that all regression coefficients are statically significant at the 5% significance level. These coefficients have the same interpretation as the supply and demand coefficients of sheep meat and have the same signs and magnitude as expected. Moreover, the regression summary output includes the following parameters: R square = 0.9547 (high degree of explanation), adjusted R square = 0.9386 (high degree of explanation), Goldfeld – Quant F test (F = 0.78 < 9.28), which means accept homoskedasticity, Durbin Watson (DW = dl = 0.712<1.593 < du = 1.991), which means that the test is inconclusive.

Consequently, the price elasticity of demand is – 0.1668 in the short run and – 0.1689 in the long run, which means that the demand is rigid both in the short and long run.

Table 4.3: Depicting the relationship between sheep meat expenditure and total expenditure 1980-2001

Year	Sheep Meat Expenditure Per capita y Sp/person	Expenditure per Capita I Sp/person	y/I %	Fitted y/I %	Expenditure per Capita I Sp/person
1981	285.73	5,343.48	0.053	0.0813	3,760.30
1982	341.32	4,783.09	0.071	0.0813	4,032.48
1983	281.85	4,044.24	0.070	0.0813	4,044.24
1984	282.48	3,760.30	0.075	0.0812	4,783.09
1985	311.51	4,032.48	0.077	0.0812	5,343.48
1986	413.23	5,375.20	0.077	0.0812	5,375.20
1987	547.24	5,945.07	0.092	0.0812	5,945.07
1988	877.50	7,348.62	0.119	0.0811	7,348.62
1989	714.56	7,732.75	0.092	0.0811	7,732.75
1990	1,045.40	10,717.35	0.098	0.0809	10,717.35
1991	1,508.91	16,979.54	0.089	0.0805	16,979.54
1992	1,488.17	17,487.84	0.085	0.0805	17,189.18
1993	1,801.40	18,758.91	0.096	0.0805	17,487.84
1994	1,727.69	18,476.71	0.094	0.0804	18,476.71
1995	1,488.28	17,189.18	0.087	0.0804	18,492.18
1996	1,387.43	19,637.03	0.071	0.0804	18,694.10
1997	1,315.69	18,694.10	0.070	0.0804	18,758.91
1998	1,368.92	19,050.51	0.072	0.0804	19,050.51
1999	1,364.80	19,424.63	0.070	0.0804	19,391.90
2000	1,333.33	19,391.90	0.069	0.0804	19,424.63
2001	1,282.90	18,492.18	0.069	0.0804	19,637.03

Source: Author calculations according to MAAR & NAPC data

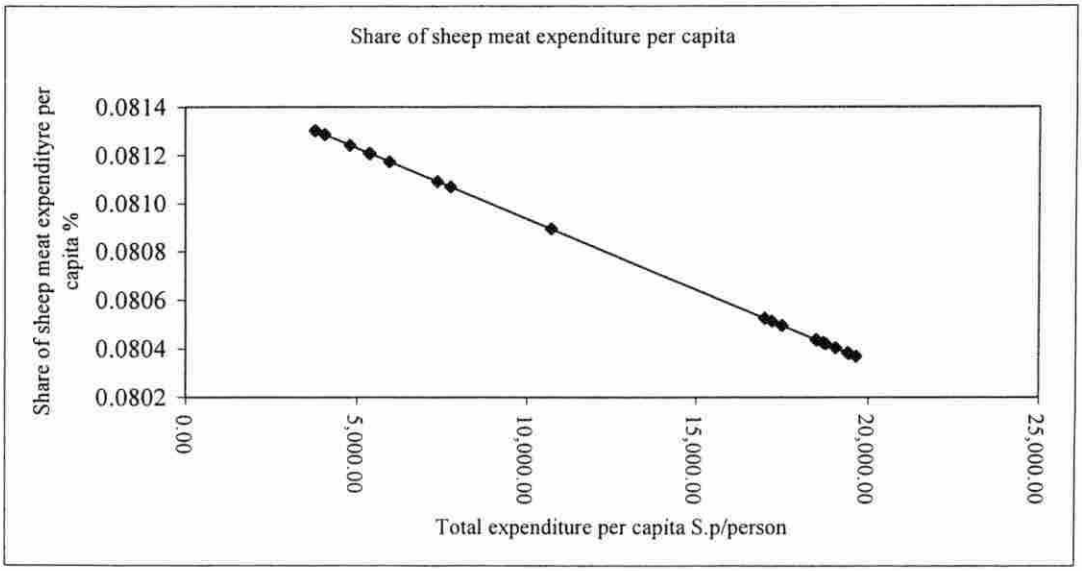


Figure 4.6: Share of sheep meat expenditure per capita

Table 4.4: Alternative forms of Engel's curves of Syrian sheep meat

Consumption Per kg/person	Private Expenditure Capita I Sp/person	Linear Income (Linear Engel's Curve) kg/person	Double log Income (Double-log Engel's Curve) kg/person	Semi log Income (Semi-log Engel's Curve) kg/person
13.00	5343	12.64	12.94	12.93
12.95	4783	12.69	12.88	12.87
12.93	4044	12.75	12.88	12.87
12.81	4032	12.75	12.62	12.63
12.57	5375	12.64	12.62	12.62
12.30	5945	12.59	12.53	12.54
12.15	7349	12.47	12.34	12.35
12.11	7733	12.44	12.29	12.31
12.02	10717	12.19	12.01	12.02
11.79	16980	11.67	11.62	11.63
11.67	17488	11.63	11.61	11.62
11.43	18759	11.52	11.60	11.60
11.61	17189	11.66	11.55	11.55
11.71	18694	11.53	11.54	11.54
11.70	19051	11.50	11.53	11.53
11.53	19392	11.47	11.51	11.51
10.95	18492	11.55	11.50	11.50

Source: Author calculations according to MAAR & NAPC data

Figure 4.7: Panel A

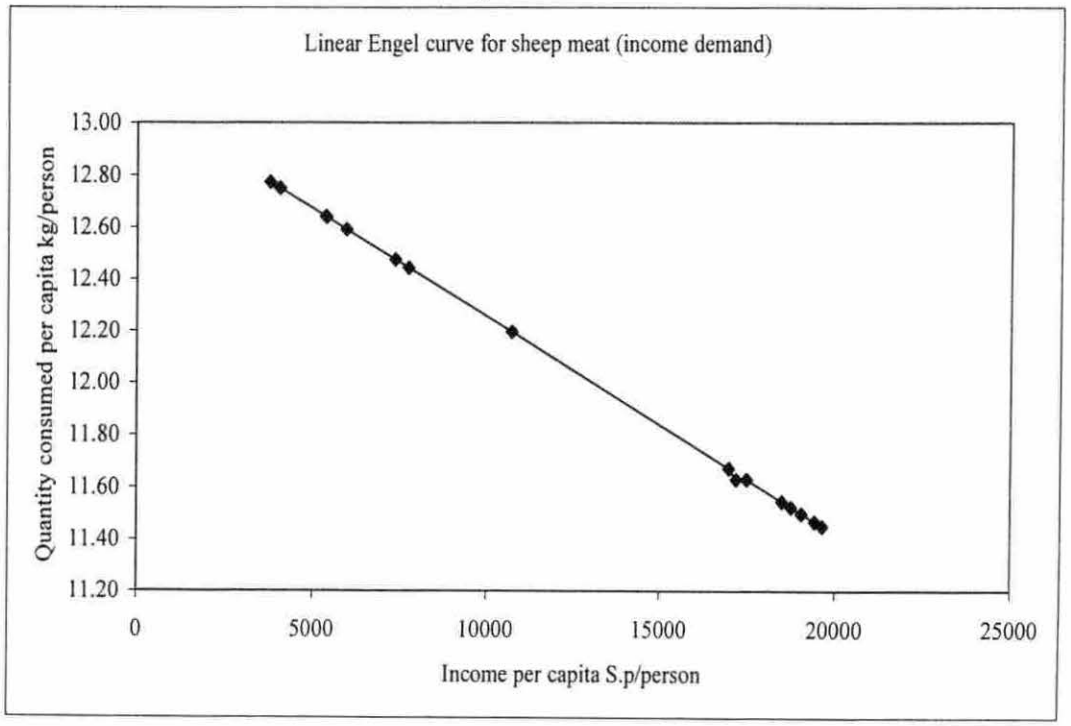


Figure 4.7: Panel B

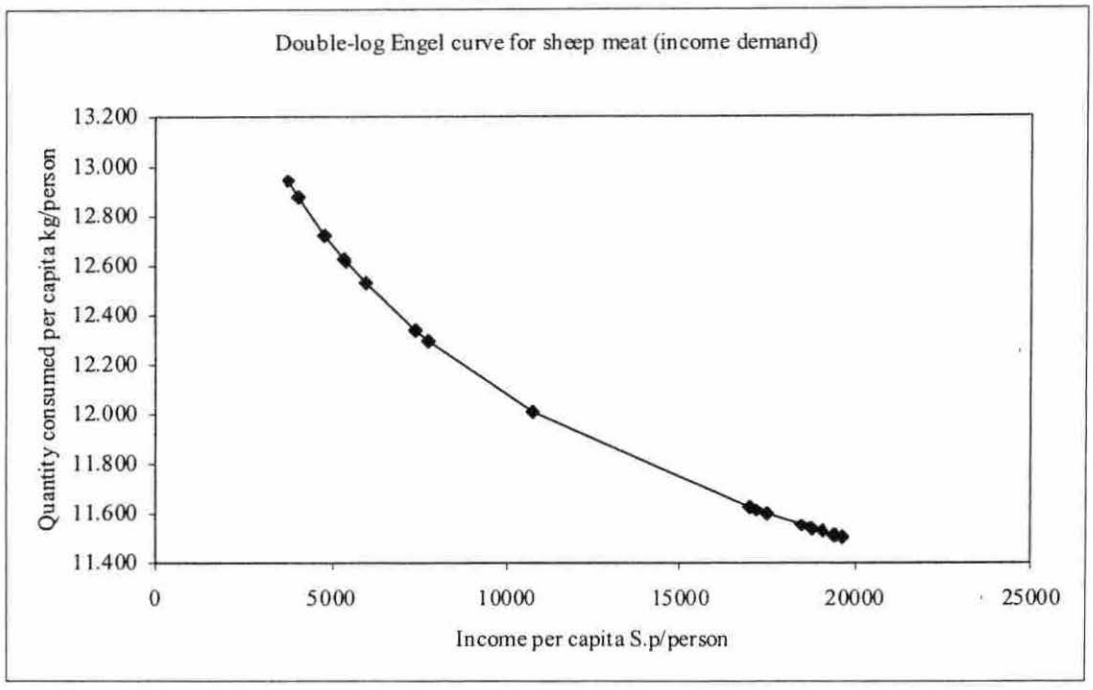


Figure 4.7: Panel C

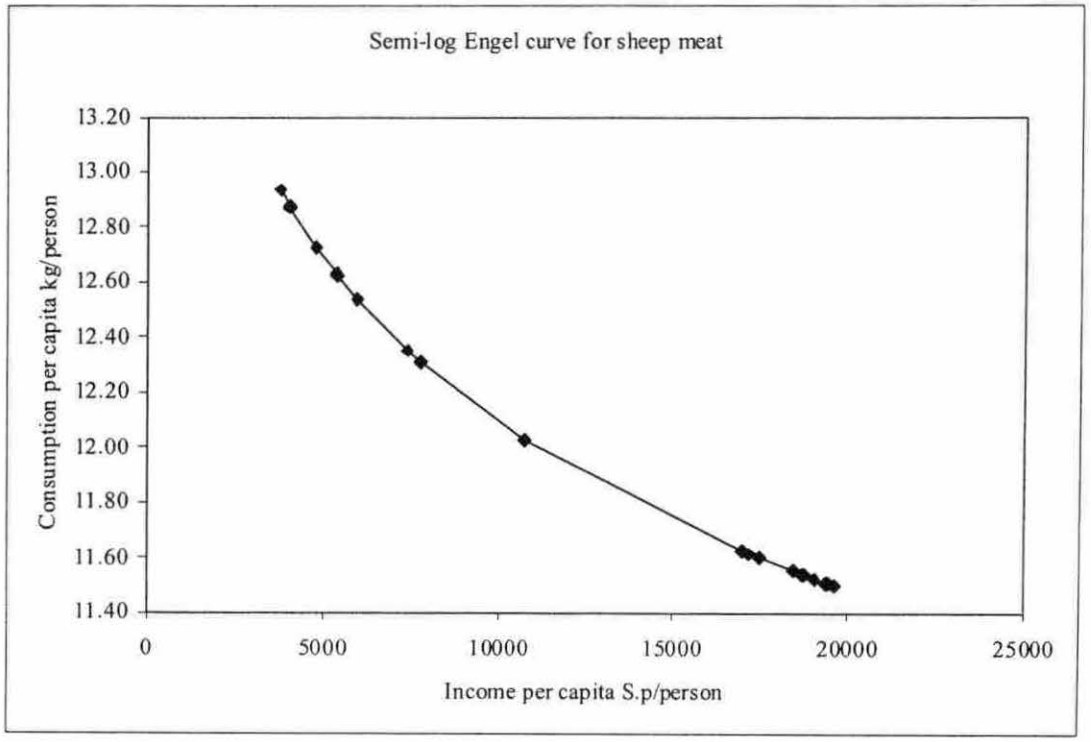


Figure 4.7:Alternative forms of Engel's curves of Syrian sheep meat

Table 4.5: Summary for the comparison among various demand estimation models for sheep meat 1980-2001

	Coefficient	Standard Error	T Statistic	P Value	Multiple R	R Square	Adjusted R Square
Model 1: Two variables static linear without correction for autocorrelation							
Constant term	361440.35	164403.32	2.1985	0.0412			
Consumption per capita	-27592.35	12553.06	-2.1981	0.0413	0.9638	0.9289	0.9210
Private expenditure per capita	4.53	1.14	3.9829	0.0009			
Model 2: Two variables static logarithmic without correction for autocorrelation							
Constant term	17.04	6.85	2.4876	0.0229			
Consumption per capita	-5.09	2.17	-2.3475	0.0305	0.9759	0.9525	0.9472
Private expenditure per capita	0.73	0.17	4.4232	0.0003			
Model 3: Three variables (static-dynamic) linear corrected for autocorrelation							
Constant term	76758.85	38625.78	1.9872	0.0643			
Corrected lagged sheep meat retail price	0.88	0.08	11.2754	0.0000			
Corrected sheep meat consumption per capita	-25066.06	13246.56	-1.8923	0.0767	0.9825	0.9652	0.9587
Corrected private expenditure per capita	6.50	1.41	4.6145	0.0003			
Model 4: Three variables (static-dynamic) logarithmic corrected for autocorrelation							
Constant term	2.64	0.73	3.6073	0.0024			
Corrected lagged sheep meat retail price	0.61	0.06	10.4361	0.0000			
Corrected sheep meat consumption per capita	-0.47	0.41	-1.1387	0.2716	0.9894	0.9788	0.9749
Corrected private expenditure per capita	0.30	0.05	5.4836	0.0001			
Model 5: Two variables dynamic linear with time trend							
Constant term	709789.59	122147.80	5.8109	0.0000			
Sheep meat consumption per capita	-54124.51	9320.03	-5.8073	0.0000			
Private expenditure per capita	6.57	0.81	8.1059	0.0000	0.9867	0.9735	0.9688
Time trend	-4927.45	921.72	-5.3459	0.0001			
Model 6: Two variables dynamic logarithmic with time trend							
Constant term	23.18	6.54	3.5432	0.0025			
Sheep meat consumption per capita	-7.88	2.22	-3.5422	0.0025			
Private expenditure per capita	0.86	0.16	5.5488	0.0000	0.9823	0.9650	0.9588
Time trend	-0.04	0.02	-2.4647	0.0247			

Source: Author calculations according to MAAR & NAPC data

Table 4.5: Continued

	Squared Residuals e^2	Durbin Watson Calculated	Durbin Watson required dl	du	Goldfeld- Quant F- Test F Calculated	F Required
Model 1: Two variables static linear without correction for autocorrelation						
Constant term						
Consumption per capita	3.22E+09	0.5708	1.125	1.538	9.6454	5.05
Private expenditure per capita		Accept autocorrelation			Accept heteroskedasticity	
Model 2: Two variables static logarithmic without correction for autocorrelation						
Constant term						
Consumption per capita	0.5162	0.46486	1.125	1.538	9.6454	5.05
Private expenditure per capita		Accept autocorrelation			Accept heteroskedasticity	
Model 3: Three variables (static-dynamic) linear corrected for autocorrelation						
Constant term						
Corrected lagged sheep meat retail price						
Corrected sheep meat consumption per capita	1.42E+09	1.937	0.998	1.676	6.308	6.390
Corrected private expenditure per capita		Reject autocorrelation			Accept homoskedasticity	
Model 4: Three variables (static-dynamic) logarithmic corrected for autocorrelation						
Constant term						
Corrected lagged sheep meat retail price						
Corrected sheep meat consumption per capita	0.200498	0.2997	0.998	1.676	6.308	6.390
Corrected private expenditure per capita		Accept autocorrelation			Accept homoskedasticity	
Model 5: Two variables dynamic linear with time trend						
Constant term						
Sheep meat consumption per capita						
Private expenditure per capita	1.2E+09	1.7695	1.026	1.669	3.04	5.05
Time trend		Reject autocorrelation			Accept homoskedasticity	
Model 6: Two variables dynamic logarithmic with time trend						
Constant term						
Sheep meat consumption per capita						
Private expenditure per capita	0.380336	1.0799	1.026	1.669	3.04	5.05
Time trend		Inconclusive			Accept homoskedasticity	

Source: Author calculations according to MAAR & NAPC data

Table 4.6: Data for the estimation of Syrian sheep meat demand 1980-2001

Year	Sheep Meat Retail Price Sp/ton		Consumption Per Capita kg/person	Private Expenditure per Capita Sp/person	t	Inverse sheep meat demand Estimated		Inverse sheep meat demand CP Estimated	
						Baseline Sp/ton	Current Sp/ton	Baseline Sp/ton	Current Sp/ton
1981	21,979.00		13.00	5,343.48	1.00	36,336.37	36,336.37	34,113.39	34,113.39
1982	26,352.00		12.95	4,783.09	2.00	30,312.59	30,312.59	36,697.37	36,697.37
1983	21,798.00		12.93	4,044.24	3.00	21,737.52	21,737.52	37,902.10	37,902.10
1984	21,898.00		12.90	3,760.30	4.00	16,569.05	16,569.05	39,525.84	39,525.84
1985	24,318.00		12.81	4,032.48	5.00	18,300.35	18,300.35	44,397.05	44,397.05
1986	32,886.00		12.57	5,375.20	6.00	35,427.95	35,427.95	57,633.92	57,633.92
1987	44,491.00		12.30	5,945.07	7.00	48,609.70	48,609.70	72,000.55	72,000.55
1988	72,222.00		12.15	7,348.62	8.00	61,018.64	61,018.64	80,119.23	80,119.23
1989	59,006.00		12.11	7,732.75	9.00	60,778.91	60,778.91	82,284.21	82,284.21
1990	86,972.00		12.02	10,717.35	10.00	80,323.81	80,323.81	87,155.41	87,155.41
1991	127,982.00		11.79	16,979.54	11.00	128,971.47	128,971.47	99,604.05	99,604.05
1992	127,521.00		11.67	17,487.84	12.00	133,877.16	133,877.16	106,098.99	106,098.99
1993	157,603.00		11.43	18,758.91	13.00	150,287.22	150,287.22	119,088.87	119,088.87
1994	150,365.00		11.49	18,476.71	14.00	140,258.98	140,258.98	115,841.40	115,841.40
1995	128,214.00		11.61	17,189.18	15.00	120,500.83	120,500.83	109,466.46	109,466.46
1996	118,929.00		11.67	19,637.03	16.00	128,497.94	128,497.94	106,314.90	106,314.90
1997	112,361.00		11.71	18,694.10	17.00	115,025.25	115,025.25	103,962.29	103,962.29
1998	116,982.00		11.70	19,050.51	18.00	112,844.57	112,844.57	104,368.41	104,368.41
1999	116,997.00		11.67	19,424.63	19.00	112,362.21	112,362.21	106,356.49	106,356.49
2000	115,640.00		11.53	19,391.90	20.00	114,539.78	114,539.78	113,676.42	113,676.42
2001	117,160.00		10.95	18,492.18	21.00	135,095.70	135,095.70	145,068.64	145,068.64

Source: Author calculation according to MAAR & NAPC data

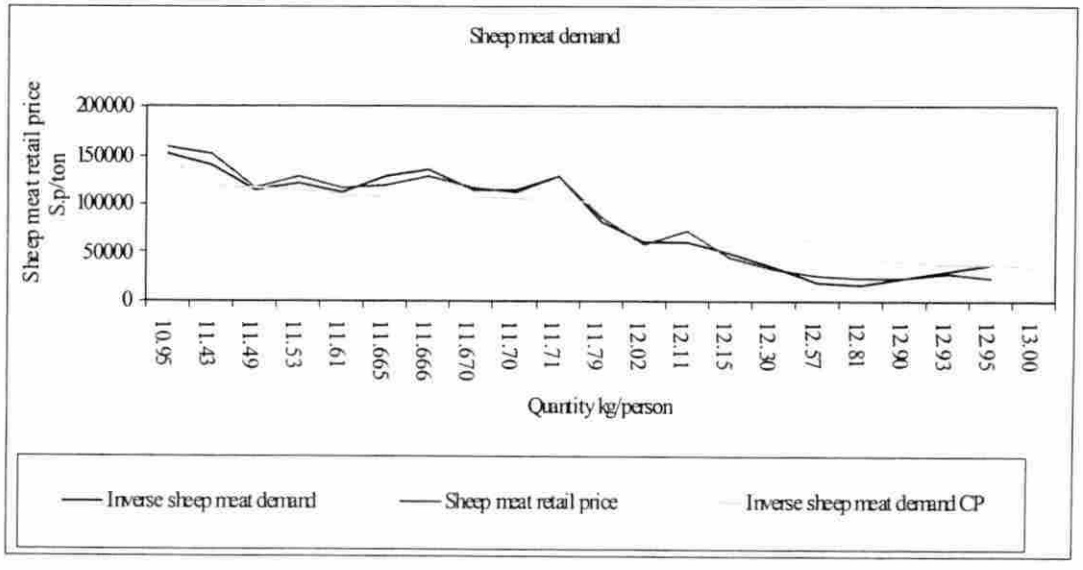


Figure 4.8: Syrian sheep meat demand

Figure 4.9: Panel A

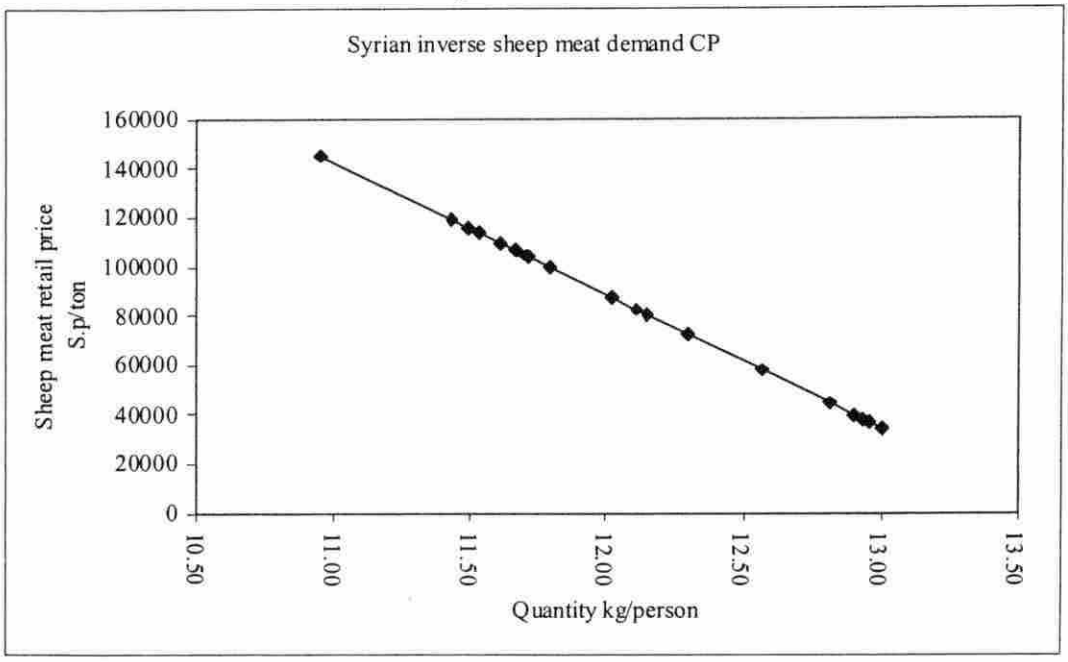


Figure 4.9: Panel B

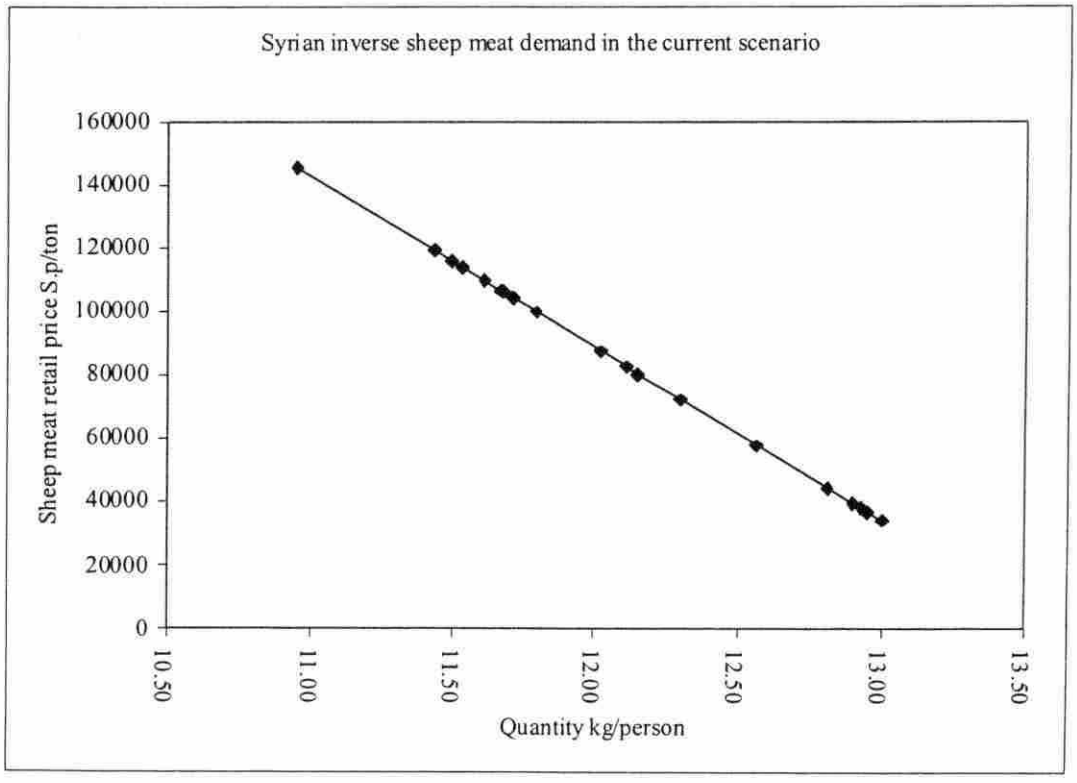


Figure 4.9: Syrian inverse sheep meat demand in the baseline and current scenarios

Table 4.7: Equilibrium of Syrian sheep meat 1980-2001

Year	Lagged Sheep Meat Wholesale Price	Sheep Meat Supply CP Estimated		Sheep Meat Retail Price	Inverse Sheep Meat Retail Price	Sheep Meat Demand CP Estimated	
		Baseline	Current			Baseline	Current
	Sp/ton	000 tons	000 tons	Sp/Ton	Sp/Ton	1000 ton	1000 ton
1981	16,114.00	120.00	120.00	21,798.00	157,603.00	161.22	161.22
1982	19,084.00	122.00	122.00	21,898.00	150,365.00	161.21	161.21
1983	19,133.00	122.00	122.00	21,979.00	128,214.00	161.20	161.20
1984	19,187.00	122.00	122.00	24,318.00	127,982.00	160.85	160.85
1985	19,262.00	122.00	122.00	26,352.00	127,521.00	160.54	160.54
1986	19,294.00	122.00	122.00	32,886.00	118,929.00	159.56	159.56
1987	27,329.00	127.00	127.00	44,491.00	117,160.00	157.82	157.82
1988	41,642.00	136.00	136.00	59,006.00	116,997.00	155.64	155.64
1989	50,409.00	142.00	142.00	72,222.00	116,982.00	153.66	153.66
1990	75,352.00	158.00	158.00	86,972.00	115,640.00	151.45	151.45
1991	93,709.00	170.00	170.00	112,361.00	112,361.00	147.64	147.64
1992	98,710.00	173.00	173.00	115,640.00	86,972.00	147.15	147.15
1993	99,083.00	173.00	173.00	116,982.00	72,222.00	146.94	146.94
1994	99,250.00	173.00	173.00	116,997.00	59,006.00	146.94	146.94
1995	99,853.00	174.00	174.00	117,160.00	44,491.00	146.92	146.92
1996	100,306.00	174.00	174.00	118,929.00	32,886.00	146.65	146.65
1997	103,306.00	176.00	176.00	127,521.00	26,352.00	145.36	145.36
1998	103,971.00	176.00	176.00	127,982.00	24,318.00	145.29	145.29
1999	107,779.00	179.00	179.00	128,214.00	21,979.00	145.26	145.26
2000	112,727.00	182.00	182.00	150,365.00	21,898.00	141.94	141.94
2001	112,737.00	182.00	182.00	157,603.00	21,798.00	140.85	140.85

Source: Author calculations according to MAAR & NAPC data

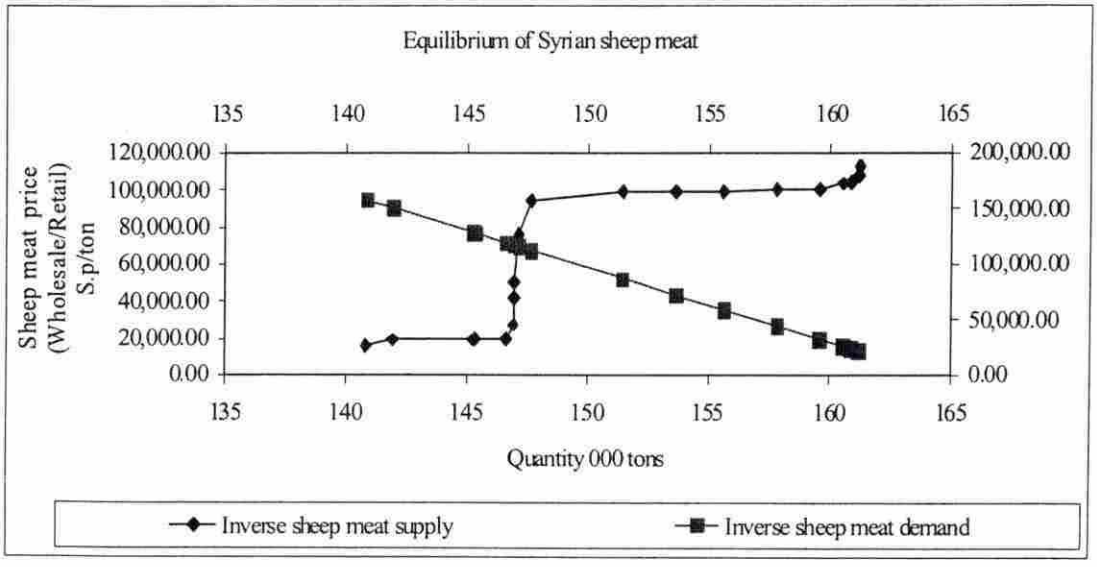


Figure 4.10: Equilibrium of Syrian sheep meat with deflated prices

Table 4.8: Agents' share in revenue, cost, gross margin, and value added of the sheep meat chain 2001 by applying the equilibrium prices

Measure	Revenue				Cost				Gross Margin			
	Baseline		Current		Baseline		Current		Baseline		Current	
Agent	Value Mill.S.p	%	Value Mill.S.p	%	Value Mill.S.p	%	Value Mill.S.p	%	Value Mill.S.p	%	Value Mill.S.p	%
Private Sector	32,154	14.39	32,154	16.47	32,112	16.42	32,112	18.13	43	0.15	43	0.24
Cooperative Sector	2,717	1.22	2,717	1.39	2,722	1.39	2,722	1.54	-5	-0.02	-5	-0.03
Live Animal Wholesalers	42,535	19.04	37,809	19.37	35,716	18.27	35,716	20.16	6,818	24.46	2,093	11.60
Carcass Wholesalers	53,033	23.74	39,381	20.18	36,580	18.71	31,854	17.98	16,453	59.03	7,527	41.73
Carcass Retailers	57,023	25.53	47,187	24.18	53,114	27.17	39,462	22.28	3,909	14.02	7,725	42.83
Slaughter-houses	34,464	15.43	34,464	17.66	34,191	17.49	34,191	19.30	273	0.98	273	1.51
Importers	25	0.01	25	0.01	18	0.01	18	0.01	7	0.02	7	0.04
Exporters	1,437	0.64	1,437	0.74	1,061	0.54	1,061	0.60	376	1.35	376	2.08
Total	223,389	100.00	195,176	100.00	195,515	100.00	177,138	100.00	27,874	100.00	18,038	100.00

Table 4.8: (Continued)

Measure	Value Added			
	Baseline		Current	
Agent	Value Mill.S.p	%	Value Mill.S.p	%
Private Sector	3,062	9.75	3,062	14.19
Cooperative Sector	246	0.78	246	1.14
Live Animal Wholesalers	6,933	22.07	2,207	10.23
Carcass Wholesalers	16,506	52.54	7,579	35.12
Carcass Retailers	3,955	12.59	7,771	36.01
Slaughter-houses	331	1.05	331	1.53
Importers	7	0.02	7	0.03
Exporters	379	1.21	379	1.75
Total	31,418	100.00	21,582	100.00

Source: Author calculations according to MAAR & NAPC

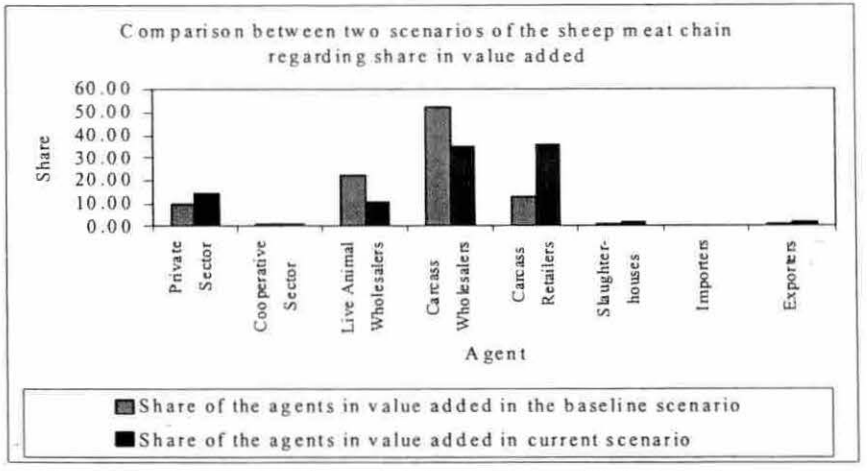
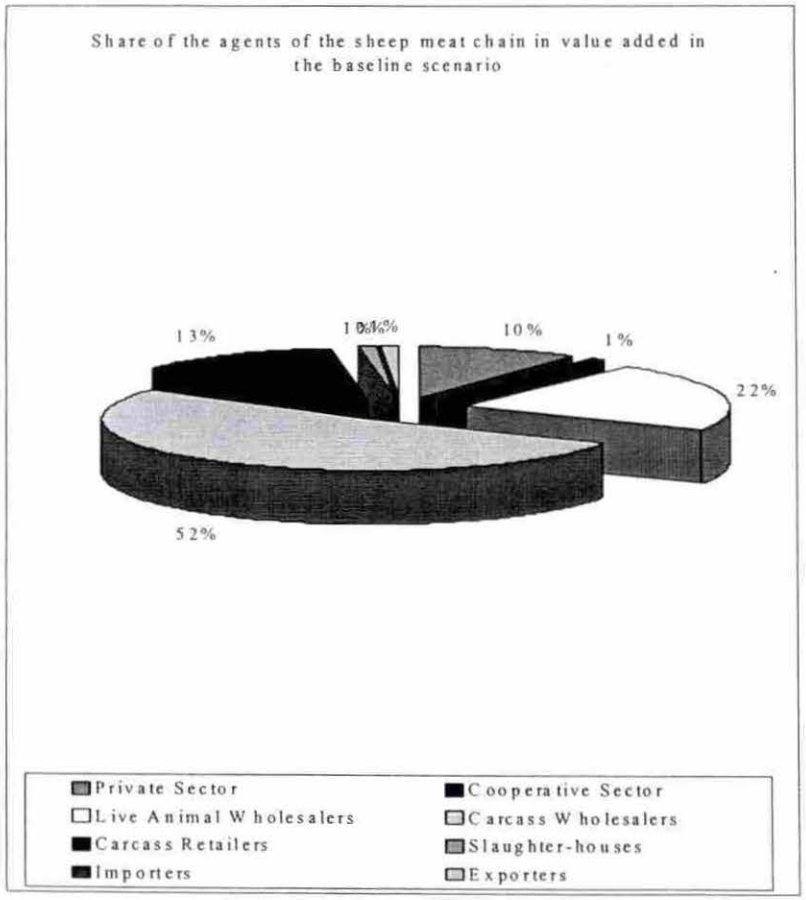


Figure 4.11: Comparison the agents' share in value added of the sheep meat chain in two scenarios



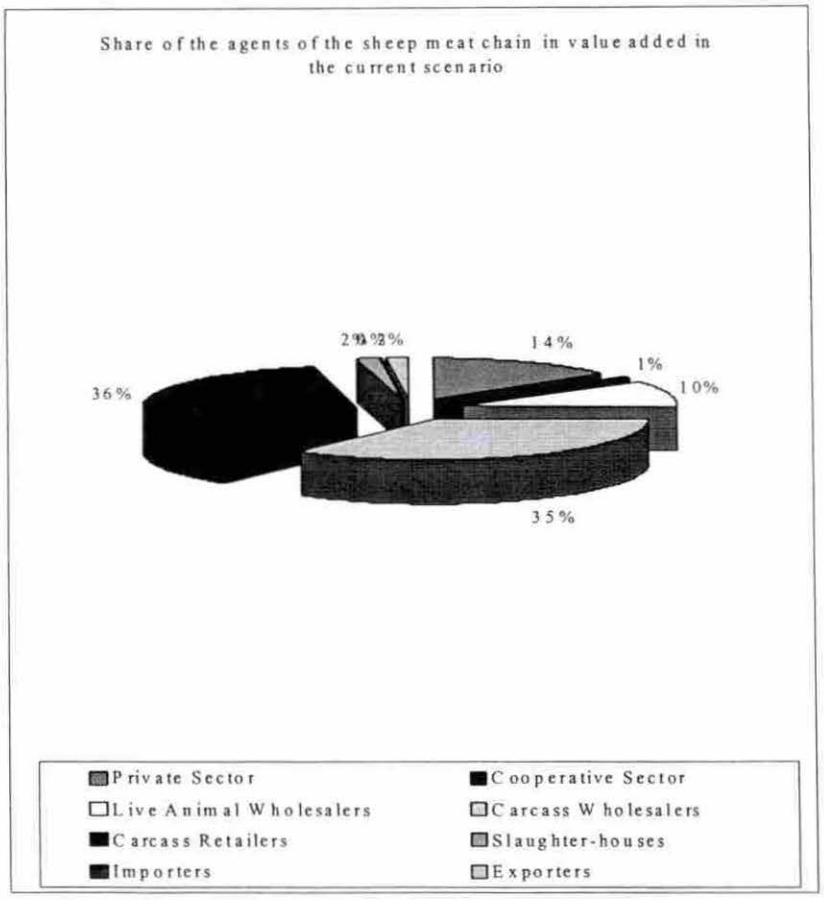


Figure 4.12: Comparison the agents' share of the sheep meat chain before (baseline) and after (current) the equilibrium prices

Table 4.9: Sensitivity of the market equilibrium under various assumptions deflated

		Production increase %			
		Constant	5%	10%	15%
Consumption increase %	Constant	69,511	62,617	55,722	48,827
	5%	79,882	72,987	66,092	59,197
	10%	90,252	83,357	76,463	69,568
	15%	100,623	93,728	86,833	79,938
		Equilibrium price percentage changes			
		Constant	5%	10%	15%
	Constant	0%	-10%	-20%	-30%
	5%	15%	5%	-5%	-15%
	10%	30%	20%	10%	0%
	15%	45%	35%	25%	15%

Figure 4.13: Panel A

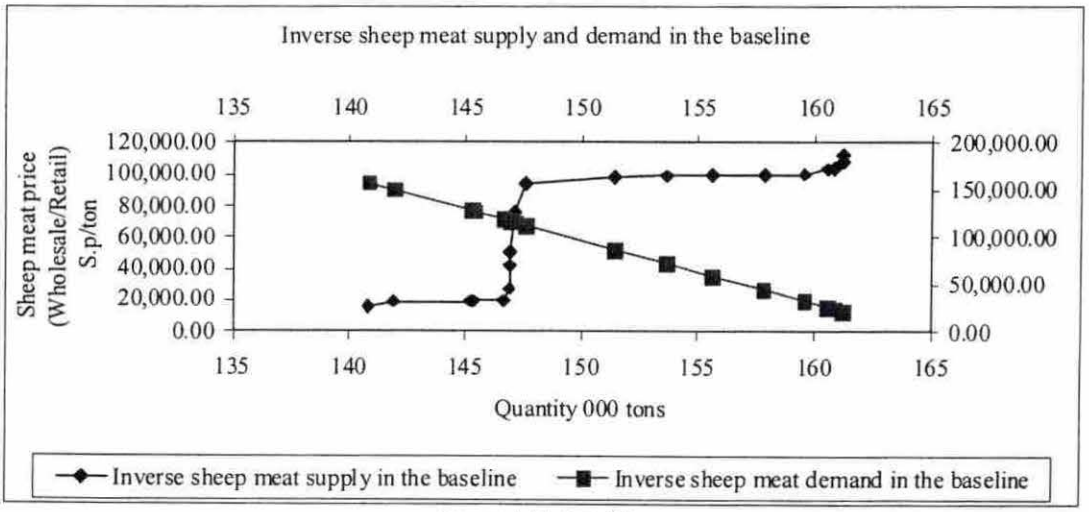


Figure 4.13: Panel B

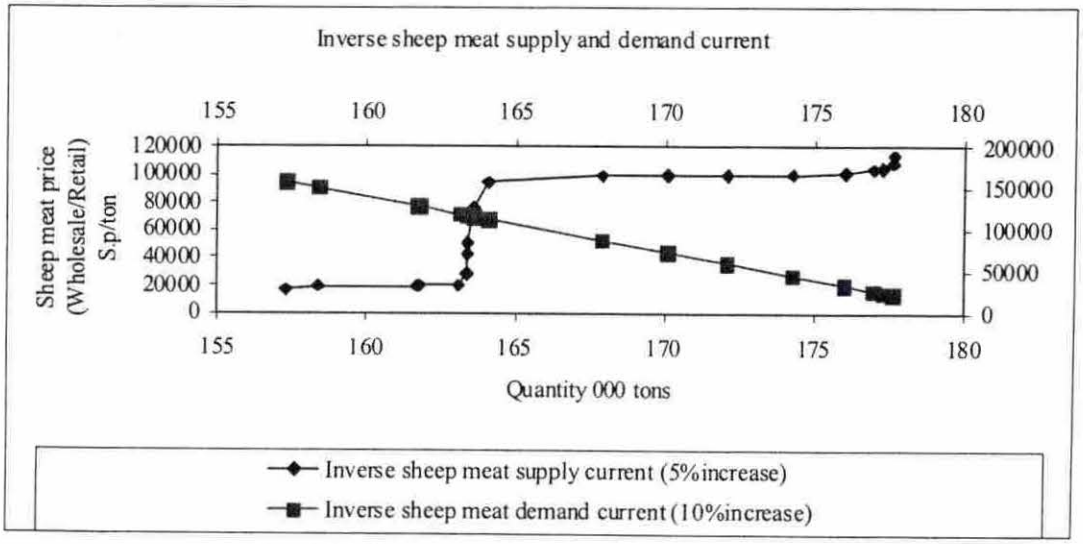


Figure 4.13: Sheep meat equilibrium under various scenarios

Table 4.10: Estimation of Syrian linear sheep milk supply 1980-2001

year	Sheep Milk Production	Lagged Sheep Milk Production	Number of Milked Sheep Females	Lagged Sheep Milk Whole Sale Price Deflated	Lagged Fodder Price Deflated	Sheep Milk Supply Estimated	Sheep Milk Supply CP Estimated
	000tons	000tons	thousand	Sp/ton	Sp/ton	000tons	000tons
1981	384	385	6,621	1,381	750	394	427
1982	410	384	6,825	1,589	1,485	397	429
1983	401	410	7,036	1,781	870	415	431
1984	414	401	7,015	1,491	748	414	428
1985	419	414	7,144	1,509	752	418	428
1986	420	419	6,950	1,717	814	409	430
1987	457	420	7,624	2,081	828	448	434
1988	506	457	8,403	2,919	1,017	490	444
1989	439	506	8,323	3,889	2,191	471	454
1990	497	439	8,928	4,561	2,944	511	462
1991	513	497	9,498	6,796	6,338	506	486
1992	512	513	9,275	9,633	7,294	509	518
1993	517	512	9,396	9,050	5,868	530	511
1994	418	517	7,144	9,132	5,868	411	512
1995	454	418	7,820	8,467	5,182	466	505
1996	499	454	8,507	7,922	4,610	498	499
1997	524	499	8,980	7,641	4,176	519	496
1998	582	524	10,074	6,945	3,880	570	488
1999	495	582	8,993	6,598	3,859	499	484
2000	500	495	8,622	6,892	3,838	498	488
2001	483	500	8,100	6,915	3,723	471	488

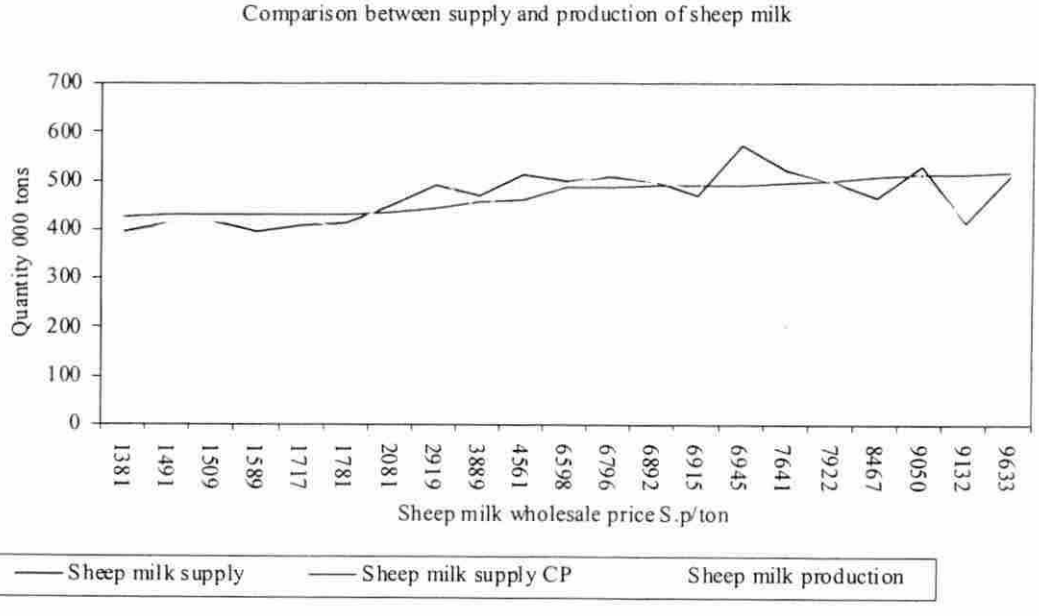


Figure 4.14: Comparison between Syrian supply and production of sheep milk

Source: Author calculation according to MAAR & NAPC data

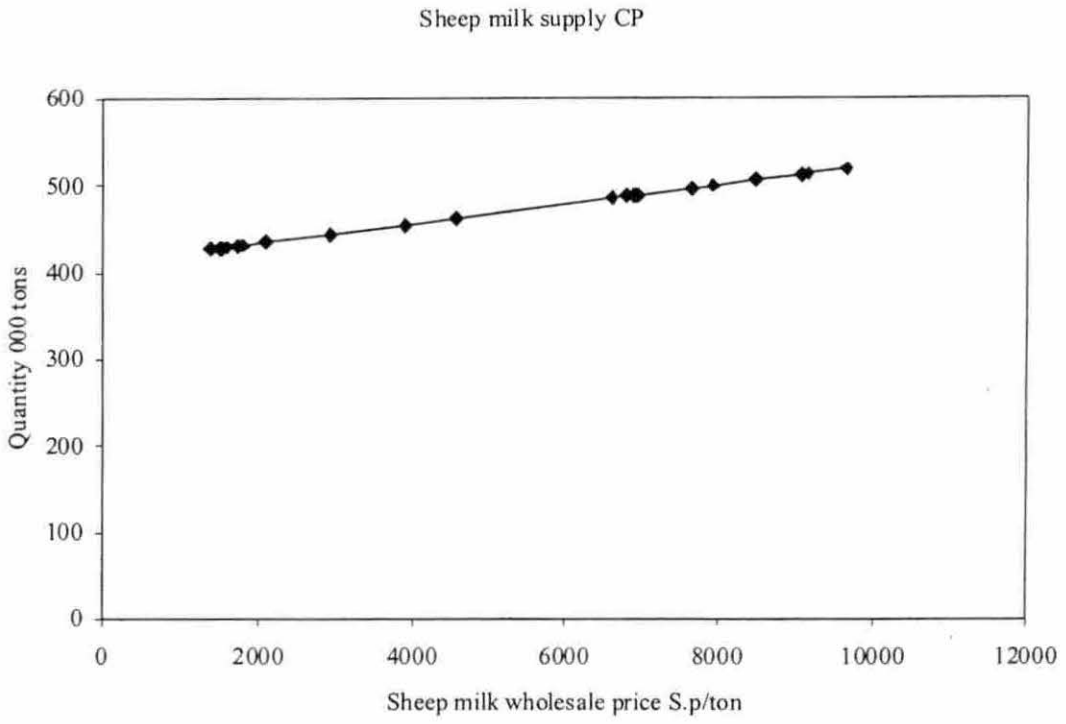


Figure 4.15 Panel A: Syrian sheep milk supply ceteris paribus (CP)

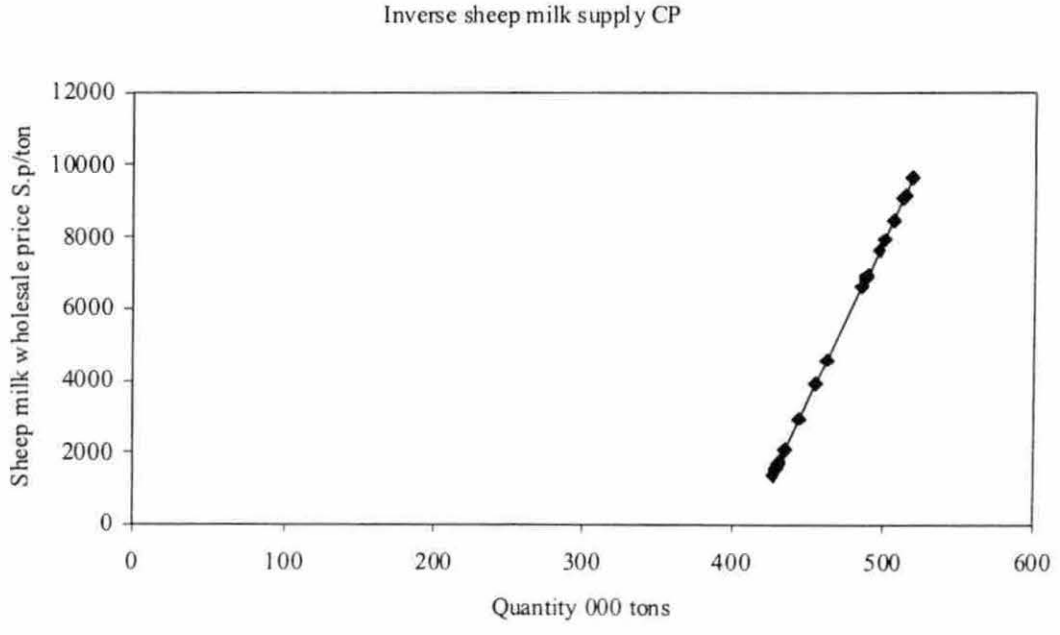


Figure 4.15 Panel B: Syrian inverse sheep milk supply ceteris paribus
Figure 4.15 : Syrian sheep milk supply ceteris paribus and its inverse

Table 4.11: Data for the linear estimation of Syrian sheep milk demand

Year	sheep Milk Consumption	Lagged sheep Milk Consumption	Lagged Sheep Milk Retail Price Deflated	Difference in Sheep Milk Retail Price Deflated DP	Lagged Private Consumption per Capita Deflated	Difference in Expenditure per Capita Deflated DE	Sheep Milk Demand Estimated	Sheep Milk Demand CP Estimated
	1000 tons	1000 tons	Sp/ton	Sp/ton	Sp/person	Sp/person	000tons	000tons
1981	387	371	1,955	45	4,663	61	400	498
1982	399	387	2,000	-33	4,724	-528	392	498
1983	409	399	1,967	-26	4,196	-250	410	498
1984	415	409	1,941	213	3,946	444	433	498
1985	432	415	2,155	524	4,389	728	437	496
1986	461	432	2,679	827	5,118	1,105	449	490
1987	467	461	3,506	926	6,223	786	449	480
1988	456	467	4,432	1,617	7,009	1,591	450	469
1989	458	456	6,049	2,378	8,600	3,210	463	449
1990	481	458	8,427	1,806	11,810	3,252	472	421
1991	486	481	10,232	945	15,062	2,681	493	399
1992	445	486	11,178	-364	17,742	499	463	388
1993	426	445	10,814	-501	18,241	-100	422	393
1994	444	426	10,313	-962	18,142	293	445	398
1995	487	444	9,351	-1,081	18,434	72	468	410
1996	529	487	8,270	-748	18,507	620	520	423
1997	512	529	7,522	-169	19,127	-16	518	432
1998	486	512	7,353	104	19,111	-57	495	434
1999	453	486	7,457	1	19,054	-701	454	433
2000	306	453	7,458	-2,577	18,353	-6,529	304	433

Source: MAAR $ NAPC

Comparison between sheep milk demand and consumption

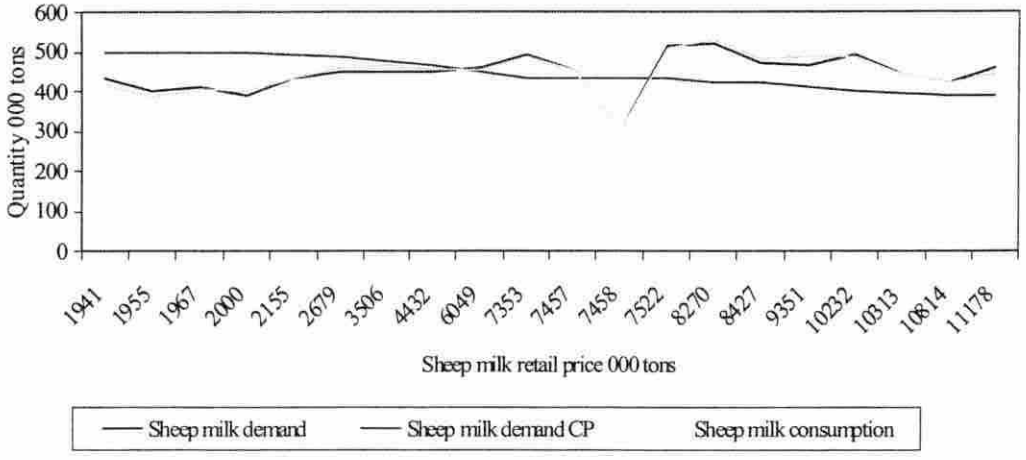


Figure 4.16: Comparison of Syrian sheep milk demand and consumption

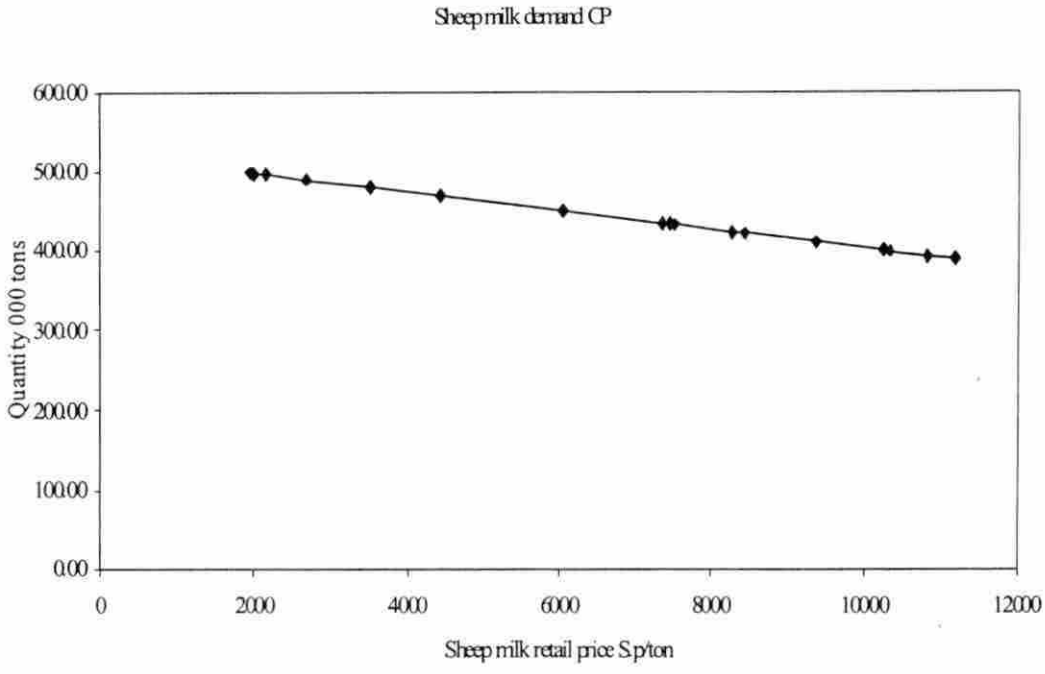


Figure 4.17 Panel A: Syrian linear sheep milk demand

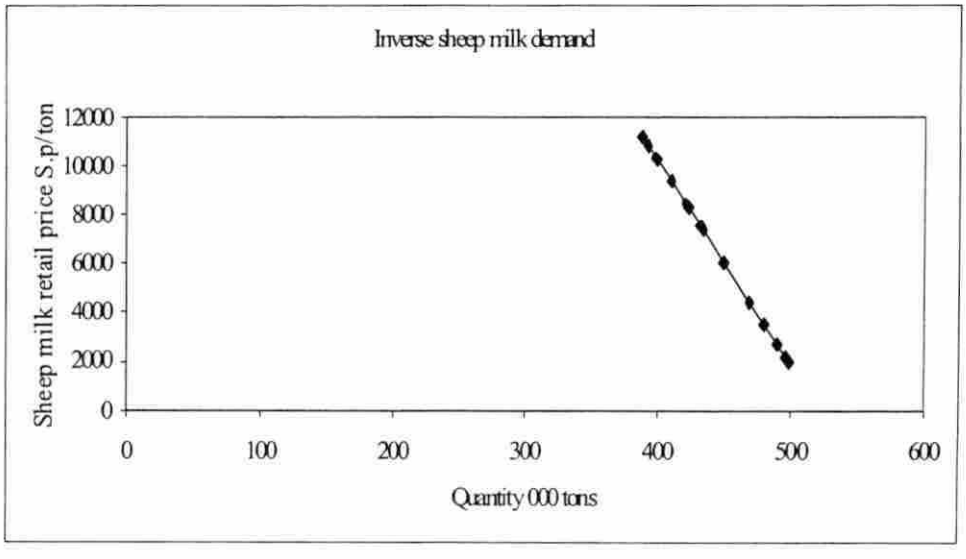


Figure 4.17 Panel B: Syrian inverse linear sheep milk demand
Figure 4.17 : Syrian linear sheep milk demand and its inverse

Chapter 5

Policy Recommendations

The results of investigating the Syrian sheep sector in both chapter 3 and chapter 4 can be divided into factors affecting the particular chains (sheep meat and sheep milk) and conditions influencing both chains. This finding, taking into account the main effects, can be summarized as follows:

Findings of the sheep meat chain

- Diversified sheep meat industry should be promoted.
- The quality of sheep meat transportation should be improved.
- The activities concerning slaughterhouses and carcass retailers should be improved.
- Sheep meat supply is mainly affected by lagged sheep meat production, lagged sheep meat wholesale price, lagged fodder concentrate price, difference in sheep meat wholesale price between two successive periods, and difference in sheep herd between two successive periods.
- Sheep meat demand is affected to a great extent by sheep meat retail price, private expenditure per capita, and time trend.
- Both supply and demand of sheep meat are rigid to price changes both in the short run and in the long run.

Findings of the sheep milk chain

- Both collection and transportation of sheep milk should be improved (cool transportation in big containers and cool assembly centers).
- The extension service should be oriented to more diversified dairy industry.
- Dairy firms should be established in high production areas.
- More credits should be provided for improving the rural dairy industry.
- The share of long term credits should be increased especially to introduce advanced milking technologies.
- The activities concerning fresh milk wholesalers should be improved.

- Sheep milk supply is mainly influenced by lagged sheep milk production, number of milked sheep females (ewes), lagged sheep milk wholesale price, and lagged fodder concentrate price.
- Sheep milk demand is mainly influenced by lagged sheep milk consumption, lagged sheep milk retail price, lagged expenditure per capita, difference in sheep milk retail price between two successive periods, and difference in private expenditure per capita between two successive periods.
- Both sheep milk supply and sheep milk demand are rigid to price changes both in the short and long run.

Findings of both chains (sheep meat and sheep milk)

- Improving marketing information and research especially agent-based projects.
- Applying the Agent-Based Costing approach and the commodity chain analysis approach taking into account the differences among governorates, ecological zones, farming structure, and other analysis methods (e.g., policy analysis matrix and linear programming).
- Improving the vertical and horizontal organization of both chains especially reorganization of cooperatives and average herd size.
- Increasing the export orientation of both chains.
- Continuing with the liberalization and privatization process in higher pace and reducing the central restrictions (Planning).
- Encouraging the establishment of specialized feed and marketing firms.
- Implementing quality standards and standardization on all stages of the marketing chains in a higher rate.
- Enhancing the competition between private and public sector on equal footing to a higher level.

Accordingly, improving the decision making process and the implications within the chains should be introduced through policies affecting the supply side, or the demand side, or both the supply and demand side to improve international competitiveness. In this context, the interaction among the various policies plays an important role; see, Khan and Knight (1985).

Supply side projects

- Improving of fodder supply, promoting the establishment of modern fodder (feed) firms, and improving the veterinary services in order to decrease cost of production, increase the benefits to sheep producers, reduce loss and wastage, and increase farm income.
- Enforcing of cool and bulk transportation in order to improve the safety of sheep business, increase the traded quantities, and improve farm income.
- Promoting the use of modern milking technologies through credits to decrease the microbiological capacity of milk, improve quality and safety, reduce loss and wastage, and increase farm income.
- Promoting the establishment of cool milk collection centers to decrease cost of production, improve quality, increase the traded volume, reduce loss and wastage, improve safety, and increase farm income.

Demand side projects

- Providing credits for rural industry (especially sheep meat and sheep milk) and increasing long-term credits to make it more diversified, capable, and profitable.
- Promoting of product diversification programs of sheep meat and sheep milk to expand the horizon of tastes and change habits.
- Improving the rural dairy industry through extension services to make it more capable and diversified.
- Promoting the establishment of dairy firms in high production areas to absorb the additional growth in milk production, make the industry more stable, improve the quality of processing, produce high quality products, and increase farm income.

Projects to enhance international competitiveness

- Establishing a database concerned with marketing especially agents' based to improve marketing information and research.
- Applying quality assurance standards at all levels of the marketing chains to comply with international standards and to harmonize the chain coordination.

- Establishing of a follow up program to assess the effectiveness of credits and investments and to comply with the conditions of the export oriented chains.
- Continuing with the reduction of imports restrictions to enhance demand and efficiency and increase farm income.
- Enhancing the privatization and liberalization process to improve competitiveness both domestically and internationally.
- Promoting the establishment of specialized marketing and fodder (feed) firms to improve standards and quality, decrease costs, improve productivity and efficiency, and increase farm income.
- Improving research and extension services and their coordination as well as setting priorities in both areas to achieve better resource allocation and improve productivity and efficiency. In this context, the research concerning a specialized high yielding breed for sheep meat will improve the chain efficiency, increase producers' returns, and improve competitiveness.
- Promoting of marketing research especially biotechnology achievements in the field of sheep science (high yielding breed) to enhance productivity and growth, improve competitiveness, and increase farmers' profitability.
- Reorganizing the holding size and cooperatives to benefit from economies of scale, productivity increase, and cost decrease, achieve the critical mass, and increase farm income.
- Promoting of processing (especially in rural areas) as well as export oriented policies to improve value creation of the chains especially at farm level.
- Applying the Agent-Based Costing approach, the commodity chain analysis, and the partial equilibrium approach to assess the impact of various market organizations, government interventions, and farming structure (linear programming) on the agents of the concerned chains in the different regions and enhance a higher efficiency level.
- Encouraging the vertical and horizontal organization of the sheep chain to achieve a higher level of standardization, the critical mass, and an increasing bargaining power within the chains especially farming.

Consequently, the following projects should be highlighted at first place to improve the performance of the sheep chain:

Building a market information system

The objective of this project is to design a system for collection, clearance and public dissemination of market information for agricultural and food products (improving the coordination among the information collections of public institutions).

Reorientation of farmers' cooperatives

The lack of horizontal farmers' organization and the bad quality of vertical coordination are among the basic questions in Syrian agricultural marketing. Thus, concentration of supply is necessary for implementation of standardization and grading and for reaching the "critical mass" needed in order to enter foreign markets and even to differentiate products into domestic market. A starting point for this process of organization is the reorientation of farmers' cooperatives including marketing cooperatives (especially improving the transportation and collection of milk).

Appendix A

Complementary Tables for the Sheep Meat Chain

Appendix A

Basic Data - Waste & Self - Consumption of the Sheep Meat Chain 2001

Table 1: Waste & self - consumption coefficients of the sheep meat chain in 2001

	Output	Baseline			Current		
	Input	Waste	SC	NF	Waste	SC	NF
Sectors	Lambs	1.0%	4.8%	94.2%	1.0%	4.8%	94.2%
	Sheep	0.0%	0.4%	99.6%	0.0%	0.4%	99.6%
	Average	0.8%	4.8%	94.4%	0.8%	4.8%	94.4%
	By-product	0.0%	0.0%	100.0%	0.0%	0.0%	100.0%
Live Animal Wholesaler	Lambs	0.0%	0.0%	100.0%	0.0%	0.0%	100.0%
	Sheep	0.0%	0.0%	100.0%	0.0%	0.0%	100.0%
	Carcasses	0.0%	0.0%	100.0%	0.0%	0.0%	100.0%
	By-product	0.0%	0.0%	100.0%	0.0%	0.0%	100.0%
Slaughter-house	Carcasses	0.0%	0.0%	100.0%	0.0%	0.0%	100.0%
	By-product	0.0%	0.0%	100.0%	0.0%	0.0%	100.0%
Carcass Wholesaler	Carcasses	0.0%	0.0%	100.0%	0.0%	0.0%	100.0%
	FMR	0.0%	0.1%	99.9%	0.0%	0.1%	99.9%
	By-product	0.0%	0.0%	100.0%	0.0%	0.0%	100.0%
Carcass Retailers	FMR	0.0%	0.0%	100.0%	0.0%	0.0%	100.0%
	Bons	0.0%	0.0%	100.0%	0.0%	0.0%	100.0%
Exporters	Lambs	0.0%	0.0%	100.0%	0.0%	0.0%	100.0%
Importers	Lambs	0.0%	0.0%	100.0%	0.0%	0.0%	100.0%

SC: Self - consumption

NF: Net flow

FMR: Fresh meat ready

Source: MAAR & NAPC

Table 2: Assumptions and slaughtering rates of sheep in 2001

	Base line	Current
Slaughter-house		
Carcass	67.80%	67.80%
By-product	32.20%	32.20%
Carcass Retailers		
Fresh meat ready	78.05%	78.05%
Bons	21.95%	21.95%

Table 3: Assumptions and share of sheep parts in 2001

Animal part share according to the live weight		%
Carcass weight		88.80%
Carcass emptied		67.80%
Hair and head		7.40%
Intestine and stomach		10.20%
Blood		4.10%
Bons		13.60%
Meat		41.80%
Eatable fat		11.00%
Ineatable fat		4.00%
Skin		7.90%
Bons according to carcass emptied		22.00%
Fed lamb weight	kg	45

Source: MAAR & NAPC

Appendix A

Basic Data - The Sheep Meat Chain 2001

Sectors

Table 4: Unit cost and revenue items of fattening one ton lambs-live weight in state centers in 2001

	Unit	Baseline		Current	
		Quantity	Price S.p	Quantity	Price S.p
Total revenue items					
Live sheep sales	ton	84.4	86.0	84.4	86.0
Cost items of fattening one ton live weight					

Source: MAAR & NAPC

Table 5: Unit cost and revenue items of fattening one ton lambs-live weight in cooperative sector in 2001

	Unit	Baseline		Current	
		Quantity	Price S.p	Quantity	Price S.p
Total revenue items					
Production	ton	31,984.2		31,984.2	
Fatted lamb sales	ton	31,664.4	90.0	31,664.4	90.0
Manure	M^3	480.0	200.0	480.0	200.0
Cost items of fattening one ton live weight					
Lambs for fattening (fed lambs)			54,000		54,000
Fodder			26,000		26,000
Milk			2,984		2,984
Veterinary expenses			663		663
Electricity, fuel, water			435		435
Services			414		414
Waste			882		882
Hired labor			2,454		2,454
Family labor			1,380		1,380
Other expenses			950		950

Source: MAAR & NAPC

Appendix A

Basic Data - The Sheep Meat Chain 2001

Table 6: Unit cost and revenue items of fattening one ton lambs-live weight in private sector in 2001

	Unit	Baseline		Current	
		Quantity	Price S.p	Quantity	Price S.p
Total revenue items					
Production	ton	390,442.6		390,442.6	
Fed lamb sales	ton	378,466.0	90.0	378,466.0	90.0
Manure	M^3	64.0	200.0	64.0	200.0
Cost items of fattening one ton live weight					
Lambs for fattening (fed lambs)			54,000		54,000
Fodder			26,000		26,000
Milk			2,984		2,984
Veterinary expenses			663		663
Electricity, fuel, water			435		435
Services			414		414
Waste			651		651
Hired labor			2,454		2,454
Family labor			1,380		1,380
Other expenses			899		899

Source: MAAR & NAPC

Appendix A

Traders and Slaughter-house of the Sheep Meat Chain 2001

Table 7: Unit marketing cost of wholesalers in 2001

	Live Animal WHS		Carcass WHS		Exporters	
	Baseline Price(S.p)	Current Price(S.p)	Baseline Price(S.p)	Current Price(S.p)	Baseline Price(S.p)	Current Price(S.p)
Slaughtering	375.00	375.00				
Transport	700.00	700.00	100.00	100.00	350.00	350.00
Wages	350.00	350.00	200.00	200.00	250.00	250.00
Services	2.00	2.00	1.00	1.00	1.50	1.50
Others	40.00	40.00	30.00	30.00	25.00	25.00

Source: MAAR & NAPC

Table 8: Unit marketing cost of importers, retailers, and slaughter-house in 2001

	Importers		Slaughter-house		Carcass RT	
	Baseline Price(S.p)	Current Price(S.p)	Baseline Price(S.p)	Current Price(S.p)	Baseline Price(S.p)	Current Price(S.p)
Slaughtering						
Transport	350.00	350.00	80.00	80.00	125.00	125.00
Wages	250.00	250.00	150.00	150.00	175.00	175.00
Services	1.00	1.00	60.00	60.00	0.5	0.5
Others	25.00	25.00	5.00	5.00	10.00	10.00

Source: MAAR & NAPC

WHS:Wholesalers

RT:Retailers

Notes:
1.Costs for live animal wholesaler (live Animal WHS) are given per one ton live animal
2.Costs for carcass wholesaler are given per one ton carcasses
3.Costs for exporters are given per one ton live weight
4.Costs for carcass retailers(RT) are given per one ton fresh meat ready
5.Costs for slaughter-house are given per one ton live weight
6.Costs for importers are given per one ton live weight

Appendix A

Basic Data - Prices of the Sheep Meat Chain 2001

Table 9: Prices of the sheep meat chain in 2001 — Syrian pound (S.p)

Agents	Unit	Baseline Price (S.p)	Current Price (S.p)
Sectors			
Fed lamb meat- live weight	kg	90.00	90.00
Sheep meat-live weight	kg	86.00	86.00
Mixed meat (lambs+sheep)-live weight	kg	88.00	88.00
Manure of private and cooperative sector	M^3	200.00	200.00
Lambs for fattening	Lamb	2,500.00	2,500.00
Ready made feed mixture for private sector	kg	6.50	6.50
Ready made feed mixture for cooperative sector	kg	6.50	6.50
Ready made feed mixture for state centers	kg	12.00	12.00
Hay	kg	4.00	4.00
Traders			
Carcass/ live animal wholesalers	kg	139.00	139.00
By-product/live animal wholesalers	kg	40.00	40.00
Carcass/ carcass wholesalers	kg	202.00	202.00
Fresh meat ready / carcass retailers	kg	278.00	278.00
Meat by-products	kg	1,000.00	1,000.00
Bons	kg	1.00	1.00
Exporters (live weight)	kg	85.00	85.00
Slaughter-house			
Service/ slaughter-house	kg	1.00	1.00
Carcasses and by-products/ slaughter-house	kg	89.00	89.00
Exporters			
Live lambs	kg	120.00	120.00
Importers			
Live lambs(purchase)	kg	50.00	50.00
Live lambs(sale)	kg	70.00	70.00

Source: MAAR & NAPC

Appendix A

Farm Budget Calculations - The Sheep Meat Chain 2001

Table 10: Cooperative sector - lamb fattening budget of the sheep meat chain in 2001

	Unit	Baseline			Current		
		Quantity	Price	Value Mill.S.p	Quantity	Price	Value Mill.S.p
1. Revenues							
Fed lamb production - live weight	ton	31,664			31,664		
Sheep meat production* - live weight	ton	320			320		
Total meat production - live weight	ton	31,984			31,984		
Waste	ton	256			256		
Home consumption	ton	1,535			1,535		
Fed Lamb sales - live weight	ton	30,193	90,000	2,717	30,193	90,000	2,717
Manure sales	M^3	480	200	0	480	200	0
Total Sales				2,717			2,717
2.Variable Cost**							
Lambs for fattening	ton	30,193	54,000	1,630	30,193	54,000	1,630
Fodder	ton	30,193	26,000	785	30,193	26,000	785
Milk	ton	30,193	2,984	90	30,193	2,984	90
Veterinary expenses	ton	30,193	663	20	30,193	663	20
Electricity, fuel, water	ton	30,193	435	13	30,193	435	13
Services	ton	30,193	414	12	30,193	414	12
Waste	ton	30,193	882	27	30,193	882	27
Hired labor	ton	30,193	2,454	74	30,193	2,454	74
Family labor	ton	30,193	1,380	42	30,193	1,380	42
Other expenses	ton	30,193	950	29	30,193	950	29
Total Variable Cost				2,722			2,722
3.Value Added				98			98

Source:Author calculations according to MAAR & NAPC data

Mill.S.p: Million Syrian pounds

* Sheep meat production refers to milk farms

** Variable costs are calculated per ton of meat sales

** Interest , taxes,rent, and depreciation are not included in the variable costs because they are value added items

Appendix A

Farm Budget Calculations - The Sheep Meat Chain 2001

Table 11: Private sector - lamb fattening budget of the sheep meat chain in 2001

	Unit	Baseline			Current		
		Quantity	Price	Value Mill.S.p	Quantity	Price	Value Mill.S.p
1. Revenues							
Fed lamb production - live weight	ton	378,466			378,466		
Sheep meat production* - live weight	ton	11,977			11,977		
Total meat production - live weight	ton	390,443			390,443		
Waste	ton	3,028			3,028		
Home consumption	ton	18,166			18,166		
Fed lamb sales - live weight	ton	357,272	90,000	32,154	357,272	90,000	32,154
Manure sales	M^3	64	200	0	64	200	0
Total Sales				32,154			32,154
2.Variable Cost**							
Lambs for fattening	ton	357,272	54,000	19,293	357,272	54,000	19,293
Fodder	ton	357,272	26,000	9,289	357,272	26,000	9,289
Milk	ton	357,272	2,984	1,066	357,272	2,984	1,066
Veterinary expenses	ton	357,272	663	237	357,272	663	237
Electricity, fuel, water	ton	357,272	435	155	357,272	435	155
Services	ton	357,272	414	148	357,272	414	148
Waste	ton	357,272	651	233	357,272	651	233
Hired labor	ton	357,272	2,454	877	357,272	2,454	877
Family labor	ton	357,272	1,380	493	357,272	1,380	493
Other expenses	ton	357,272	899	321	357,272	899	321
Total Variable Cost				32,112			32,112
3.Value Added				1,241			1,241

Source:Author calculations

Mill.S.p: Million Syrian pounds

* Sheep meat production refers to milk farms

** Variable costs are calculated per ton of meat sales

** Interest , taxes,rent, and depreciation are not included in the variable costs because they are value added items

Appendix A

Farm Budget Calculations - The Sheep Meat Chain 2001

Table 12: Lamb fattening of the sheep meat chain - total budget in 2001

	Unit	Baseline			Current		
		Quantity	Price	Value Mill.S.p	Quantity	Price	Value Mill.S.p
1. Revenues							
Fed lamb production - live weight	ton	410,130			410,130		
Sheep meat production* - live weight	ton	12,296			12,296		
Total meat production - live weight	ton	422,427			422,427		
Waste	ton	3,284			3,284		
Home consumption	ton	19,702			19,702		
Fed lamb sales - live weight	Ton	387,145		34,872	387,145		34,872
Manure sales	M^3	544		0.1	544		0.1
Total Sales				34,872			34,872
2.Variable Cost**							
Lambs for fattening	ton	387,145		20,923	387,145		20,923
Fodder	ton	387,145		10,074	387,145		10,074
Milk	ton	387,145		1,156	387,145		1,156
Veterinary expenses	ton	387,145		257	387,145		257
Electricity, fuel, water	ton	387,145		169	387,145		169
Services	ton	387,145		160	387,145		160
Waste	ton	387,145		259	387,145		259
Hired labor	ton	387,145		951	387,145		951
Family labor	ton	387,145		535	387,145		535
Other expenses	ton	387,145		350	387,145		350
Total Variable Cost				34,834			34,834
3.Value Added				1,339			1,339

Source:Author calculations

Mill.S.p: Million Syrian pounds

* Sheep meat production refers to milk farms

** Variable costs are calculated per ton of meat sales

** Interest , taxes,rent, and depreciation are not included in the variable costs because they are value added items

Table 13: Matrix of flow coefficients (%) of the sheep meat chain in 2001

Appendix A

To ↓		From →	Supply				Production			Traders	
			Domestic Production			Import					
			PS	CS	SC		PS	CS	SC	IMP	LAW
Meat Production	Private Sector (PS)	Live Animals	100%				-100%				
	Cooperative Sector (CS)	Live Animals		100%				-100%			
	State Centers (SC)	Live Animals			100%				-100%		
Traders of Raw Material	Importers(IMP)	Live Animals				100%				-100%	
	Live Animal Wholesaler (LAW)	Live Animals					94.4%	94.4%	100%	100%	-100%
Services	Slaughter- house (SHLA)	Live Animals									97%
	Slaughter- house (SHC)	Carcasses									
	Slaughter- house (SHB)	By-products									
Meat Traders	Live Animal Wholesaler (LAWC)	Carcasses									
	Live Animal Wholesaler (LAWB)	By-products									
	Carcass Wholesaler (CWC)	Carcasses									
	Carcass Retailer (CRC)	Carcasses									
	Carcass Retailer (CRM)	Meat									
	Carcass Retailer (CRB)	Bons									
	Exporters(EX)	Live Animals									3%
Consumption	Consumers	Fresh Meat Ready									
	Meat By-product Users	By-products									
	Rest of the World (ROW)	Live Animals									
Sub Total							-6%	-6%	0%	0%	0%
Waste							1%	1%	0%	0%	0%
Self - Consumption							4.8%	5%	0%	0%	0%
Sub Total							6%	6%	0%	0%	0%
Grand Total							0%	0%	0%	0%	0%

Farm by-products are not taken into account

Source: constructed by the author according to MAAR & NAPC data

Table 13: (Continued)

Appendix A

To ↓		From →	Slaughter House			Meat Traders						
						LAW			Carcass Retailer (CR)			
			SHLA	SHC	SHB	LAWC	LAWB	CWC	CR	CRM	CRB	EX
Meat Production	Private Sector (PS)	Live Animals										
	Cooperative Sector (CS)	Live Animals										
	State Centers (SC)	Live Animals										
Traders of Raw Material	Importers(IMP)	Live Animals										
	Live Animal Wholesaler (LAW)	Live Animals										
Services	Slaughter- house (SHLA)	Live Animals	-100%									
	Slaughter- house (SHC)	Carcasses	67.8%	-100%								
	Slaughter- house (SHB)	By-products	32.2%		-100%							
Meat Traders	Live Animal Wholesaler (LAWC)	Carcasses		100%		-100%						
	Live Animal Wholesaler (LAWB)	By-products			100%		-100%					
	Carcass Wholesaler (CWC)	Carcasses				100%		-100%				
	Carcass Retailer (CRC)	Carcasses						100%	-100%			
	Carcass Retailer (CRM)	Meat							78%	-100%		
	Carcass Retailer (CRB)	Bons							22%		-100%	
	Exporters(EX)	Live Animals										-100%
Consumption	Consumers	Fresh Meat Ready								100%		
	Meat By-product Users	By-products					100%				100%	
	Rest of the World (ROW)	Live Animals										100%
Sub Total				0%	0%	0%	0%	0%		0%	0%	0%
Waste				0%	0%	0%	0%	0%		0%	0%	0%
Home Consumption				0%	0%	0%	0%	0%		0%	0%	0%
Sub Total				0%	0%	0%	0%	0%		0%	0%	0%
Grand Total				0%	0%	0%	0%	0%		0%	0%	0%

Farm by-products are not taken into account

Source: constructed by the author according to MAAR & NAPC data

Table 14: Matrix of flow quantities (000 tons) of the sheep meat chain ((-)inflow, (+)outflow) in 2001

Appendix A

To ↓		From →	Supply				Production			Traders	
			Domestic Production			Import					
			PS	CS	SC		PS	CS	SC	IMP	LAW
Meat Production	Private Sector (PS)	Live Animals	390.4				-390.4				
	Cooperative Sector (CS)	Live Animals		32.0				-32.0			
	State Centers (SC)	Live Animals			0.1				-0.1		
Traders of Raw Material	Importers(IMP)	Live Animals				0.4				-0.4	
	Live Animal Wholesaler (LAW)	Live Animals					368.6	30.2	0.1	0.4	-399.2
Services	Slaughter- house (SHLA)	Live Animals									387.2
	Slaughter- house (SHC)	Carcasses									
	Slaughter- house (SHB)	By-products									
Meat Traders	Live Animal Wholesaler (LAW C)	Carcasses									
	Live Animal Wholesaler (LAW B)	By-products									
	Carcass Wholesaler (CWC)	Carcasses									
	Carcass Retailer (CRC)	Carcasses									
	Carcass Retailer (CRM)	Meat									
	Carcass Retailer (CRB)	Bons									
	Exporters(EX)	Live Animals									12.0
Consumption	Consumers	Fresh Meat Ready									
	Meat By-product Users	By-products									
	Rest of the World (ROW)	Live Animals									
Sub Total							-21.9	-1.8	0.0	0.0	0.0
Waste							3.1	0.3	0.0	0.0	0.0
Home Consumption							18.7	1.5	0.0	0.0	0.0
Sub Total							21.9	1.8	0.0	0.0	0.0
Grand Total							0.0	0.0	0.0	0.0	0.0

Farm by-products are not taken into account

Source: Constructed by the author according to MAAR & NAPC data

Table 14: (Continued)

To ↓		From →	Slaughter House			Meat Traders							Total
						LAW			Carcass Retailer (CR)				
			SHLA	SHC	SHB	LAWC	LAWB	CWC	CR	CRM	CRB	EX	
Meat Production	Private Sector (PS)	Live Animals											0.0
	Cooperative Sector (CS)	Live Animals											0.0
	State Centers (SC)	Live Animals											0.0
Traders of Raw Material	Importers(IMP)	Live Animals											0.0
	Live Animal Wholesaler (LAW)	Live Animals											0.0
Services	Slaughter- house (SHLA)	Live Animals	-387.2										0.0
	Slaughter- house (SHC)	Carcasses	262.5	-262.5									0.0
	Slaughter- house (SHB)	By-products	124.7		-124.7								0.0
Meat Traders	Live Animal Wholesaler (LAWC)	Carcasses		262.5		-262.5							0.0
	Live Animal Wholesaler (LAWB)	By-Products			124.7		-124.7						0.0
	Carcass Wholesaler (CWC)	Carcasses				262.5		-262.5					0.0
	Carcass Retailer (CRC)	Carcasses						262.5	-262.5				0.0
	Carcass Retailer (CRM)	Meat							204.9	-204.9			0.0
	Carcass Retailer (CRB)	Bons							57.6		-57.6		0.0
	Exporters(EX)	Live Animals										-12.0	0.0
Consumption	Consumers	Fresh Meat Ready								204.9			204.9
	Meat By-product Users	By-products					124.7				57.6		182.3
	Rest of the World (ROW)	Live Animals										12.0	12.0
Sub Total				0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	
Waste				0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	
Home Consumption				0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	
Sub Total				0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	-
Grand Total				0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	

Farm by-products are not taken into account

Source: Constructed by the author to MAAR & NAPC data

Table 15: Matrix of prices of purchases (-) and sales (+) of the sheep meat chain in 2001

Appendix A

To ↓		From →	Supply				Production			Traders	
			Domestic Production			Import					
			PS	CS	SF		PS	CS	SC	IMP	LAW
Meat Production	Private Sector (PS)	Live Animals					88,000				
	Cooperative Sector (CS)	Live Animals						88,000			
	State Centers (SC)	Live Animals							88,000		
Traders of Raw Material	Importers(IMP)	Live Animals				50,000				70,000	
	Live Animal Wholesaler (LAW)	Live Animals					-88,000	-88,000	-88,000	-70,000	88,000
Services	Slaughter- house (SHLA)	Live Animals									-88,000
	Slaughter- house (SHC)	Carcasses									
	Slaughter- house (SHB)	By-products									
Meat Traders	Live Animal Wholesaler (LAWC)	Carcasses									
	Live Animal Wholesaler (LAWB)	By-products									
	Carcass Wholesaler (CWC)	Carcasses									
	Carcass Retailer (CRC)	Carcasses									
	Carcass Retailer (CRM)	Meat									
	Carcass Retailer (CRB)	Bons									
	Exporters(EX)	Live Animals									-88,000
Consumption	Consumers	Fresh Meat Ready									
	Meat By-product Users	By-products									
	Rest of the World (ROW)	Live Animals									
Waste Home Consumption							88,000	88,000	88,000		

Source: Constructed by the author according to MAAR & NAPC data

Table 15: (Continued)

Appendix A

To ↓		From →	Slaughter House			Meat Traders						
						LAW			Carcass Retailer(CR)			
			SHLA ↓	SHC	SHB	LAWC	LAWB	CWC	CR ↓	CRM	CRB	EX
Meat Production	Private Sector (PS)	Live Animals										
	Cooperative Sector (CS)	Live Animals										
	State Centers (SC)	Live Animals										
Traders of Raw Material	Importers(IMP)	Live Animals										
	Live Animal Wholesaler (LAW)	Live Animals										
Services	Slaughter- house (SHLA)	Live Animals										
	Slaughter- house (SHC)	Carcasses		89,000								
	Slaughter- house (SHB)	By-Products			89,000							
Meat Traders	Live Animal Wholesaler (LAWC)	Carcasses		-89,000		139,000						
	Live Animal Wholesaler (LAWB)	By-products			-89,000		40,000					
	Carcass Wholesaler (CWC)	Carcasses				-139,000		202,000				
	Carcass Retailer (CRC)	Carcasses						-202,000				
	Carcass Retailer (CRM)	Meat								278,000		
	Carcass Retailer (CRB)	Bons									1,000	
	Exporters(EX)	Live Animals										120,000
Consumption	Consumers	Fresh Meat Ready								-278,000		
	Meat By-product Users	By-products					-40,000				-1,000	
	Rest of the World (ROW)	Live Animals										-120,000
Waste Home Consumption												

Source: Constructed by the author according to MAAR & NAPC data

Appendix A

Agents of the Sheep Meat Chain Except Farms 2001

Purchases & Sales - Marketing Cost

Live Animal Wholesalers of the sheep meat chain 2001

Table 16a: Live animal wholesalers of the sheep meat chain - purchases & sales in 2001

		Flow ton	Price S.p/ton	Value Mill S.p
Purchases from:	Sectors	399,213.7	88,000.0	35,130.8
	Importers	358.4	70,000.0	25.1
				35,155.9
Sales to :	Carcass Wholesalers	262,539.1	139,000.0	36,492.9
	By-product Users	124,698.1	40,000.0	4,987.9
	Exporters	11,976.4	88,000.0	1,053.9
	Total	399,213.7		42,534.8

Table 16b: Live animal wholesalers of the sheep meat chain - marketing costs in 2001

	Baseline			Current		
	Unit Cost S.p/ton	Flows ton	Total Cost Mill.S.p	Unit Cost S.p/ton	Flows ton	Total Cost Mill.S.p
Slaughtering	375.0	399,213.7	149.7	375.0	399,213.7	149.7
Transport	700.0	399,213.7	279.4	700.0	399,213.7	279.4
Wages	350.0	399,213.7	139.7	350.0	399,213.7	139.7
Services	2.0	399,213.7	0.8	2.0	399,213.7	0.8
Others	40.0	399,213.7	16.0	40.0	399,213.7	16.0
Total			585.6			585.6

Slaughter-house of the sheep meat chain 2001

Table 17a: Slaughter-house of the sheep meat chain - purchases & sales in 2001

		Flow ton	Price S.p/ton	Value Mill S.p
Purchases from:	Live Animal Wholesalers	387,237.3	88,000.0	34,076.9
Sales to :	Live Animal Wholesalers	387,237.3	89,000.0	34,464.1

Table 17b: Slaughter-house of the sheep meat chain - slaughtering costs in 2001

	Baseline			Current		
	Unit Cost S.p/ton	Flows ton	Total Cost Mill.S.p	Unit Cost S.p/ton	Flows ton	Total Cost Mill.S.p
Slaughtering	0	387,237.3	0.0	0.0	387,237.3	0.0
Transport	80	387,237.3	31.0	80.0	387,237.3	31.0
Wages	150	387,237.3	58.1	150.0	387,237.3	58.1
Services	60	387,237.3	23.2	60.0	387,237.3	23.2
Others	5	387,237.3	1.9	5.0	387,237.3	1.9
Total			114.2			114.2

Mill.S.p: Million Syrian pounds S.p: Syrian pound

Source: Author calculations according to MAAR & NAPC data

Appendix A

Carcass Wholesalers of the sheep meat chain 2001

Table 18a:Carcass wholesalers of the sheep meat chain - purchases & sales in 2001

		Flow ton	Price S.p/ton	Value Mill S.p
Purchases from:	Live Animal Wholesalers	262,539.1	139,000.0	36,492.9
Sales to :	Carcass Retailers	262,539.1	202,000.0	53,032.9

Table 18b: Carcass wholesalers of the sheep meat chain - marketing costs in 2001

	Baseline			Current		
	Unit Cost S.p/ton	Flows ton	Total Cost Mill.S.p	Unit Cost S.p/ton	Flows ton	Total Cost Mill.S.p
Slaughtering	0.0	262,539.1	0.0	0.0	262,539.1	0.0
Transport	100.0	262,539.1	26.3	100.0	262,539.1	26.3
Wages	200.0	262,539.1	52.5	200.0	262,539.1	52.5
Services	1.0	262,539.1	0.3	1.0	262,539.1	0.3
Others	30.0	262,539.1	7.9	30.0	262,539.1	7.9
Total			86.9			86.9

Carcass Retailers of the sheep meat chain 2001

Table 19a: Carcass retailers of the sheep meat chain - purchases & sales in 2001

		Flow ton	Price S.p/ton	Value Mill S.p
Purchases from:	Carcass Wholesalers	262,539.1	202,000.0	53,032.9
Sales to :	Consumers	204,911.8	278,000.0	56,965.5
	By-product Users	57,627.3	1,000.0	57.6
	Total	262,539.1		57,023.1

Table 19b: Carcass retailers of the sheep meat chain - marketing costs in 2001

	Baseline			Current		
	Unit Cost S.p/ton	Flows ton	Total Cost Mill.S.p	Unit Cost S.p/ton	Flows ton	Total Cost Mill.S.p
Slaughtering	0	262,539.1	0.0	0.0	262,539.1	0.0
Transport	125	262,539.1	32.8	125.0	262,539.1	32.8
Wages	175	262,539.1	45.9	175.0	262,539.1	45.9
Services	0.5	262,539.1	0.1	0.5	262,539.1	0.1
Others	10	262,539.1	2.6	10.0	262,539.1	2.6
Total			81.5			81.5

Mill.S.p: Million Syrian pounds

S.p: Syrian pound

Source: Author calculations according to MAAR & NAPC data

Appendix A

Exporters of the sheep meat chain 2001

Table 20a: Exporters of the sheep meat chain - purchases & sales in 2001

		Flow ton	Price S.p/ton	Value Mill S.p
Purchases from:	Live Animal Wholesalers	11976.4	88000.0	1053.9
Sales to :	Rest of the World	11976.4	120000.0	1437.2

Table 20b: Exporters of the sheep meat chain - marketing costs in 2001

	Baseline			Current		
	Unit Cost S.p/ton	Flows ton	Total Cost Mill.S.p	Unit Cost S.p/ton	Flows ton	Total Cost Mill.S.p
Slaughtering	0.0	11976.4	0.0	0.0	11976.4	0.0
Transport	350.0	11976.4	4.2	350.0	11976.4	4.2
Wages	250.0	11976.4	3.0	250.0	11976.4	3.0
Services	1.5	11976.4	0.0	1.5	11976.4	0.0
Others	25.0	11976.4	0.3	25.0	11976.4	0.3
Total			7.5			7.5

Importers of the sheep meat chain 2001

Table 21a : Importers of the sheep meat chain - purchases & sales in 2001

		Flow ton	Price S.p/ton	Value Mill S.p
Purchases from:	Rest of the World	358.4	50,000.0	17.9
Sales to :	Live Animal Wholesalers	358.4	70,000.0	25.1

Table 21b: Importers of the sheep meat chain - marketing costs in 2001

	Baseline			Current		
	Unit Cost S.p/ton	Flows ton	Total Cost Mill.S.p	Unit Cost S.p/ton	Flows ton	Total Cost Mill.S.p
Slaughtering	0.0	358.4	0.0	0.0	358.4	0.0
Transport	350.0	358.4	0.1	350.0	358.4	0.1
Wages	250.0	358.4	0.1	250.0	358.4	0.1
Services	1.0	358.4	0.0	1.0	358.4	0.0
Others	25.0	358.4	0.0	25.0	358.4	0.0
Total			0.2			0.2

Mill.S.p: Million Syrian pounds
S.p: Syrian pound
Source: Author calculations according to MAAR & NAPC data

Appendix A

Agents' Budget Summary of the Sheep Meat Chain 2001

Table 22: Agents' budget summary in million S.p of the sheep meat chain in 2001

	Sectors			Slaughter-house SH
	Private Sector	Cooperative Sector	Total	
Output out of Chain				
Fresh meat ready/Carcass retailers			0	
Meat by-products/Live animal wholesalers			0	
Meat by-products/Carcass retailers			0	
Farm by-products/Private sector	0		0	
Farm By-products/Cooperative sector		0	0	
Live animals/Rest of the world			0	
Total Output out of Chain	0	0	0	0
Output within Chain				
Live animals/Private sector	32,154		32,154	
Live animals/ Cooperative sector		2,717	2,717	
Live animals/Live animal wholesalers			0	
Carcasses/Live animal wholesalers			0	
Services/Slaughter-house			0	387
Carcasses/Carcass wholesalers			0	
Total Outputs within Chain	32,154	2,717	34,872	387
Home Cosumption	1,649	135	1,784	
Total Home Cosumption	1,649	135	1,784	0
Total Output	33,804	2,853	36,656	387
Inputs out of Chain				
Fodder	9,289	785	10,074	
Veterinary expenses	237	20	257	
Electricity, fuel, water	155	13	169	
Services	148	12	160	23
Transport			0	31
Live lambs				
Other expenses	321	29	350	2
Total Inputs out of Chain	10,150	859	11,010	56
Inputs within Chain				
Lambs	19,293	1,630	20,923	
Milk	1,066	90	1,156	
Waste	233	27	259	
Live animals/Live animal wholesalers			0	
Slaughtering/Live animal wholesalers			0	
Carcasses/Carcass wholesalers			0	
Carcasses/Carcass retailers			0	
Total Inputs within Chain	20,591	1,747	22,339	0
Total Inputs	30,742	2,607	33,348	56
Total Value Added	3,062	246	3,308	331
Value Added Items				
Wages & salaries	1,370	116	1,486	58
Profit, taxes, interest, amortization, and depreciation	1,692	130	1,822	273
Total Value Added	3,062	246	3,308	331

Source: Author calculations according to MAAR & NAPC data

Table 22: (Continued) Appendix A

	Traders						Total
	LWA	CWC	CR	IMP	EX	Total	Chain
Output out of Chain							
Fresh meat ready/Carcass retailers			56,965			56,965	56,965
Meat by-products/Live animal wholesalers	4,988					4,988	4,988
Meat by-products/Carcass retailers			58			58	58
Farm by-products/Private sector						0	0
Farm By-products/Cooperative sector						0	0
Live animals/Rest of the world					1,437	1,437	1,437
Total Output out of Chain	4,988	0	57,023		1,437	63,448	63,448
Output within Chain							
Live animals/Private sector						0	32,154
Live animals/ Cooperative sector						0	2,717
Live animals/Live animal wholesalers	1,054			25		1,079	1,079
Carcasses/Live animal wholesalers	36,493					36,493	36,493
Services/Slaughter-house						0	387
Carcasses/Carcass wholesalers		53,033				53,033	53,033
Total Outputs within Chain	37,547	53,033	0	25	0	90,605	125,864
Home Cosumption							1,784
Total Home Cosumption	0	0	0	0	0	0	1,784
Total Output	42,535	53,033	57,023	25	1,437	154,053	191,097
Inputs out of Chain							
Fodder						0	10,074
Veterinary expenses						0	257
Electricity, fuel, water						0	169
Services	1	0	0	0	0	1	185
Transport	279	26	33	0	4	343	374
Live lambs				18		18	18
Other expenses	16	8	3	0	0	27	379
Total Inputs out of Chain	296	34	36	18	5	389	11,455
Inputs within Chain							
Lambs	25					25	20,948
Milk						0	1,156
Waste						0	259
Live animals/Live animal wholesalers	35,131				1,054	36,185	36,185
Slaughtering/Live animal wholesalers	150					150	150
Carcasses/Carcass wholesalers		36,493				36,493	36,493
Carcasses/Carcass retailers			53,033			53,033	53,033
Total Inputs within Chain	35,306	36,493	53,033	0	1,054	125,885	148,224
Total Inputs	35,602	36,527	53,068	18	1,058	126,274	159,679
Total Value Added	6,933	16,506	3,955	7	379	27,779	31,418
Value Added Items							
Wages & salaries	140	53	46	0	3	241	1,785
Profit, taxes, interest, amortization, and depreciation	6,793	16,453	3,909	7	376	27,538	29,633
Total Value Added	6,933	16,506	3,955	7	379	27,779	31,418

Source: Author calculations according to MAAR & NAPC data

Table 23: Performance measures of the sheep meat chain according to agents in 2001 Appendix A

Indicators	Revenues or Sales	Share	Purchase	Share	Cost	Share	Total Cost	Share	Gross Margin	Share	Value Added	Share	Relative Indicators	
													Shar of Revenues to Cost	Share of Value Added to Cost
Agent	Mill.Sp	%	Mill.Sp	%	Mill.Sp	%	Mill.Sp	%	Mill.Sp	%	Mill.Sp	%	%	%
Private Sector	32,154	14.4		0.0	32,112	89.9	32,112	16.4	43	0.2	3,062	9.7	100.1	9.5
Cooperative Sector	2,717	1.2		0.0	2,722	7.6	2,722	1.4	-5	0.0	246	0.8	99.8	9.0
Total	34,872	15.6	0	0.0	34,834	97.5	34,834	17.8	38	0.1	3,308	10.5	100.1	9.5
Live Animal Wholesalers	42,535	19.0	35,131	22.0	586	1.6	35,716	18.3	6,818	24.5	6,933	22.1	119.1	19.4
Carcass Wholesalers	53,033	23.7	36,493	22.8	87	0.2	36,580	18.7	16,453	59.0	16,506	52.5	145.0	45.1
Total	95,568	42.8	71,624	44.8	673	1.9	72,296	37.0	23,271	83.5	23,439	74.6	132.2	32.4
Carcass Retailers	57,023	25.5	53,033	33.2	82	0.2	53,114	27.2	3,909	14.0	3,955	12.6	107.4	7.4
Slaughterhouses	34,464	15.4	34,077	21.3	114	0.3	34,191	17.5	273	1.0	331	1.1	100.8	1.0
Importers	25	0.0	18	0.0	0	0.0	18	0.0	7	0.0	7	0.0	138.3	38.8
Exporters	1,437	0.6	1,054	0.7	8	0.0	1,061	0.5	376	1.3	379	1.2	135.4	35.7
Total	223,389	100.0	159,805	100.0	35,710	100.0	195,515	100.0	27,874	100.0	31,418	100.0	114.3	16.1

Source: Author calculations according to MAAR & NAPC data

Appendix B
Complementary Tables for the Sheep Milk Chain

Appendix B

Basic Data - Waste & Self Consumption of the Sheep Milk Chain 2001

Table 1: Waste & self - consumption coefficients of the sheep milk chain in 2001

	Output	Baseline			Current		
	Input	Waste	SC	NF	Waste	SC	NF
Private Sector	Milk	0.37%	42.57%	57.07%	0.37%	42.57%	57.07%
	BG	0%	3.38%	96.62%	0%	3.38%	96.62%
	Cheese	0%	46.43%	53.57%	0%	46.43%	53.57%
	Yogurt	0%	7.09%	92.91%	0%	7.09%	92.91%
	LO	0%	4.71%	95.29%	0%	4.71%	95.29%
Cooperative Sector	Milk	0.37%	42.57%	57.07%	0.37%	42.57%	57.07%
	BG	0%	3.38%	96.62%	0%	3.38%	96.62%
	Cheese	0%	46.43%	53.57%	0%	46.43%	53.57%
	Yogurt	0%	7.09%	92.91%	0%	7.09%	92.91%
	LO	0%	4.71%	95.29%	0%	4.71%	95.29%
State Farms	Milk	0.37%	16.84%	82.79%	0.37%	16.84%	82.79%
Fresh Milk Wholesaler	Milk	0%	0%	100%	0%	0%	100%
Traditional Processing	Milk	0%	0%	100%	0%	0%	100%
	Cheese	1%	5.28%	93.72%	1%	5.28%	93.72%
Dairy Wholesalers	D.P	0%	0%	100%	0%	0%	100%
Dairy Retailers	D.P	0%	0%	100%	0%	0%	100%
Dairy Exporters	Cheese	0%	0%	100%	0%	0%	100%
	BG	0%	0%	100%	0%	0%	100%

Source: MAAR and NAPC

SC: Self - consumption
NF: Net flow
BG: Butter and ghee
LO: Labneh and others
D.P: Dairy products

Table 2: Unit cost and revenue items of keeping 100 ewes in state centers in 2001

	Unit	Baseline		Current	
		Quantity	Price S.p	Quantity	Price S.p
Total revenue items					
Milk production	kg	6,000		6,000	
Keeping milk consumption	kg	1,010	14	1,010	14
Waste	kg	22		22	
Milk sales	kg	4,968	15	4,968	14
Lambs	No.	72	2,500	72	2,500
Replacement	kg	800	86	800	86
Manure	M^3	10	250	10	250
Total number of ewes	No.	6,480		6,480	
Cost items per 100 ewes					
Fodder	S.p	1	108,463	1	108,463
Milk	kg	1,010	14	1,010	14
Veterinary expenses	100	1	3,240	1	3,240
Fuel, water, electricity	100	1	1,700	1	1,700
Maintenance	100	1	4,874	1	4,874
Waste	kg	22	14	22	14
Others	100	1	2,609	1	2,609
Replacement	No.	20	2,500	20	2,500
Hired labor	month	11	4,000	11	4,000
Family labor	month	0	4,000	0	4,000

Source: MAAR & NAPC
Ewes: Sheep females

Appendix B

Basic Data- The Sheep Milk Chain 2001

Table 3: Unit cost and revenue items of keeping 100 ewes in cooperative sector in 2001

	Unit	Baseline		Current	
		Quantity	Price S.p	Quantity	Price S.p
Total revenue items					
Milk production	kg	6,000.0		6,000.0	
Keeping milk consumption	kg	974.0		974.0	
Waste	kg	22.0		22.0	
Milk sales	kg	3,424.0	14.5	3,424.0	14.5
Lambs	No.	72.0	2,500.0	72.0	2,500.0
Replacement	kg	800.0	86.0	800.0	86.0
Manure	M^3	10.0	250.0	10.0	250.0
Ghee production	kg	76.3		76.3	
Ghee home consumption	kg	2.6		2.6	
Ghee sales	kg	73.7	297.0	73.7	297.0
Butter production	kg	14.3		14.3	
Butter home consumption	kg	0.5		0.5	
Butter sales	kg	13.8	297.0	13.8	297.0
Cheese production	kg	84.0		84.0	
Cheese home consumption	kg	39.0		39.0	
Cheese sales	kg	45.0	83.0	45.0	83.0
Labneh production	kg	110.0		110.0	
Labneh home consumption	kg	9.0		9.0	
Labneh sales	kg	101.0	60.0	101.0	60.0
Yogurt production	kg	324.4		324.4	
Yogurt home consumption	kg	23.0		23.0	
Yogurt sales	kg	301.4	23.0	301.4	23.0
Milk home Consumption	kg	90.0		90.0	
Other products	kg	400.0		400.0	
Other product home consumption	kg	15.0		15.0	
Other product sales	kg	385.0	50.0	385.0	50.0
Total number of ewes	No.	5,976,654		5,976,654	
Cost items per 100 ewes					
Fodder	S.p	1.0	108,463.0	1.0	108,463.0
Milk	kg	974.0	14.5	974.0	14.5
Veterinary expenses	100	1.0	3,350.0	1.0	3,350.0
Fuel, water, electricity	100	1.0	850.0	1.0	850.0
Maintenance	100	1.0	790.0	1.0	790.0
Waste	kg	22.0	14.5	22.0	14.5
Replacement	No.	20.0	2,500.0	20.0	2,500.0
Others	100	1.0	2,890.0	1.0	2,890.0
Hired labor	month	4.1	4,000.0	4.1	4,000.0
Family labor	month	6.9	4,000.0	6.9	4,000.0

Source: MAAR & NAPC Ewes: Sheep females

Appendix B

Basic Data- The Sheep Milk Chain 2001

Table 4: Unit cost and revenue items of keeping 100 ewes in private sector in 2001

	Unit	Baseline		Current	
		Quantity	Price S.p	Quantity	Price S.p
Total revenue items					
Milk production	kg	6,000		6,000	
Keeping milk consumption	kg	974		974	
Waste	kg	22		22	
Milk sales	kg	3,424	15	3,424	15
Lambs	No.	72	2,500	72	2,500
Replacement	kg	800	86	800	86
Manure	M^3	10	250	10	250
Ghee production	kg	76		76	
Ghee home consumption	kg	3		3	
Ghee sales	kg	74	297	74	297
Butter production	kg	14		14	
Butter home consumption	kg	0		0	
Butter sales	kg	14	297	14	297
Cheese production	kg	84		84	
Cheese home consumption	kg	39		39	
Cheese sales	kg	45	83	45	83
Labneh production	kg	110		110	
Labneh home consumption	kg	9		9	
Labneh sales	kg	101	60	101	60
Yogurt production	kg	324		324	
Yogurt home consumption	kg	23		23	
Yogurt sales	kg	301	23	301	23
Milk home Consumption	kg	90		90	
Other products	kg	400		400	
Other product home consumption	kg	15		15	
Other product Sales	kg	385	40	385	40
Total number of ewes	No.	2,116,411		2,116,411	
Cost items per 100 ewes					
Fodder	S.p	1.0	108,463.0	1.0	108,463.0
Milk	kg	974.0	14.5	974.0	14.5
Veterinary expenses	100	1.0	3,120.0	1.0	3,120.0
Fuel, water, electricity	100	1.0	750.0	1.0	750.0
Maintenance	100	1.0	950.0	1.0	950.0
Waste	kg	22.0	14.5	22.0	14.5
Replacement	No.	20.0	2,500.0	20.0	2,500.0
Others	100	1.0	2,340.0	1.0	2,340.0
Hired labor	month	4.0	4,000.0	4.0	4,000.0
Family labor	month	6.0	4,000.0	6.0	4,000.0

Source: MAAR & NAPC Ewes: Sheep females

Appendix B

Basic Data- The Sheep Milk Chain 2001

Processors

Table 5: Unit cost of processing (traditional processing) one ton milk in 2001

	Baseline S.p	Current S.p
Inputs commodities	100	100
Fuel,water,electricity	50	50
Maintenance	5	5
Packaging	200	200
Services	5	5
Others	15	15
Waste	100	100
Wages and salaries	350	350

Source: MAAR & NAPC

Traders

Table 6: Unit marketing cost of traders in 2001

	Exporters		Milk Wholesalers		Dairy Wholesalers		Dairy Retailers	
	Baseline Price(S.p)	Current Price(S.p)	Baseline Price(S.p)	Current Price(S.p)	Baseline Price(S.p)	Current Price(S.p)	Baseline Price(S.p)	Current Price(S.p)
Transport	250	250	400	400	200	200	75	75
Wages	200	200	100	100	150	150	40	40
Services	60	60	125	125	100	100	40	40
Others	40	40	10	10	50	50	10	10

Source: MAAR & NAPC

Table 7: Export

	Unit	Baseline	Current
Cheese	ton	691.4	691.4
Ghee and butter	ton	48.1	48.1

Source: MAAR & NAPC

Appendix B

Basic Data - Prices of the Sheep Milk Chain 2001

Table 8: Prices of the sheep milk chain in 2001

Agents	Unit	Baseline Price S.p	Current Price S.p
State Centers			
Milk farm gate prices	kg	14	14
Lambs	No.	2,500	2,500
Replacement	kg	86	86
Manure	M^3	250	250
Fodder	kg	4	4
Cooperative and Private Sector			
Milk farm gate price	kg	15	15
Milk wholesale price	kg	16	16
Milk retail price	kg	19	19
Lambs	No.	2,500	2,500
Ewes meat - live weight	kg	86	86
Manure	M^3	250	250
Ghee and butter farm gate price	kg	225	225
Ghee and butter wholesale price	kg	246	246
Ghee and butter retail price	kg	297	297
Cheese farm gate price	kg	67	67
Cheese wholesale price	kg	73	73
Cheese retail price	kg	83	83
Labneh farm gate price	kg	50	50
Labneh wholesale price	kg	54	54
Labneh retail price	kg	60	60
Yogurt farm gate price	kg	18	18
Yogurt wholesale price	kg	20	20
Yogurt retail price	kg	23	23
Other product farm gate price	kg	35	35
Other product wholesale price	kg	37	37
Other product retail price	kg	40	40
Labneh and other product farm gate price	kg	43	43
Labneh and other Product wholesale price	kg	46	46
Labneh and other product retail price	kg	50	50
Fresh Milk Wholesalers			
Freh milk wholesale price	kg	16	16
Traditional Processing			
Cheese	kg	65	65
Dairy Wholesalers			
Cheese wholesale price	kg	73	73
Ghee and butter wholesale price	kg	246	246
Dairy Retailers			
Milk retail price	kg	19	19
Cheese retail price	kg	83	83
Dairy Exporters			
Ghee and butter	kg	325	325
Cheese	kg	100	100

Source: MAAR & NAPC

Appendix B

Farm Budget Calculations - The Sheep Milk Chain 2001

Table 9: State centers- milk budget of the sheep milk chain in 2001

	Unit	Baseline			Current		
		Quantity	Price S.p	Value Mill.S.p	Quantity	Price S.p	Value Mill.S.p
1. Revenues							
Milk production	ton	388.8			388.8		
Keeping milk consumption	ton	65.5			65.5		
Waste	ton	1.4			1.4		
Milk sales	ton	321.9	14,000.0	4.5	321.9	14,000.0	4.5
Lambs	No.	4,665.6	2,500.0	11.7	4,665.6	2,500.0	11.7
Replacement	ton	84.4	86,000.0	7.3	84.4	86,000.0	7.3
Manure	M^3	648.0	250.0	0.2	648.0	250.0	0.2
Total Sales				23.6			23.6
2.Variable Cost*							
Fodder	No.	6,480.0	1,084.6	7.0	6,480.0	1,084.6	7.0
Milk	ton	65.5	14,000.0	0.9	65.5	14,000.0	0.9
Veterinary expenses	No.	6,480.0	32.4	0.2	6,480.0	32.4	0.2
Fuel, water, electricity	No.	6,480.0	17.0	0.1	6,480.0	17.0	0.1
Maintenance	No.	6,480.0	48.7	0.3	6,480.0	48.7	0.3
Waste	ton	1.4	14,000.0	0.0	1.4	14,000.0	0.0
Others	No.	6,480.0	26.1	0.2	6,480.0	26.1	0.2
Replacement	No.	1,296.0	2,500.0	3.2	1,296.0	2,500.0	3.2
Hired labor	000 days	712.8	4,000.0	2.9	712.8	4,000.0	2.9
Family labor	000 days	0.0	4,000.0	0.0	0.0	4,000.0	0.0
Total Variable Cost				14.9			14.9
3.Value Added				12.0			12.0

Source: MAAR and NAPC

Mill.S.p: Million Syrian pounds

* Interest , taxes,rent, and depreciation are not included in the variable costs because they are value added items

Appendix B

Farm Budget Calculations - The Sheep Milk Chain 2001

Table 10: Cooperative sector- milk budget of the sheep milk chain in 2001

	Unit	Baseline			Current		
		Quantity	Price	Value Mill.S.p	Quantity	Price	Value Mill.S.p
1. Revenues							
Milk production	ton	358,599			358,599		
Keeping milk consumption	ton	58,213			58,213		
Waste	ton	1,315			1,315		
Ghee production	ton	4,558			4,558		
Butter production	ton	855			855		
Cheese production	ton	5,020			5,020		
Labneh production	ton	6,574			6,574		
Yogurt production	ton	19,388			19,388		
Other products	ton	23,907			23,907		
Milk home consumption	ton	5,379			5,379		
Ghee home consumption	ton	154			154		
Butter home consumption	ton	29			29		
Cheese home consumption	ton	2,331			2,331		
Labneh home consumption	ton	538			538		
Yogurt home consumption	ton	1,375			1,375		
Other product home consumption	ton	896			896		
Milk sales	ton	204,643	14,500	2,967	204,643	14,500	2,967
Ghee sales	ton	4,404	225,000	991	4,404	225,000	991
Butter sales	ton	826	225,000	186	826	225,000	186
Cheese sales	ton	2,689	67,000	180	2,689	67,000	180
Labneh sales	ton	6,036	50,000	302	6,036	50,000	302
Yogurt sales	ton	18,014	18,000	324	18,014	18,000	324
Other product sales	ton	23,010	35,000	805	23,010	35,000	805
Lambs	No.	4,303,191	2,500	10,758	4,303,191	2,500	10,758
Replacement	ton	47,813	86,000	4,112	47,813	86,000	4,112
Manure	M^3	597,665	250	149	597,665	250	149
Total Sales				20,775			20,775
2.Variable Cost*							
Fodder	No.	5,976,654	1,085	6,482	5,976,654	1,085	6,482
Milk	ton	58,213	14,500	844	58,213	14,500	844
Veterinary expenses	ton	5,976,654	34	200	5,976,654	34	200
Fuel, water, electricity	No.	5,976,654	9	51	5,976,654	9	51
Maintenance	ton	5,976,654	8	47	5,976,654	8	47
Waste	ton	1,315	14,500	19	1,315	14,500	19
Others	No.	5,976,654	29	173	5,976,654	29	173
Replacement	No.	1,195,331	2,500	2,988	1,195,331	2,500	2,988
Hired labor	000 days	243,250	4,000	973	243,250	4,000	973
Family labor	000 days	414,182	4,000	1,657	414,182	4,000	1,657
Total Variable Cost				13,435			13,435
3.Value Added				7,340			7,340

Source: MAAR and NAPC

Mill.S.p: Million Syrian pounds

* Interest , taxes,rent, and depreciation are not included in the variable costs because they are value added items

Appendix B

Farm Budget Calculations - Sheep Milk Chain 2001

Table 11: Private sector- milk budget of the sheep milk chain in 2001

	Unit	Baseline			Current		
		Quantity	Price	Value Mill.S.p	Quantity	Price	Value Mill.S.p
1. Revenues							
Milk production	ton	126,985			126,985		
Keeping milk consumption	ton	20,614			20,614		
Waste	ton	466			466		
Ghee production	ton	1,614			1,614		
Butter production	ton	303			303		
Cheese production	ton	1,778			1,778		
Labneh production	ton	2,328			2,328		
Yogurt production	ton	6,866			6,866		
Other products	ton	8,466			8,466		
Milk home consumption	ton	1,905			1,905		
Ghee home consumption	ton	55			55		
Butter home consumption	ton	10			10		
Cheese home consumption	ton	825			825		
Labneh home consumption	ton	190			190		
Yogurt home consumption	ton	487			487		
Other product home consumption	ton	317			317		
Milk sales	ton	72,467	14,500	1,051	72,467	14,500	1,051
Ghee sales	ton	1,560	225,000	351	1,560	225,000	351
Butter sales	ton	292	225,000	66	292	225,000	66
Cheese sales	ton	952	67,000	64	952	67,000	64
Labneh sales	ton	2,138	50,000	107	2,138	50,000	107
Yogurt sales	ton	6,379	18,000	115	6,379	18,000	115
Other product sales	ton	8,148	35,000	285	8,148	35,000	285
Lambs	No.	1,523,816	2,500	3,810	1,523,816	2,500	3,810
Replacement	ton	16,931	86,000	1,456	16,931	86,000	1,456
Manure	M^3	211,641	250	53	211,641	250	53
Total Sales				7,357			7,357
2.Variable Cost*							
Fodder	No.	2,116,411	1,085	2,296	2,116,411	1,085	2,296
Milk	ton	20,614	14,500	299	20,614	14,500	299
Veterinary expenses	No.	2,116,411	31	66	2,116,411	31	66
Fuel, water, electricity	No.	2,116,411	8	16	2,116,411	8	16
Maintenance	No.	2,116,411	10	20	2,116,411	10	20
Waste	ton	466	14,500	7	466	14,500	7
Others	No.	2,116,411	23	50	2,116,411	23	50
Replacement	No.	423,282	2,500	1,058	423,282	2,500	1,058
Hired labor	000 days	84,656	4,000	339	84,656	4,000	339
Family labor	000 days	126,985	4,000	508	126,985	4,000	508
Total Variable Cost				4,657			4,657
3.Value Added				2,699			2,699

Source: MAAR and NAPC

Mill.S.p: Million Syrian pounds

* Interest , taxes,rent, and depreciation are not included in the variable costs because they are value added items

Appendix B

Farm Budget Calculations - Sheep Milk Chain 2001

Table 12: Milk -total budget of the sheep milk chain in 2001

	Unit	Baseline			Current		
		Quantity	Price	Value Mill.S.p	Quantity	Price	Value Mill.S.p
1. Revenues							
Milk production	000 ton	486.0			486.0		
Keeping milk consumption	000 ton	78.9			78.9		
Waste	000 ton	1.8			1.8		
Ghee production	000 ton	6.2			6.2		
Butter production	000 ton	1.2			1.2		
Cheese production	000 ton	6.8			6.8		
Labneh production	000 ton	8.9			8.9		
Yogurt production	000 ton	26.3			26.3		
Other products	000 ton	32.4			32.4		
Milk home consumption	000 ton	7.3			7.3		
Butter home consumption	000 ton	0.0			0.0		
Cheese home consumption	000 ton	3.2			3.2		
Labneh home consumption	000 ton	0.7			0.7		
Yogurt home consumption	000 ton	1.9			1.9		
Other product home consumption	000 ton	1.2			1.2		
Milk sales	000 ton	277.4		4,022.6	277.4		4,022.6
Ghee sales	000 ton	6.0		1,341.9	6.0		1,341.9
Butter sales	000 ton	1.1		251.7	1.1		251.7
Cheese sales	000 ton	3.6		244.0	3.6		244.0
Labneh sales	000 ton	8.2		408.7	8.2		408.7
Yogurt sales	000 ton	24.4		439.1	24.4		439.1
Other Product sales	000 ton	31.2		1,090.5	31.2		1,090.5
Lambs	1000	5,831.7		14,579.2	5,831.7		14,579.2
Replacement	000 ton	64.8		5,575.3	64.8		5,575.3
Manure	000 M^3	810.0		202.5	810.0		202.5
Total Sales				28,155.4			28,155.4
2.Variable Cost*							
Fodder	000 ton	8,099.5		8,785.0	8,099.5		8,785.0
Milk	000 ton	78.9		1,143.9	78.9		1,143.9
Veterinary expenses	000 ewes	80,995.5		266.5	80,995.5		266.5
Fuel, water, electricity	000 ewes	80,995.5		66.8	80,995.5		66.8
Maintenance	000 ewes	80,995.5		67.6	80,995.5		67.6
Waste	000 ton	1.8		25.8	1.8		25.8
Others	000 ewes	80,995.5		222.4	80,995.5		222.4
Replacement	000 No.	1,619.9		4,049.8	1,619.9		4,049.8
Hired labor	000 days	328,619.1		1,314.5	328,619.1		1,314.5
Family labor	000 day	541,166.8		2,164.7	541,166.8		2,164.7
Total Variable Cost				18,107.0			18,107.0
3.Value Added				10,048.4			10,048.4

Source: MAAR and NAPC

Mill.s.p: Million Syrian pounds

* Interest , taxes,rent, and depreciation are not included in the variable costs because they are value added items

Table 13: Matrix of flow coefficients (%) of the sheep milk chain in 2001

Appendix B

To ↓		From →	Supply				Producers					
			Domestic Production			Import	Private Sector					
			PS	CS	SC		↓ PS	PSM	PSGB	PSCH	PSY	PSLO
Milk Producers	Private Sector (PS)		100%				-100%					
	Private Sector (PSM)	Milk					57.1%	-100%				
	Private Sector(PSGB)	Ghee,Butter					1.51%		-100%			
	Private Sector(PSCH)	Cheese					1.40%			-100%		
	Private Sector(PSY)	Yogurt					5.41%				-100%	
	Private Sector (PSLO)	Labneh and Others					8.5%					-100%
	Cooperative Sector (CS)			100%								
	Cooperative Sector (CSM)	Milk										
	Cooperative Sector (CSGB)	Ghee and Butter										
	Cooperative Sector (CSCH)	Cheese										
	Cooperative Sector(CSY)	Yogurt										
	Cooperative Sector (CSLO)	Labneh and Others										
	State Centers (SCM)	Milk			100%							
Traders of Raw Mat.	Fresh Milk Wholesaler (FWHS)	Milk						20.8%				
Processors	Traditional Processing (TPM)	Milk						36.3%				
	Traditional Processing(TPCH)	Cheese										
Traders	Dairy Wholesalers(DWHSCH)	Cheese										
	Dairy Wholesalers(DWHSGB)	Ghee and Butter							0.60%			
	Dairy Retailers (DRTS)	Dairy Products										
	Dairy Exporters(EXCH)	Cheese										
	Dairy Exporters(EXGB)	Ghee and Butter										
Consumption	Consumers	Dairy Products							96.0%	53.6%	92.9%	95.3%
	Rest of the World	Dairy Products										
Sub Total			100%	100%	100%			-43%	-3.4%	-46%	-7.1%	-4.7%
Waste								0.37%	0%	0%	0%	0%
Self - Consumption								42.6%	3.4%	46.4%	7.09%	4.71%
Sub Total								42.9%	3.4%	46.4%	7.09%	4.71%
Grand Total								0.0%	0.0%	0.0%	0.0%	0.0%

Traders of Raw Mat.: Traders of raw materials

Source: Author calculations according to MAAR & NAPC data

Table 13: (Continued)

To ↓ / From →			Producers						Trader	Traditional Processing		Traders				
			Cooperative Sector													
			CS	CSM	CSGB	CSCH	CSY	CSLO	SCM	FWHS	TPM	TPCH	DWH SCH	DWH SGB	DRTS	EXCH	EXGB
Milk Producers	Private Sector (PS)																
	Private Sector (PSM)	Milk															
	Private Sector(PSGB)	GB															
	Private Sector(PSCH)	Cheese															
	Private Sector(PSY)	Yogurt															
	Private Sector (PSLO)	LO															
	Cooperative Sector (CS)		-100%														
	Cooperative Sector (CSM)	Milk	57.1%	-100%													
	Cooperative Sector (CSGB)	GB	1.51%		-100%												
	Cooperative Sector (CSCH)	Cheese	1.40%			-100%											
	Cooperative Sector(CSY)	Yogurt	5.41%				-100%										
	Cooperative Sector (CSLO)	LO	8.50%					-100%									
	State Centers (SCM)	Milk							-100%								
TRM	Fresh Milk Wholesaler (FWHS)	Milk		20.8%					82.8%	-100%							
Processors	Traditional Processing (TPM)	Milk		36.3%						0.6%	-100%						
	Traditional Processing(TPCH)	Cheese									28.7%	-100%					
Traders	Dairy Wholesalers(DWHSCH)	Cheese										93.7%	-100%				
	Dairy Wholesalers(DWHSGB)	GB			0.60%									-100%			
	Dairy Retailers (DRTS)	DP								99.4%			97.8%		-100%		
	Dairy Exporters(EXCH)	Cheese											2.2%			-100%	
	Dairy Exporters(EXGB)	GB												100%			-100%
Consumption	Consumers	DP			96.0%	53.6%	92.9%	95.3%							100%		
	Rest of the World	DP														100%	100%
Sub Total				-43%	-3.4%	-46%	-7.1%	-4.7%	-17%	0.0%		-6.3%	0.0%	0.0%	0.0%	0.0%	0.0%
Waste				0.37%	0%	0%	0%	0%	0.37%	0%		1%	0%	0%	0%	0%	0%
SC				42.6%	3.4%	46.4%	7.1%	4.7%	16.8%	0%	19.8%	5.3%	0%	0%	0%	0%	0%
Sub Total				42.9%	3.4%	46.4%	7.1%	4.7%	17.2%	0%		6.3%	0%	0%	0%	0%	0%
Grand Total				0.0%	0%	0.0%	0.0%	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%	0%	0%	0%

TRM: Traders of raw materials GB: Ghee and butter LO: Labneh and others DP: Dairy products SC: Home consumption

Source: Author calculations according to MAAR & NAPC data

Table 14:Matrix of flow quantities (000 tons) of the sheep milk chain (inflow(-), outflow(+)) in 2001

Appendix B

To ↓		From →	Supply				Producers					
			Domestic Production			Import	Private Sector					
			PS	CS	SC		↓ PS	PSM	PSGB	PSCH	PSY	PSLO
Milk Producers	Private Sector (PS)		127.0				-127.0					
	Private Sector (PSM)	Milk					72.5	-72.5				
	Private Sector(PSGB)	Ghee and Butter					1.9		-1.9			
	Private Sector(PSCH)	Cheese					1.8			-1.8		
	Private Sector(PSY)	Yogurt					6.9				-6.9	
	Private Sector (PSLO)	Labneh and Others					10.8					-10.8
	Cooperative Sector (CS)			359								
	Cooperative Sector (CSM)	Milk										
	Cooperative Sector (CSGB)	Ghee and Butter										
	Cooperative Sector (CSCH)	Cheese										
	Cooperative Sector(CSY)	Yogurt										
	Cooperative Sector (CSLO)	Labneh and Others										
	State Centers (SCM)	Milk			0.4							
Traders of Raw Mat.	Fresh Milk Wholesaler (FWHS)	Milk						15.0				
Processors	Traditional Processing (TPM)	Milk						26.3				
	Traditional Processing(TPCH)	Cheese										
Traders	Dairy Wholesalers(DWHSCH)	Cheese										
	Dairy Wholesalers(DWHSGB)	Ghee and Butter							0.01			
	Dairy Retailers (DRTS)	Dairy Products										
	Dairy Exporters(EXCH)	Cheese										
	Dairy Exporters(EXGB)	Ghee and Butter										
Consumption	Consumers	Dairy Products							1.8	1.0	6.4	10.3
	Rest of the World	Dairy Products										
Sub Total			127	359	0.4			-31.1	-0.1	-0.8	-0.5	-0.5
Waste								0.3	0.0	0%	0%	0%
Home Consumption								30.8	0.1	0.8	0.5	0.5
Sub Total								31.1	0.1	0.8	0.5	0.5
Grand Total								0.0	0.0	0.0	0.0	0.0

Traders of Raw Mat.: Traders of raw materials

Source: Author calculations according to MAAR & NAPC data

Table 14: (Continued)

Appendix B

To ↓		From →	Producers							Trader	Traditional Processing		Traders					Total
			Cooperative Sector															
			CS	CSM	CSGB	CSCH	CSY	CSLO	SCM	FWHS	TPM	TPCH	DWH SCH	DWH SGB	DRTS	EXCH	EXGB	
Milk Producers	Private Sector (PS)																	0.0
	Private Sector (PSM)	Milk																0.0
	Private Sector(PSGB)	GB																0.0
	Private Sector(PSCH)	Cheese																0.0
	Private Sector(PSY)	Yogurt																0.0
	Private Sector (PSLO)	LO																0.0
	Cooperative Sector (CS)		-359															0.0
	Cooperative Sector (CSM)	Milk	204.6	-205														0.0
	Cooperative Sector (CSGB)	GB	5.4		-5.4													0.0
	Cooperative Sector (CSCH)	Cheese	5.0			-5.0												0.0
	Cooperative Sector(CSY)	Yogurt	19.4				-19.4											0.0
	Cooperative Sector (CSLO)	LO	30.5					-30.5										0.0
	State Centers (SCM)	Milk							-0.4									0.0
Traders of Raw Mat.	Fresh Milk Wholesaler (FWHS)	Milk		42.5					0.32	-57.9								0.0
Processors	Traditional Processing (TPM)	Milk		74.3						0.3	-101							0.0
	Traditional Processing(TPCH)	Cheese									28.9	-28.9						0.0
Traders	Dairy Wholesalers(DWHSCH)	Cheese										27.1	-27					0.0
	Dairy Wholesalers(DWHSGB)	GB			0.03									-0.04				0.0
	Dairy Retailers (DRTS)	Dairy Products								57.5			26.5		-84.0			0.0
	Dairy Exporters(EXCH)	Cheese											0.61			-0.61		0.0
	Dairy Exporters(EXGB)	GB												0.04			-0.04	0.0
Consumption	Consumers	Dairy Products			5.2	2.7	18.0	29.0							84.0			158.4
	Rest of the World	Dairy Products														0.61	0.04	0.65
Sub Total				-87.9	-0.2	-2.3	-1.4	-1.4	-0.1	0.0		-1.8	0.0	0.0	0.0	0.0	0.0	
Waste				0.75	0.0	0.0	0.0	0.0	0.0	0.0		0.3	0.0	0.0	0.0	0.0	0.0	
Home Consumption				87.1	0.2	2.3	1.4	1.4	0.1	0.0		1.5	0.0	0.0	0.0	0.0	0.0	
Sub Total				87.9	0.2	2.3	1.4	1.4	0.1	0.0		1.8	0.0	0.0	0.0	0.0	0.0	
Grand Total				0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	

Traders of Raw Mat.: Traders of raw materials GB: Ghee and butter LO: Labneh and others DP:Dairy products SC: Home consumption

Source: Author calculations according to MAAR & NAPC data

Table 15: Matrix of prices of purchase(-) and sales(+) of the sheep milk chain in 2001

Appendix B

To ↓		From →	Supply				Producers					
			Domestic Production			Import	Private Sector					
			PS	CS	SC		↓ PS	PSM	PSGB	PSCH	PSY	PSLO
Milk Producers	Private Sector (PS)											
	Private Sector (PSM)	Milk						14,500				
	Private Sector(PSGB)	Ghee,Butter							225,000			
	Private Sector(PSCH)	Cheese								67,000		
	Private Sector(PSY)	Yogurt									18,000	
	Private Sector (PSLO)	Labneh and Others										43,000
	Cooperative Sector (CS)											
	Cooperative Sector (CSM)	Milk										
	Cooperative Sector (CSGB)	Ghee and Butter										
	Cooperative Sector (CSCH)	Cheese										
	Cooperative Sector(CSY)	Yogurt										
	Cooperative Sector (CSLO)	Labneh and Others										
	State Centers (SCM)	Milk										
Traders of Raw Mat.	Fresh Milk Wholesaler (FWHS)	Milk						-14,500				
Processors	Traditional Processing (TPM)	Milk						-14,500				
	Traditional Processing(TPCH)	Cheese										
Traders	Dairy Wholesalers(DWHSCH)	Cheese										
	Dairy Wholesalers(DWHSGB)	Ghee and Butter							-225000			
	Dairy Retailers (DRTS)	Dairy Products										
	Dairy Exporters(EXCH)	Cheese										
	Dairy Exporters(EXGB)	Ghee and Butter										
Consumption	Consumers	Dairy Products							-297000	-83,000	-23,000	-50,000
	Rest of the World	Dairy Products										
Waste Home Consumption								14,500	297,000	83,000	23,000	50,000

Traders of Raw Mat.: Traders of raw materials

Source: Author calculations according to MAAR & NAPC data

Table 15:(Continued)

Appendix B

To ↓			From → Producers: Cooperative Sector: CS	CSM	CSGB	CSCH	CSY	CSLO	SCM	Trader: FWHS	Traditional Processing: TPM	TPCH	Traders: DWH SCH	DWH SGB	DRTS	EXCH	EXGB
Milk Producers	Private Sector (PS)																
	Private Sector (PSM)	Milk															
	Private Sector(PSGB)	Ghee,Butter															
	Private Sector(PSCH)	Cheese															
	Private Sector(PSY)	Yogurt															
	Private Sector (PSLO)	Labneh and Others															
	Cooperative Sector(CS)																
	Cooperative Sector(CSM)	Milk		14500													
	Cooperative Sector(CSGB)	Ghee and Butter			22500												
	Cooperative Sector(CSCH)	Cheese				67000											
	Cooperative Sector(CSY)	Yogurt					18000										
	Cooperative Sector(CSLO)	Labneh and Others						43000									
	State Centers (SCM)	Milk							14000								
Traders of R M.	Fresh Milk Wholesaler (FWHS)	Milk		-14500					-14000	16000							
Processors	Traditional Processing (TPM)	Milk		-14500						-16000							
	Traditional Processing(TPCH)	Cheese										65000					
Traders	Dairy Wholesalers(DWHSCH)	Cheese										-65000	73000				
	Dairy Wholesalers(DWHSGB)	Ghee and Butter			-22500									246000			
	Dairy Retailers (DRTS)	Dairy Products								-16000			-73000				
	Dairy Exporters(EXCH)	Cheese											-73000			100000	
	Dairy Exporters(EXGB)	Ghee and Butter												-246000			325000
Consumption	Consumers	Dairy Products			-29700	-83000	-23000	-50000		-19000							
	Rest of the World	Dairy Products														-100000	-325000
Waste																	
Home Consumption				14500	29700	83000	23000	50000	14000			65000					

Source: Author calculations according to MAAR & NAPC data

Traders of R M.: Traders of raw materials

Appendix B

Agents of the Sheep Milk Chain Except Farms 2001

Purchases & Sales - Processing Costs - Marketing Costs

Traditional Processing 2001

Table 16a: Traditional processing of the sheep milk chain - purchases & sales in 2001

			Flows ton	Price S.p/ton	Value Mill S.p
Purchases from:	Private Sector	Milk	26,306.6	14,500.0	381.4
	Cooperative Sector	Milk	74,288.6	14,500.0	1,077.2
	Fresh Milk Wholesalers	Milk	347.2	16,000.0	5.6
	Total		100,942.3		1,464.2
Sales to :	Dairy Wholesalers	Cheese	27,128.4	65,000.0	1,763.3

Table 16b: Traditional processing of the sheep milk chain - processing costs in 2001

	Baseline			Current		
	Unit Cost S.p/ton	Flows ton	Total Cost Mill.S.p	Unit Cost S.p/ton	Flows ton	Total Cost Mill.S.p
Inputs commodities	100.0	27,128.4	2.7	100.0	27,128.4	2.7
Fuel, water, electricity	50.0	27,128.4	1.4	50.0	27,128.4	1.4
Maintenance	5.0	27,128.4	0.1	5.0	27,128.4	0.1
Packaging	200.0	27,128.4	5.4	200.0	27,128.4	5.4
Services	5.0	27,128.4	0.1	5.0	27,128.4	0.1
Others	15.0	27,128.4	0.4	15.0	27,128.4	0.4
Waste	100.0	27,128.4	2.7	100.0	27,128.4	2.7
Wages and salaries	350.0	27,128.4	9.5	350.0	27,128.4	9.5
Total			22.4			22.4

Fresh Milk Wholesalers of the sheep milk chain 2001

Table 17a: Fresh milk wholesalers of the sheep milk chain - purchases & sales in 2001

			Flows ton	Price S.p/ton	Value Mill S.p
Purchases from:	Private Sector	Milk	15,048.2	14,500.0	218.2
	Cooperative Sector	Milk	42,495.5	14,500.0	616.2
	State Centers	Milk	321.9	14,000.0	4.5
	Total		57,865.6		838.9
Sales to:	Traditional Processing	Milk	347.2	16,000.0	5.6
	Dairy Retailers	Milk	57,518.4	16,000.0	920.3
	Total		57,865.6		925.9

Table 17b: Fresh milk wholesalers of the sheep milk chain- marketing costs in 2001

	Baseline			Current		
	Unit Cost S.p/ton	Flows ton	Total Cost Mill.S.p	Unit Cost S.p/ton	Flows ton	Total Cost Mill.S.p
Transport	400.0	57,865.6	23.1	400.0	57,865.6	23.1
Wages	100.0	57,865.6	5.8	100.0	57,865.6	5.8
Services	125.0	57,865.6	7.2	125.0	57,865.6	7.2
Others	10.0	57,865.6	0.6	10.0	57,865.6	0.6
Total			36.7			36.7

Mill.S.p: Million Syrian pounds S.p: Syrian pound

Source: Author calculations according to MAAR & NAPC data

Appendix B

Dairy Wholesalers of the sheep milk chain 2001

Table 18a: Dairy wholesalers of the sheep milk chain - purchases & sales in 2001

			Flows ton	Price S.p/ton	Value Mill S.p
Purchases from:	Private Sector	GB	11.5	225,000.0	2.6
	Cooperative Sector	GB	32.5	225,000.0	7.3
	Traditional Processing	Cheese	27,128.4	65,000.0	1,763.3
	Total		27,172.4		1,773.2
Sales to :	Dairy Retailers	Cheese	26,520.7	73,000.0	1,936.0
	Dairy Exporters				
	Cheese		607.7	73,000.0	44.4
	Ghee and Butter (GB)		44.0	246,000.0	10.8
	Total		27,172.4		1,991.2

Table 18b: Dairy wholesalers of the sheep milk chain - marketing costs in 2001

	Baseline			Current		
	Unit Cost S.p/ton	Flows ton	Total Cost Mill.S.p	Unit Cost S.p/ton	Flows ton	Total Cost Mill.S.p
Transport	200.0	27,172.4	5.4	200.0	27,172.4	5.4
Wages	150.0	27,172.4	4.1	150.0	27,172.4	4.1
Services	100.0	27,172.4	2.7	100.0	27,172.4	2.7
Others	50.0	27,172.4	1.4	50.0	27,172.4	1.4
Total			13.6			13.6

Dairy Retailers of the sheep milk chain 2001

Table 19a: Dairy retailers of the sheep milk chain - purchases & sales in 2001

			Flows ton	Price S.p/ton	Value Mill S.p
Purchases from:	Dairy Wholesalers	Cheese	26,520.7	73,000.0	1,936.0
	Fresh Milk Wholesalers/Milk		57,518.4	16,000.0	920.3
	Total		84,039.2		2,856.3
Sales to:	Consumers				
		cheese	26,520.7	83,000.0	2,201.2
		Milk	57,518.4	19,000.0	1,092.9
	Total		84,039.2		3,294.1

Table 19b: Dairy retailers of the sheep milk chain - marketing costs in 2001

	Baseline			Current		
	Unit Cost S.p/ton	Flows ton	Total Cost Mill.S.p	Unit Cost S.p/ton	Flows ton	Total Cost Mill.S.p
Transport	75.0	84,039.2	6.3	75.0	84,039.2	6.3
Wages	40.0	84,039.2	3.4	40.0	84,039.2	3.4
Services	40.0	84,039.2	3.4	40.0	84,039.2	3.4
Others	10.0	84,039.2	0.8	10.0	84,039.2	0.8
Total			13.9			13.9

Mill.S.p: Million Syrian pounds S.p: Syrian pound GB: Ghee and butter

Source: Author calculations according to MAAR & NAPC data

Appendix B

Dairy Exporters of the sheep milk chain 2001

Table 20a: Dairy exporters of the sheep milk chain - purchases & sales in 2001

			Flows ton	Price S.p/ton	Value Mill S.p
Purchases from:	Dairy Wholesalers				
		Ghee and Butter	44.0	246,000.0	10.8
		Cheese	607.7	73,000.0	44.4
	Total		651.7		55.2
Sales to :	Rest of the World				
		Ghee and Butter	44.0	325,000.0	14.3
		Cheese	607.7	100,000.0	60.8
	Total		651.7		75.1

Table 20b: Dairy exporters of the sheep milk chain - marketing costs in 2001

	Baseline			Current		
	Unit Cost S.p/ton	Flows ton	Total Cost Mill.S.p	Unit Cost S.p/ton	Flows ton	Total Cost Mill.S.p
Transport	250.0	651.7	0.2	250.0	651.7	0.2
Wages	200.0	651.7	0.1	200.0	651.7	0.1
Services	60.0	651.7	0.0	60.0	651.7	0.0
Others	40.0	651.7	0.0	40.0	651.7	0.0
Total			0.4			0.4

Mill.S.p: Million Syrian pounds

S.p: Syrian pound

Source: Author calculations according to MAAR & NAPC data

Appendix B

Agents' Budget Summary of the Sheep Milk Chain 2001

Table 21 : Agents' budget summary in million S.p of the sheep milk chain in 2001

	Sectors				Traditional
	Private Sector	Cooperative Sector	State Centers	Total	Processing
Output out of Chain					
Milk				0	
Lambs	3,810	10,758	12	14,579	
Replacement	1,456	4,112	7	5,575	
Manure	53	149	0	202	
Ghee and butter	547	1,544		2,090	
Cheese	79	223		302	
Yogurt	147	414		561	
Labneh and others	514	1,452		1,967	
Total Output out of Chain	6,605	18,653	19	25,277	0
Output within Chain					
Milk	600	1,693	5	2,298	
Ghee and butter	3	7		10	
Cheese				0	1,763
Yogurt				0	
Labneh and others				0	
Total Output within Chain	602	1,701	5	2,307	1,763
Home Consumption					
Milk	447	1,263		1,710	
Ghee and butter	19	54		74	
Cheese	69	193		262	99
Yogurt	11	32		43	
Labneh and others	25	72		97	
Total Home Consumption	572	1,614	0	2,186	99
Total Output	7,779	21,968	24	29,770	1,863
Inputs out of Chain					
Fodder	2,296	6,482	7	8,785	
Veterinary expenses	66	200	0	266	
Fuel, water, electricity	16	51	0	67	1
Maintenance	20	47	0	68	0
Inputs commodities				0	3
Packaging				0	5
Services				0	0
Trasport					
Others	50	173	0	222	0
Total Inputs out of Chain	2,447	6,953	8	9,408	10
Inputs within Chain					
Milk	299	844	1	1,144	1,464
waste	7	19	0	26	3
Replacement	1,058	2,988	3	4,050	
Ghee and butter				0	
Cheese				0	
Yogurt				0	
Labneh and others				0	
Total Inputs within Chain	1,364	3,851	4	5,220	1,467
Total Inputs	3,811	10,805	12	14,628	1,477
Total Value Added	3,968	11,163	12	15,143	386
Value Added Items					
Wages & salaries	847	2,630	3	3,479	9
Profit, taxes, interest, amortization, and depreciation	3,122	8,533	9	11,663	376
Total Value Added	3,968	11,163	12	15,143	386

Source: Author calculations according to MAAR & NAPC data

Table 21 : (Continued) Appendix B

	Milk Whole Salers	Dairy Whole Salers	Dairy Retailers	Dairy Exporters	Total Traders	**Total Chain**
Output out of Chain						
Milk			1,093		1,093	1,093
Lambs					0	14,579
Replacement					0	5,575
Manure					0	202
Ghee and butter				14	14	2,105
Cheese			2,201	61	2,262	2,564
Yogurt					0	561
Labneh and others					0	1,967
Total Output out of Chain	0	0	3,294	75	3,369	28,646
Output within Chain						
Milk	926				926	3,223
Ghee and butter		11			11	21
Cheese		1,980			1,980	3,744
Yogurt					0	0
Labneh and others					0	0
Total Output within Chain	926	1,991	0	0	2,917	6,988
Home Consumption						
Milk					0	1,710
Ghee and butter					0	74
Cheese					0	361
Yogurt					0	43
Labneh and others					0	97
Total Home Consumption		0	0		0	2,285
Total Output	926	1,991	3,294	75	6,286	37,919
Inputs out of Chain						
Fodder					0	8,785
Veterinary expenses					0	266
Fuel, water, electricity					0	68
Maintenance					0	68
Inputs commodities					0	3
Packaging					0	5
Services	7	3	3	0	13	13
Trasport	23	5	6	0	35	35
Others	1	1	1	0	3	226
Total Inputs out of Chain	31	10	11	0	51	9,470
Inputs within Chain						
Milk	839		920		1,759	4,367
waste					0	29
Replacement					0	4,050
Ghee and butter		10		11	21	21
Cheese		1,763	1,936	44	3,744	3,744
Yogurt					0	0
Labneh and others					0	0
Total Inputs within Chain	839	1,773	2,856	55	5,524	12,210
Total Inputs	870	1,783	2,867	55	5,575	21,680
Total Value Added	56	208	427	20	711	16,240
Value Added Items						
Wages & salaries	6	4	3	0	13	3,502
Profit, taxes, interest, amortization, and depreciation	50	204	424	20	698	12,738
Total Value Added	56	208	427	20	711	16,240

Source: Author calculations according to MAAR & NAPC data

Table 22: Performance measures of the sheep milk chain according to agents in 2001

Appendix B

Indicators	Revenues or Sales	Share	Purchase	Share	Cost	Share	Total Cost	Share	Gross Margin	Share	Value Added	Share	Relative Indicators	
													Share of Revenues to Cost	Share of Value Added to Cost
Agent	Mill.Sp	%	Mill.Sp	%	Mill.Sp	%	Mill.Sp	%	Mill.Sp	%	Mill.Sp	%	%	%
Private Sector	7,357	20.3		0.0	4,657	25.6	4,657	18.4	2,699	24.9	3,968	24.4	158.0	85.2
Cooperative Sector	20,775	57.4		0.0	13,435	73.8	13,435	53.0	7,340	67.6	11,163	68.7	154.6	83.1
State Centers	24	0.1		0.0	15	0.1	15	0.1	9	0.1	12	0.1	158.7	77.9
Total	28,155	77.8	0	0.0	18,107	99.5	18,107	71.4	10,048	92.5	15,143	93.2	155.5	83.6
Fresh Milk Wholesalers	926	2.6	839	11.7	37	0.2	876	3.5	50	0.5	56	0.3	105.7	6.4
Dairy Wholesalers	1,991	5.5	1,936	27.1	14	0.1	1,950	7.7	42	0.4	208	1.3	102.1	10.7
Total	2,917	8.1	2,775	38.8	50	0.3	2,825	11.1	92	0.8	264	1.6	103.2	9.4
Dairy Retailers	3,294	9.1	2,856	39.9	14	0.1	2,870	11.3	424	3.9	427	2.6	114.8	14.9
Exporters	75	0.2	55	0.8	0	0.0	56	0.2	20	0.2	20	0.1	135.2	35.4
Trditional Processing	1,763	4.9	1,464	20.5	22	0.1	1,487	5.9	277	2.5	386	2.4	118.6	25.9
Total	36,205	100.0	7,151	100.0	18,194	100.0	25,344	100.0	10,860	100.0	16,240	100.0	142.9	64.1

Source: Author calculations according to MAAR & NAPC data

Appendix C
Testing Tables

Appendix C

Table 1: 5% Critical Values of the F Distribution

		Numerator Degrees of Freedom									
		1	2	3	4	5	6	7	8	9	10
Denominator Degrees of Freedom	10	4.65	4.10	3.71	3.48	3.33	3.22	3.14	3.07	3.02	2.98
	11	4.84	3.98	3.59	3.36	3.20	3.09	3.01	2.95	2.90	2.85
	12	4.75	3.89	3.49	3.26	3.11	3.00	2.91	2.85	2.80	2.75
	13	4.67	3.81	3.41	3.18	3.03	2.92	2.83	2.77	2.71	2.67
	14	4.60	3.74	3.34	3.11	2.96	2.85	2.76	2.70	2.65	2.60
	15	4.54	3.68	3.29	3.06	2.90	2.79	2.71	2.64	2.59	2.54
	16	4.49	3.63	3.24	3.01	2.85	2.74	2.66	2.59	2.54	2.49
	17	4.45	3.59	3.20	2.96	2.81	2.70	2.61	2.55	2.49	2.45
	18	4.41	3.55	3.16	2.93	2.77	2.66	2.58	2.51	2.46	2.41
	19	4.38	3.52	3.13	2.90	2.74	2.63	2.54	2.48	2.42	2.38
	20	4.35	3.49	3.10	2.87	2.71	2.60	2.51	2.45	2.39	2.35
	21	4.32	3.47	3.07	2.84	2.68	2.57	2.49	2.42	2.37	2.32
	22	4.30	3.44	3.05	2.82	2.66	2.55	2.46	2.40	2.34	2.30
	23	4.28	3.42	3.03	2.80	2.64	2.53	2.44	2.37	2.32	2.27
	24	4.26	3.40	3.01	2.78	2.62	2.51	2.42	2.36	2.30	2.25
	25	4.24	3.39	2.99	2.76	2.60	2.49	2.40	2.34	2.28	2.24
	26	4.23	3.37	2.98	2.74	2.59	2.47	2.39	2.32	2.27	2.22
	27	4.21	3.35	2.96	2.73	2.57	2.46	2.37	2.31	2.25	2.20
	28	4.20	3.34	2.95	2.71	2.56	2.45	2.36	2.29	2.24	2.19
	29	4.18	3.33	2.93	2.70	2.55	2.43	2.35	2.28	2.22	2.18
	30	4.17	3.32	2.92	2.69	2.53	2.42	2.33	2.27	2.21	2.16
	40	4.08	3.23	2.84	2.61	2.45	2.34	2.25	2.18	2.12	2.08
	60	4.00	3.15	2.76	2.53	2.37	2.25	2.17	2.10	2.04	1.99
	90	3.95	3.10	2.71	2.47	2.32	2.20	2.11	2.04	1.99	1.94
	120	3.92	3.07	2.68	2.45	2.29	2.17	2.09	2.02	1.96	1.91
	Infinity	3.84	3.00	2.60	2.37	2.21	2.10	2.01	1.94	1.88	1.83

Source: Econ 571 Spring 2003

Appendix C

Table 2: Critical Values of the t Distribution

Signifigance Level						
1-Tailed		**0.10**	**0.05**	**0.03**	**0.01**	**0.01**
2-Tailed		**0.20**	**0.10**	**0.05**	**0.02**	**0.01**
Degrees of Freedom	1	3.078	6.314	12.706	31.821	63.657
	2	1.886	2.920	4.303	6.965	9.925
	3	1.638	2.353	3.182	4.541	5.841
	4	1.533	2.132	2.776	3.747	4.604
	5	1.476	2.015	2.571	3.365	4.032
	6	1.44	1.943	2.447	3.143	3.707
	7	1.415	1.895	2.365	2.998	3.499
	8	1.397	1.860	2.306	2.896	3.355
	9	1.383	1.833	2.262	2.821	3.250
	10	1.372	1.812	2.228	2.764	3.169
	11	1.363	1.796	2.201	2.718	3.106
	12	1.356	1.782	2.179	2.681	3.055
	13	1.350	1.771	2.160	2.650	3.012
	14	1.345	1.761	2.145	2.624	2.977
	15	1.341	1.753	2.131	2.602	2.947
	16	1.337	1.746	2.120	2.583	2.921
	17	1.333	1.740	2.110	2.567	2.898
	18	1.33	1.734	2.101	2.552	2.878
	19	1.328	1.729	2.093	2.539	2.861
	20	1.325	1.725	2.086	2.528	2.845
	21	1.323	1.721	2.080	2.518	2.831
	22	1.321	1.717	2.074	2.508	2.819
	23	1.319	1.714	2.069	2.500	2.807
	24	1.318	1.711	2.064	2.492	2.797
	25	1.316	1.708	2.060	2.485	2.787
	26	1.315	1.706	2.056	2.479	2.779
	27	1.314	1.703	2.052	2.473	2.771
	28	1.313	1.701	2.048	2.467	2.763
	29	1.311	1.699	2.045	2.462	2.756
	30	1.310	1.697	2.042	2.457	2.750
	40	1.303	1.684	2.021	2.423	2.704
	60	1.296	1.671	2.000	2.390	2.660
	90	1.291	1.662	1.987	2.368	2.632
	120	1.289	1.658	1.980	2.358	2.617
	Infinity	1.282	1.645	1.960	2.326	2.576

Source: Econ 571 Spring 2003

Appendix C

Table 3: Durbin-Watson statistic-5% significance points of dl and du

	k' = 1		k' = 2		k' = 3		k' = 4		k' = 5		k' =6	
n	dl	du	dl	du	dl	du	dl	du	dl	du	dl	du
6	0.610	1.400										
7	0.700	1.356	0.467	1.896								
8	0.763	1.332	0.559	1.777	0.368	2.287						
9	0.824	1.320	0.629	1.699	0.455	2.128	0.296	2.588				
10	0.879	1.320	0.697	1.641	0.525	2.016	0.376	2.414	0.243	2.822		
11	0.927	1.324	0.758	1.604	0.595	1.928	0.444	2.283	0.316	2.645	0.203	3.005
12	0.971	1.331	0.812	1.579	0.658	1.864	0.512	2.177	0.379	2.506	0.268	2.832
13	1.010	1.340	0.861	1.562	0.715	1.816	0.574	2.094	0.445	2.390	0.328	2.692
14	1.045	1.350	0.905	1.551	0.767	1.779	0.632	2.030	0.505	2.296	0.389	2.572
15	1.077	1.361	0.946	1.543	0.814	1.750	0.685	1.977	0.562	2.220	0.447	2.472
16	1.106	1.371	0.982	1.539	0.857	1.728	0.734	1.935	0.615	2.157	0.502	2.388
17	1.133	1.381	1.015	1.536	0.897	1.710	0.779	1.900	0.664	2.104	0.554	2.318
18	1.158	1.391	1.046	1.535	0.933	1.696	0.820	1.872	0.710	2.060	0.603	2.257
19	1.180	1.401	1.074	1.536	0.967	1.685	0.859	1.848	0.752	2.023	0.649	2.206
20	1.201	1.411	1.100	1.537	0.998	1.676	0.894	1.828	0.792	1.991	0.692	2.162
21	1.221	1.420	1.125	1.538	1.026	1.669	0.927	1.812	0.829	1.964	0.732	2.124
22	1.239	1.429	1.147	1.541	1.053	1.664	0.958	1.797	0.863	1.940	0.769	2.090
23	1.257	1.437	1.168	1.543	1.078	1.660	0.986	1.785	0.895	1.920	0.804	2.061
24	1.273	1.446	1.188	1.546	1.101	1.656	1.013	1.775	0.925	1.886	0.837	2.035
25	1.288	1.454	1.206	1.550	1.123	1.654	1.038	1.767	0.953	1.873	0.868	2.012
26	1.302	1.461	1.224	1.553	1.143	1.652	1.062	1.759	0.979	1.861	0.897	1.992
27	1.316	1.469	1.240	1.556	1.162	1.651	1.084	1.753	1.004	1.850	0.925	1.974
28	1.328	1.476	1.255	1.560	1.181	1.650	1.104	1.747	1.028	1.841	0.951	1.958
29	1.341	1.483	1.270	1.563	1.198	1.650	1.124	1.743	1.050	1.833	0.975	1.944
30	1.352	1.489	1.284	1.567	1.214	1.650	1.143	1.739	1.071	1.825	0.998	1.931

Source: Econ 571 Spring 2003

k' - is the number of regressors excluding the intercept

This table is constructed only for the purpose of this research because the orginal table includes values till n= 200 and k' = 20

Appendix D
Regression and Testing Tables

Table 1: Summary output for the estimation of linear sheep meat supply 1980 - 2001

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.9580
R Square	0.9177
Adjusted R Square	0.8902
Standard Error	8.2120
Observations	21.0000

ANOVA

	df	*SS*	*MS*	*F*
Regression	5	11276	2255	33
Residual	15	1012	67	
Total	20	12288		

		Baseline	Current			
		Coefficients	*Coefficients*	*Standard Error*	*t Stat*	*P-value*
Constant term	Intercept	87.97148	87.97148	14.88945	5.90831	0.00003
Lagged sheep meat production	X Variable 1	0.29324	0.29324	0.11764	2.49264	0.02486
Lagged sheep meat wholesale price	X Variable 2	0.00064	0.00064	0.00014	4.59076	0.00035
Lagged fodder price	X Variable 3	-0.00525	-0.00525	0.00205	-2.55693	0.02190
Difference in sheep herd	X Variable 4	0.00720	0.00720	0.00214	3.36245	0.00427
Difference in prices	X Variable 5	-0.00113	-0.00113	0.00041	-2.75339	0.01479

	Baseline	Current
CP	109.3646	109.36
Short run price elasticity of supply	0.2871	
Long run price elasticity of supply	0.2873	

Source: Author calculations according to MAAR & NAPC data

Appendix D

Table 2: Correlation matrix of linear sheep meat supply 1980 - 2001

	Sheep Meat Production	Lagged Sheep Meat Production	Lagged Sheep Meat Wholesale Price	Lagged Fodder Concentrate Price	Difference in Sheep Herd	Difference in Price
Sheep meat production	1.0000					
Lagged sheep meat production	0.8550	1.0000				
Lagged sheep meat wholesale price	0.7158	0.6977	1.0000			
Lagged fodder concentrate price	0.4265	0.4726	0.8813	1.0000		
Difference in sheep herd	0.0553	-0.0824	-0.3439	-0.3060	1.0000	
Difference in price	-0.4151	-0.2929	0.0696	0.0696	-0.0574	1.0000

Table 3: Testing for aurocorrelation of linear sheep meat supply 1980 -2001

et	et-et-1	et^2	(et-et-1)^2	Durbin Watson Calculated (DWT)			
				DWC	1.987		
				Durbin Watson critical values (DWC)			
				dl	0.829	du	1.964
				Reject autocorrelation			
-15		229					
1	17	2	275				
7	6	51	33				
10	3	108	10				
0	-10	0	104				
-1	-1	1	1				
-4	-3	17	10				
-4	0	13	0				
8	11	61	131				
-4	-12	19	150				
3	7	8	52				
-4	-7	20	53				
-5	0	21	0				
3	8	9	57				
12	9	139	77				
-10	-22	99	474				
2	12	4	144				
-1	-3	1	9				
-11	-10	125	104				
7	18	46	324				
6	-1	36	1				
Sum		1012	2010				

Source: Author calculations according to MAAR & NAPC data

Appendix D

Table 4: Testing for heteroskedasticity of linear sheep meat supply 1980-2001

Sheep Meat Production	Lagged Sheep Meat Production	Lagged Sheep Meat Wholesale Price	Lagged Fodder	Difference In number Of sheep Herd	Difference in Sheep Price	Sheep Meat Supply	et	et^2
000 tons	000 tons	Sp/ton	Sp/ton	Thousand	Sp/ton			
108	104	16,114	743	306	3,537	109	-1	0.3356
123	108	19,084	1,442	315	4,477	123	0	0.2131
142	123	19,294	713	325	195	140	2	3.9772
137	126	41,642	1,011	1,022	11,568	139	-2	4.7597
126	129	27,329	766	1,000	14,571	123	3	9.8854
146	137	50,409	2,076	320	12,164	145	1	1.6713
129	138	19,262	721	676	10,268	132	-3	9.0461
154	139	112,737	5,182	-1,890	8,416	154	0	0.0403
SUM								29.93
Goldfeld - Quant F-statistic calculated				GFQT	1.67			
Goldfeld - Quant F-statistic critical value				GFQC	19			
				Accept homoscedasticity				
188	154	107,779	4,610	818	6,994	187	1	1.3637
145	159	99,083	8,257	685	15,596	145	0	0.0011
184	168	99,250	3,777	-493	440	185	-1	1.4917
190	183	98,710	3,880	710	1,689	189	1	0.4200
173	184	93,709	3,500	-1,143	7,292	174	0	0.2302
183	188	103,971	4,176	1,044	2,288	186	-3	9.7332
197	190	99,853	3,859	1,596	998	195	2	2.7890
168	197	100,306	3,838	-1,427	553	167	1	1.8708
SUM								17.90

Table 5: Correlation matrix of linear sheep meat demand 1980-2001

	Consumption	Consumption Per Capita	Sheep Meat Retail Price	Private Expenditure	Private Expenditure per Capita
Consumption	1.0000				
Consumption per capita	-0.8673	1.0000			
Sheep meat retail price	0.7739	-0.9307	1.0000		
Private Expenditure	0.9488	-0.9152	0.9061	1.0000	
Private consumption per capita	0.8923	-0.9185	0.9539	0.9860	1.0000

Source: Author calculations according to MAAR & NAPC data

Appendix D

Table 6: Summary output for the estimation of linear Engel's curve for Syrian sheep meat 1980 - 2001

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.9185
R Square	0.8437
Adjusted R Square	0.8354
Standard Error	0.2443
Observations	21

ANOVA

	df	*SS*	*MS*	*F*
Regression	1	6.1180	6.1180	102.5314
Residual	19	1.1337	0.0597	
Total	20	7.2518		

		Coefficients	*Standard Error*	*t Stat*	*P-value*
Constant term	Intercept	13.0869	0.1159	112.9421	0.0000
Expenditure per capita	X Variable 1	-0.0001	0.0000	-10.1258	0.0000
Average elasticity of income	-0.083				

Table 7: Summary output for the estimation of double-log Engel's curve for Syrian sheep meat 1980 - 2001

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.9362
R Square	0.8766
Adjusted R Square	0.8701
Standard Error	0.0179
Observations	21

ANOVA

	df	*SS*	*MS*	*F*
Regression	1	0.0433	0.0433	134.9230
Residual	19	0.0061	0.0003	
Total	20	0.0494		

		Coefficients	*Standard Error*	*t Stat*	*P-value*
Constant term	Intercept	3.1484	0.0570	55.2031	0.0000
Expenditure per capita	X Variable 1	-0.0714	0.0061	-11.6156	0.0000
Income elasticity	-0.0714				

Table 8: Summary output for the estimation of semi-log Engel's curve for Syrian sheep meat 1980 - 2001

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.9389
R Square	0.8816
Adjusted R Square	0.8753
Standard Error	0.2126
Observations	21

ANOVA

	df	*SS*	*MS*	*F*
Regression	1	6.3930	6.3930	141.4393
Residual	19	0.8588	0.0452	
Total	20	7.2518		

		Coefficients	*Standard Error*	*t Stat*	*P-value*
Constant term	Intercept	20.0759	0.6769	29.6607	0.0000
Expenditure per capita	X Variable 1	-0.8676	0.0730	-11.8928	0.0000
Income elasticity	-0.0720				

Source: Author calculations according to MAAR & NAPC data

Appendix D

Table 9: Summary output for the estimation of a dynamic linear Syrian sheep meat demand 1980 - 2001

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.9867
R Square	0.9735
Adjusted R Square	0.9688
Standard Error	8400
Observations	21

ANOVA

	df	*SS*	*MS*	*F*
Regression	3	44043200614	14681066871	208.0853
Residual	17	1199403202	70553129.5	
Total	20	45242603816		

		Coefficients	*Standard Error*	*t Stat*	*P-value*
Constant term	Intercept	709789.5915	122147.8041	5.8109	0.0000
Sheep meat consumption per capita	X Variable 1	-54124.5135	9320.0333	-5.8073	0.0000
Private expenditure per capita	X Variable 2	6.5674	0.8102	8.1059	0.0000
Time trend	X Variable 3	-4927.4497	921.7201	-5.3459	0.0001
	Baseline	Current			
CP	737732	737732			
Short run price elasticity of sheep meat demand		-0.131599			
Long run price elasticity of sheep meat demand		-0.13160099			

Table 10: Summary output for the estimation of a dynamic logarithmic Syrian sheep meat demand 1980 -2001

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.9823
R Square	0.9650
Adjusted R Square	0.9588
Standard Error	0.1496
Observations	21

ANOVA

	df	*SS*	*MS*	*F*
Regression	3	10.4796	3.4932	156.1360
Residual	17	0.3803	0.0224	
Total	20	10.8599		

		Coefficients	*Standard Error*	*t Stat*	*P-value*
Constant term	Intercept	23.1838	6.5432	3.5432	0.0025
Sheep meat consumption per capita	X Variable 1	-7.8812	2.2250	-3.5422	0.0025
Private expenditure per capita	X Variable 2	0.8625	0.1554	5.5488	0.0000
Time trend	X Variable 3	-0.0379	0.0154	-2.4647	0.0247

Source: Author calculations according to MAAR & NAPC data

Table 11: Summary output for the estimation of a total dynamic Syrian linear sheep meat demand 1980 - 2001

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.9979
Adjusted R Square	0.9951
Standard Error	1.6177
Observations	21

ANOVA

	df	*SS*	*MS*	*F*
Regression	3	10533	3511	1342
Residual	17	44	3	
Total	20	10577		

		Basline	Current			
		Coefficients	*Coefficients*	*Standard Error*	*t Stat*	*P-value*
Constant term	Intercept	114.8470	114.8470	0.8957	128.2270	0.0000
Sheep meat retail price	X Variable 1	-0.0002	-0.0002	0.0000	-7.9809	0.0000
Private expenditure	X Variable 2	0.0001	0.0001	0.0000	4.6768	0.0002
Time trend	X Variable 3	3.3312	3.3312	0.2244	14.8421	0.0000

CP	164	181		
Short run price elasticity of demand	-0.08488			
Long run price elasticity of demand	-0.08489			
	deflated	current		
P*(CP)	79938	159876	Spread	88591 Retail 71285 Wholesale
Q*	154	154		

Source: Author calculations according to MAAR & NAPC data

Table 12: Testing for autocorrelation and heteroscedasticity of linear Syrian sheep meat demand per capita 1980 - 2001

et	et-et-1	et^2	(et-et-1)^2	Sheep Meat Retail Price Sp/Ton	Consumption Per Capita kg/person	Private Expenditure per Capita Sp/person	t	Inverse Demand	et	et^2
-14,357		206,134,120		117,160	11	18,492	21	122,861	-5,701	32,496,930
-3,961	10,397	15,686,259	108,093,106	157,603	11	18,759	13	150,723	6,880	47,329,286
60	4,021	3,658	16,169,007	150,365	11	18,477	14	141,117	9,248	85,523,952
5,329	5,268	28,397,682	27,756,727	115,640	12	19,392	20	112,157	3,483	12,130,917
6,018	689	36,212,079	474,307	128,214	12	17,189	15	122,940	5,274	27,819,347
-2,542	-8,560	6,461,524	73,266,752	116,997	12	19,425	19	112,787	4,210	17,721,934
-4,119	-1,577	16,963,680	2,486,128	118,929	12	19,637	16	130,735	-11,806	139,387,395
11,203	15,322	125,515,319	234,765,545	127,521	12	17,488	12	139,109	-11,588	134,276,803
-1,773	-12,976	3,143,215	168,383,673	Sum						496,686,564
6,648	8,421	44,198,468	70,914,998	Quant F T calculated				GFQT	3	
-989	-7,638	979,047	58,333,862	Quant F T critical value				GFQC	5	
-6,356	-5,367	40,400,811	28,801,418					Accept homoscedasticity		
7,316	13,672	53,520,709	186,922,165							
10,106	2,790	102,131,547	7,785,386	72,222	12	7,349	8	65,862	6,360	40,454,001
7,713	-2,393	59,492,921	5,725,731	44,491	12	5,945	7	48,148	-3,657	13,376,372
-9,569	-17,282	91,564,560	298,671,072	32,886	13	5,375	6	40,824	-7,938	63,007,750
-2,664	6,905	7,098,202	47,674,773	24,318	13	4,032	5	24,769	-451	203,736
4,137	6,802	17,118,322	46,262,777	21,898	13	3,760	4	18,889	3,009	9,056,754
4,635	497	21,481,235	247,363	21,798	13	4,044	3	18,505	3,293	10,844,160
1,100	-3,535	1,210,494	12,493,120	26,352	13	4,783	2	23,050	3,302	10,900,429
-17,936	-19,036	321,689,352	362,366,438	21,979	13	5,343	1	25,897	-3,918	15,350,188
Sum		1,199,403,202	1,757,594,350	Sum						163,193,390
		993,269,081								

Durbin - Watson calculated

DWT	1.7695
dl	1.026
du	1.669

Reject autocorrelation

Source: Author calculations according to MAAR & NAPC data

AppendixD

Table 13: Correlation matrix of the Syrian sheep milk supply

	Sheep Milk Production	Number of Milked Sheep Females	Lagged Sheep Milk Whole Sale Price	Fodder Price	Lagged Sheep Milk Production	Rainfall	Lagged Wages
Sheep meat production	1.0000						
Number of milked sheep females	0.9033	1.0000					
Lagged sheep milk wholesale price	0.5394	0.6367	1.0000				
Fodder price	0.4896	0.7732	0.8115	1.0000			
Lagged sheep milk production	0.5782	0.7794	0.1465	0.5899	1.0000		
Rainfall	-0.1125	-0.3695	-0.4133	-0.6942	-0.3405	1.0000	
Wages	0.3457	0.6927	0.6576	0.9697	0.6500	-0.7390	1.0000

Table 14: Summary output for the linear estimation of the Syrian sheep milk supply

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.9729
R Square	0.9464
Adjusted R Square	0.9331
Standard Error	13.4353
Observations	21.0000

ANOVA

	df	*SS*	*MS*	*F*
Regression	4	51041	12760	71
Residual	16	2888	181	
Total	20	53929		

		Coefficients	*Standard Error*	*t Stat*	*P-value*
Constant term	Intercept	102.9564	34.7645	2.9615	0.0092
Lagged sheep milk production	X Variable 1	-0.1675	0.0945	-1.7731	0.0952
Number of milked sheep female	X Variable 2	0.0531	0.0046	11.4410	0.0000
Lagged sheep milk wholesale price	X Variable 3	0.0110	0.0036	3.0290	0.0080
Lagged fodder price	X Variable 4	-0.0146	0.0048	-3.0553	0.0076

Ceteris paribus (CP)	411.43	
Own price elasticity short run	0.1222	
Own price elasticity long run	0.1235	
Durbin Watson	2.2190	Inconclusive
Durbin du	1.8280	
Durbin dl	0.8940	
Goldfeld-Quant test	1.0000	Accept homoscedasticity
Goldfeld-Quant test required	9.0000	

Source: Author calculation according to MAAR & NAPC data

Appendix D

Table 15: Logarithmic estimation of Syrian sheep milk supply 1980 - 2001

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.9695
R Square	0.9400
Adjusted R Square	0.9250
Standard Error	0.0304
Observations	21

ANOVA

	df	*SS*	*MS*	*F*
Regression	4	0.2320	0.0580	62.6868
Residual	16	0.0148	0.0009	
Total	20	0.2468		

		Coefficients	*Standard Error*	*t Stat*	*P-value*
Constant term	Intercept	-0.9686	0.6999	-1.3838	0.1854
Lagged sheep milk production	X Variable 1	-0.1654	0.1065	-1.5526	0.1401
Number of milked sheep female	X Variable 2	0.8754	0.0906	9.6670	0.0000
Lagged sheep milk wholesale price	X Variable 3	0.0988	0.0415	2.3813	0.0300
Lagged fodder price	X Variable 4	-0.0738	0.0319	-2.3152	0.0342

Source: Author calculation according to MAAR & NAPC data

Table 16: Testing for autocorrelation and heteroskedasticity of Syrian linear sheep milk supply 1980 - 2001

Sheep Milk Production	Number of Milked Sheep Females	Lagged Sheep Milk Production	Lagged Sheep Milk Whole Sale Price Deflated	Lagged Fodder Price Deflated	Supply	et	et^2	et	et-et-1	et^2	(et-et-1)^2
000tons	thousand	000tons	Sp/ton	Sp/ton							
384	6,621	385	1,381	750	382	2	3	-10		102	
410	6,825	384	1,589	1,485	408	2	3	13	23	164	524
420	6,950	419	1,717	814	410	10	95	-14	-26	188	702
414	7,015	401	1,491	748	413	1	1	0	14	0	195
401	7,036	410	1,781	870	414	-13	161	1	0	0	0
419	7,144	414	1,509	752	425	-6	37	11	10	119	108
418	7,144	517	9,132	5,868	418	0	0	9	-2	81	4
457	7,624	420	2,081	828	453	5	20	16	7	267	54
							320	-32	-48	1,023	2,336
								-13	19	181	343
Goldfeld-Quant test calculated			0.7 Accept homoscedasticity					7	21	50	423
Goldfeld-Quant test critical value			9					3	-4	10	15
								-13	-16	173	268
500	8,622	495	6,892	3,838	492	8	68	8	21	57	428
497	8,928	439	4,561	2,944	505	-8	65	-12	-19	139	373
524	8,980	499	7,641	4,176	517	7	52	0	12	0	146
495	8,993	582	6,598	3,859	500	-5	24	4	4	20	17
512	9,275	513	9,633	7,294	510	2	5	12	8	146	58
517	9,396	512	9,050	5,868	531	-15	215	-5	-17	21	277
513	9,498	497	6,796	6,338	508	5	24	2	7	6	49
582	10,074	524	6,945	3,880	577	5	25	12	9	141	89
							479			2,888	6,408
				Durbin - Watson statistic				DWT	2.219		
				Durbin du	1.828			Inconclusive			
				Durbin dl	0.894						

Source: Author calculation according to MAAR & NAPC data

Table 17: Summary output for the linear estimation of Syrian sheep milk demand 1980-2001

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.9771
R Square	0.9547
Adjusted R Square	0.9386
Standard Error	12.2589
Observations	20.0000

ANOVA

	df	*SS*	*MS*	*F*
Regression	5	44368	8874	59
Residual	14	2104	150	
Total	19	46472		

		Coefficients	*Standard Error*	*t Stat*	*P-value*
Constant term	Intercept	131.4853	55.8306	2.3551	0.0336
Lagged sheep milk consumption	X Variable 1	0.7313	0.1508	4.8490	0.0003
Lagged sheep milk retail price	X Variable 2	-0.0119	0.0026	-4.6344	0.0004
Price difference between two successive periods	X Variable 3	-0.0371	0.0076	-4.8895	0.0002
Lagged expenditure per capita	X Variable 4	0.0044	0.0020	2.2026	0.0449
Expenditure difference per capita between two successive periods	X Variable 5	0.0376	0.0033	11.3630	0.0000

CP	521		
Goldfeld-Quant test	GFFT	0.7825	
	GFFC	9.2800	
	Accept homoskedasticity		
Durbin Watson for autocorrelation	Inconclusive	dl	0.7920
		du	1.9910
		calculated	1.5930
Price elasticity in the short run	-0.1668		
Price elasticity in the long run	-0.1689		

Table 18: Testing for autocorrolation and heteroskedasticity of Syrian linear sheep milk demand 1980 - 2001

sheep Milk Consumption	Lagged sheep Milk Consumption	Lagged Sheep Milk Retail Price Deflated	Difference in Sheep Milk Retail Price Deflated DP	Lagged Private Expenditure per Capita Deflated	Difference in Expenditure per Capita Deflated DE	Demand	et	et^2	et	et-et-1	et^2	(et-et-1)^2
1000 tons	1000 tons	Sp/ton	Sp/ton	Sp/person	Sp/person							
387	371	1,955	45	4,663	61	385	1	2	-13		182	
399	387	2,000	-33	4,724	-528	401	-2	6	7	20	44	406
409	399	1,967	-26	4,196	-250	406	3	12	-1	-7	0	54
415	409	1,941	213	3,946	444	417	-2	3	-18	-17	326	303
432	415	2,155	524	4,389	728	434	-2	5	-5	13	21	182
444	426	10,313	-962	18,142	293	444	0	0	12	17	153	288
461	432	2,679	827	5,118	1,105	459	2	3	18	6	321	31
487	444	9,351	-1,081	18,434	72	486	0	0	6	-12	30	154
								31	-5	-11	26	113
Goldfeld - Quant test calculated				GFQT	0.8				9	14	74	187
Qoldfeld - Quant test critical value				GFQC	9				-7	-15	43	229
				Accept homoscedasticity					-18	-11	316	126
467	461	3,506	926	6,223	786	465	2	4	3	21	10	441
456	467	4,432	1,617	7,009	1,591	458	-2	6	-1	-5	2	22
486	481	10,232	945	15,062	2,681	484	2	4	19	20	358	416
445	486	11,178	-364	17,742	499	447	-1	2	9	-10	73	107
453	486	7,457	1	19,054	-701	451	2	5	-6	-14	34	208
529	487	8,270	-748	18,507	620	530	-1	1	-9	-3	84	11
486	512	7,353	104	19,111	-57	490	-4	13	-1	8	1	64
512	529	7,522	-169	19,127	-16	509	2	6	2	3	4	10
								40			2104	3352
						Durbin - Watson test calculated			DWT	1.5930		
									dl	0.7920	Inconclusive	
									du	1.9910		

Source: Author calculations according to MAAR & NAPC data

References

1. Purcell Wayne D., Agricultural marketing: Systems, Coordination, Cash and Future Prices, Reston Publishing Company, Inc., 1979, PP. 3-4, 35.
2. Kohls Richard L., and Uhl Joseph N., Marketing of agricultural products, Ninth edition, Printice - Hall, Inc., Upper Saddle River, New Jersey 07458, 2002, PP. 7,15, 286.
3. Rama Daniele, et al., Supply chain coordination and policy implications: The case of dairy and red meat products in Syria, GCP/SYR/006/ITA, 2001, P. 5.
4. Pindyck Robert S., and Rubinfeld Daniel L., Microeconomics, Instructor's manual, Fourth edition, Prentice Hall, Upper Saddle River, NJ 07458, 1998, P. 5.
5. Bressler Raymond G., King Jr. Richard A., Markets, Prices, and International trade, John Wiley & Sons, Inc., 1970, P. 87.
6. Houck James P., Elements of agricultural trade policies: The partial equilibrium setting for trade policy analysis, Chicago, 1991, Chapter 4.
7. Gelb A., et al., From plan to market, World development report 1996, World Bank, Oxford University Press, New York, 1996, P. 3.
8. Khan Mohsin S., and Knight Malcolm D., Fund – supported adjustment programs and economic growth, International Monetary Fund, Washington, D.C., November 1985.
9. National Agricultural Policy Center (NAPC), Database, Syria, Damascus, 1999.
10. United Nation (UN), Evaluation of agricultural policies in the Syrian Arab Republic (Policy Analysis Matrix Approach), New York, 1995.
11. Rama Daniele, et al., Agricultural marketing and processing, Project GCP/SYR/006/ITA, Damascus, Syria, October 2000.
12. Marion Bruce W., NC 117 Committee, The organization and performance of the U.S. food system, Lexington Books, D.C. Heath and Company, 1986.
13. Ward Clement E., Meatpacking competition and pricing, The Research Institute on Livestock Pricing, Blacksburg, Virginia, July 1988.
14. Bottomley Anthony, and Constant Rudof, Methods for setting priorities among different lines of agricultural research, 1988.
15. Der Wal P. Van, Nieuwhof G.J., and Politiek R.D., Biotechnology for control of growth and product quality in swine implications and acceptability, Pudoc Wageningen, Netherlands, 1989.
16. United States Department of Agriculture (USDA), Grain Inspection, Packers and Stockyards Administration (GIPSA), Assessment of the cattle and hog industries, Calender year 2001, June 2002.
17. Trienekens J.H., Omta S.W.F., Paradoxes in food chains and networks, Wageningen Academic Publishers, June 2002.
18. Trienekens J.H., Zuurbier P.J.P., Chain management in agribusiness and the food industry, Wageningen Pers, May 2000.
19. Kilmer Richard L., and Armbruster Walter J., Economic efficiency in agricultural and food marketing, Iowa State University Press/Ames/1987.
20. Harwood Joy, et al., Managing risk in farming: Concepts, Research, and Analysis, Economic Research Service, U.S. Department of Agriculture, 2001.
21. Ahearn Mary Clare, Banker David, and Donald Jim Mac, Price and non-price terms in U.S. agricultural contracts, AAEA powerpoint presentation, July 2003.
22. Hull John C., Options, Futures, and other Derivatives, 5th edition, Prentice – Hall, Upper Saddle River, NJ, 2003.

23. Grant James L., Foundations of economic value added, Second edition, Frank J. Fabozzi, 2003.
24. Lawrence John D., The vision, Iowa's economic future & the role of agriculture, 2003.
25. Salvatore Dominick, and Diulio Eugene A., Principles of economics, Second edition, Mc Graw – Hill Companies, Inc., and Math Soft, Inc., 1996.
26. Binger Brian R., and Hoffman Elizabeth, Microeconomics with calculus, Second edition, Addison – Wesley, 1998.
27. Nicholson Walter, Microeconomic theory, Basic principles and extensions, seventh edition, The Dryden Press, 1998.
28. Kraker Eileen, An overview of the Canadian agriculture and agri - food system, 2003.
29. Tesfatsion Leigh, Economics 502 class lecture material, 2002.
30. Omta S.W.F., Trienekens Jacques, and Beers George, A research and management agenda for chain and network science, Journal on Chain and Network Science, Vol.2, no.1, 2002, PP. 1-5.
31. Omta Onno, Trienekens Jacques, and Beers George, The knowledge domin of chain and network science, Journal on Chain and Network Science, Vol. 1, no.2, 2001, PP. 77-85.
32. Halcrow Harold G., Agricultural policy analysis, Mc Graw – Hill, Inc., 1984.
33. Johnson S.R., and Martin S.A., Industrial policy for agriculture in the global economy, Iowa State University Press, Ames,1993.
34. Meulenberg Matthew, Food and agribusiness marketing in Europe, 1993.
35. Marion Bruce W., et al., The food retailing industry, Praeger Publishers, 1979.
36. Callahan Patricia, and Zimmerman Ann, Wal-Mart, After remaking discount retailing, now nation's largest grocery chain, Wall Street Journal, 2003 http://www.organicconsumers.org/supermarket/060103-walmart-grocery.cfm
37. Ibrahim Abdul Aziz, Commodity chain analysis, project GCP/IA/1995.
38. Helmberger Peter G., Economic analysis of farm programs, Mc Graw-Hill, Inc., 1999.
39. Salvatore Dominick, Statistics and econometrics, Mc Graw-Hill Companies, Inc., 1982.
40. Tamhane Ajit C., and Dunlop Dorothy D., Statistics and data analysis, Prentice Hall, Upper Saddle River, NJ 07458, 2000.
41. Wooldridge Jeffrey M., Introductory econometrics, A modern approach, Second edition, South – Western College publishing, 2003.
42. Boal William, Economics 571, Class slides, 2003.
43. Heady Earl O., et al., Agricultural supply functions, The Iowa State University Press, 1961.
44. Giovanni Bellu Lorenzo, Training course on economics of agricultural markets, GCP/SYR/006/ITA, 1999.
45. Perali Federico, Training course on applied agricultural policies, GCP/SYR/006/ITA, 1999.
46. Heady Earl O., and Bhide Shashanka, Livestock response functions, The Iowa State University Press, Ames, Iowa, 1983.
47. Brown D. Scott, and Brandt A. Jon, Supply response and price expectations, An analysis of the fed-beef industry, NCR-134 Conference, Applied Commodity Price Analysis, Forecasting, and Market Risk Management, 1989.
48. Pearse Elaine, Ramaratnam Ram Sri, and Dake' Chris, Dynamics of supply and demand for New Zealand Venison and Velvet, 2002.
49. Nerlove Marc, The dynamic of supply, The Johns Hopkins Press, 1958.

50. Raunikar Robert, and Huang Chung – Liang, Food demand analysis, Iowa State University Press/Ames, 1984.
51. Johnson Stanley R., Hassan Zuhair A., and Green Richard D., Demand Systems estimation, The Iowa State University Press/Ames, 1984.
52. Little Arthur D., Economic analyses of advertising effectiveness, General methodological perspective, 1985.
53. Gaisford James D., and Kerr William A., Economic analysis for international trade negotiations, Edward Elgar Publishing, Inc., 2001.
54. Key Nigel, Sadoulet Elisabeth, and de Janvry Alain, Transaction costs and agricultural household supply response, Amer. J. Agr. Econ. 82, May, 2000, PP. 245 – 259.
55. www.google.com-sheep-American Sheep Industry Association, 2003.
56. Carlson C. Wendell, Greaser Marion L., and Jones Kevin W., The meat we eat, thirteenth edition, Interstate Publishers, Inc., 1994.
57. Hayenga Marvin, et al., Meat packer vertical integration and contract linkages in the beef and pork industries: An economic perspective, American Meat Institute, Arlington, VA.June, 2000.
58. Piggott N.E., and Wright V.E., From consumer choice process to aggregate analysis, Marketing insights for models of meat demand, Australian Journal of Agricultural Economics, 36 (3), December 1992, PP. 233 – 248.
59. Fan Shou – Ching, Analysis of the demand for meat in the United States, 1910 – 1947, Thesis, Iowa State College, 1949.
60. Cashin Paul, A model of the disaggregated demand for meat in Australia, Australian Journal of Agricultural Economics, 35 (3), December 1991, PP. 263 – 281.
61. Eales James, and Unnevehr Laurian J., Simultaneity and structural changes in U.S. meat demand, NCR – 134 Conference, Applied Commodity Price Analysis, Forecasting, and Market Risk Management, Chicago, Illinois, April 20 – 21, 1992, PP. 281 – 292.
62. Wahl Thomas I., Mittelhammer Ron C., and Hayes Dermot J., To invert or not to invert: The case of direct and inverse AIDS meat demand Systems, NCR – 134 Conference, Applied Commodity Price Analysis, Forecasting, and Market Risk Management, Chicago, Illinois, April 20 – 21, 1992, PP. 262 – 292.
63. Johnes Rodney, Purcell Wayne D., and Mc Guirk Anya, Dynamic relationships in the U.S. lamb marketing channels, NCR – 134 Conference, Applied Commodity Price Analysis, Forecasting, and Market Risk Management, Chicago, Illinois, April 19 – 20, 1993, PP. 24 – 36.
64. FAO, F.A.O. yearbook, Production 2001, Vol. 55, FAO statistics series no. 170, Rome, 2002.