

Cheese: Value Added Dairy Product *Prospects for Pakistan*

DAIRY & LIVESTOCK SERVICES
Business & Sector Development Services Division
2023



Small and Medium Enterprises Development Authority
Ministry of Industries and Production (MoI&P)
Government of Pakistan
www.smeda.org.pk

4th Floor, Building No. 3, Aiwan-e-Iqbal Complex, Egerton Road, Lahore
Tel: (92 42) 111 111 456, Fax: (92 42) 36304926-7

REGIONAL OFFICE PUNJAB
3rd Floor, Building No. 3, Aiwan-e-Iqbal Complex, Egerton Road Lahore,
Tel: (042) 111-111-456
Fax: (042) 36304926-7
helpdesk.punjab@smeda.org.pk

REGIONAL OFFICE SINDH
5TH Floor, Bahria Complex II,
M.T. Khan Road, Karachi.
Tel: (021) 111-111-456
Fax: (021) 5610572
helpdesk-khi@smeda.org.pk

REGIONAL OFFICE KPK
Ground Floor State Life Building
The Mall, Peshawar.
Tel: (091) 9213046-47
Fax: (091) 286908
helpdesk-pew@smeda.org.pk

REGIONAL OFFICE BALOCHISTAN
Bungalow No.15-A Chaman Housing
Scheme Airport Road, Quetta.
Tel: (081) 831623, 831702
Fax: (081) 831922
helpdesk-qta@smeda.org.pk

Table of Contents

1	Disclaimer.....	4
2	Table of Abbreviations.....	5
3	Introduction to SMEDA.....	6
4	Purpose of the Document.....	6
5	Introduction to Study	7
6	Value Chain of Pakistan’s Dairy Sector	8
6.1	Types of Farming Systems	10
6.2	Milk Production and Consumption	10
6.3	Milk Collection.....	11
6.3.1	Informal Channels.....	11
6.3.2	Formal Channels	11
6.4	Issues.....	12
6.5	Standardization and Compliance.....	13
6.5.1	Pakistan’s National Standards.....	13
6.6	Regulations.....	14
6.6.1	Federal Ministries and Bodies Concerned	14
7	History and Definition of Cheese	15
7.1	Classification of Cheese.....	16
7.1.1	General Classification.....	16
7.1.2	Harmonized System (HS) Classification	19
7.1.3	Selection of Product for Study	20
7.2	Characteristics of Some Famous Varieties of Cheese	20
7.2.1	Mozzarella.....	20
7.2.2	Cheddar	21
7.2.3	Cream Cheese	21
7.2.4	Feta Cheese	21
7.2.5	Goat Cheese	22

7.2.6	Swiss Cheese.....	22
7.2.7	Vegetarian Cheese	22
7.2.8	Processed Cheese	23
8	Production Technology	23
8.1	Curdling.....	25
8.2	Curd Processing.....	25
8.3	Ripening and Aging	26
8.4	Machinery and Equipment Requirements	27
9	Pakistan’s Market for Cheese	30
9.1	Pakistan’s Existing Cheese Production	31
9.2	Existing Players.....	31
10	Pakistan’s Trade: Cheese and Curd (HS 0406)	34
10.1	Pakistan’s Import for Processed Cheese (HS 040630)	36
10.2	Pakistan’s Import of Fresh Cheese (HS 040610)	38
11	Global Market for Cheese.....	40
11.1	Global Imports	40
11.2	Global Exports	43
12	Recommendations.....	45
13	Useful Links	46
14	References and Websites.....	47
15	Annexures.....	49
15.1	Annexure I: Punjab Food Authority	49
15.2	Annexure II: Relevant Ministries and Departments.....	51
15.3	Annexure III: Contact Details of Machinery Suppliers.....	52

1 Disclaimer

This information memorandum is to introduce the subject matter and provide a general idea and information on the said matter. Although, the material included in this document is based on data/information gathered from various reliable sources; however, it is based upon certain assumptions, which may differ from case to case. The information has been provided on as is where is basis without any warranties or assertions as to the correctness or soundness thereof. Although, due care and diligence has been taken to compile this document, the contained information may vary due to any change in any of the concerned factors, and the actual results may differ substantially from the presented information. SMEDA, its employees or agents do not assume any liability for any financial or other loss resulting from this memorandum in consequence of undertaking this activity. The contained information does not preclude any further professional advice. The prospective user of this memorandum is encouraged to carry out additional diligence and gather any information which is necessary for making an informed decision, including taking professional advice from a qualified consultant/technical expert before taking any decision to act upon the information.

For more information on services offered by SMEDA, please contact our website: www.smeda.org.pk

Document Control

Document No.	D&LS/Cheese/23
Version	2
Prepared by	SMEDA-BSDS
1 st Version Date	April 2017
2 nd Version Date	June 2023
For information	

2 Table of Abbreviations

Description	Abbreviations
GoP	Government of Pakistan
MoIP	Ministry of Industries and Production
SMEDA	Small and Medium Enterprises Development Authority
HS Classification	Harmonized System of Classification
BL	Billion Litres
GDP	Gross Domestic Product
UHT Processing	Ultra-High Temperature Processing
FAO	Food and Agriculture Organization
USDA	United States Department of Agriculture
WTO	World Trade Organization
ISO	International Standardization Organization
HACCP	Hazard Analysis Critical Control Point
PRP	Pre-Requisite Program
MNFS & R	Ministry of National Food Security and Research (Pakistan)
NARC	National Agriculture Research Council
PSQCA	Pakistan Standards and Quality Control Authority
PFL	The Pure Food Laws
nes	Not elsewhere specified

3 Introduction to SMEDA

The Small and Medium Enterprises Development Authority (SMEDA) was established in October 1998 with an objective to provide fresh impetus to the economy through development of Small and Medium Enterprises (SMEs).

With a mission "to assist in employment generation and value addition to the national income, through development of the SME sector, by helping increase the number, scale and competitiveness of SMEs", SMEDA has carried out 'sectoral research' to identify policy, access to finance, business development services, strategic initiatives and institutional collaboration and networking initiatives.

Preparation and dissemination of prefeasibility studies in key areas of investment has been a successful hallmark of SME facilitation by SMEDA.

Concurrent to the prefeasibility studies, a broad spectrum of business development services is also offered to the SMEs by SMEDA. These services include identification of experts and consultants and delivery of need based capacity building programs of different types in addition to business guidance through help desk services.

4 Purpose of the Document

The objective of this study is primarily to facilitate potential entrepreneurs in project identification for investment. The study may form the basis of an important investment decision and in order to serve this objective, the document/study covers various aspects of project concept development, start-up, and production, marketing, finance and business management.

The purpose of this document is to facilitate potential investors in cheese production by providing them a general understanding of the sector with the intention of supporting potential investors in crucial investment decisions.

The need to come up with this study reports for undocumented or minimally documented sectors attains greater imminence as the research that precedes such reports reveal certain thumb rules; best practices developed by existing enterprises by trial and error, and certain industrial norms that become a guiding source regarding various aspects of business set-up and its successful management.

Apart from carefully studying the whole document one must consider critical aspects provided later on, which form basis of any Investment Decision.

5 Introduction to Study

Pakistan ranks among top five milk producing countries globally. Dairy and livestock sector consists of approximately 100.5 million heads of cows and buffaloes and 117 million heads of sheep and goats, producing 67.9 million tons¹ of milk besides producing other products such as meat, skins etc. Livestock sector contributes almost 62.7% ²of the value added products in agriculture and 14.36% to the GDP³ which depicts high growth in agriculture is expected to be led by the dairy and livestock sector. Within the livestock sector, milk is the most important commodity with demand growing at 10-15% annually, yet production increasing by only 3–4% per annum⁴. Due to milk supply gap of 3.5-4 billion liters in 2022-23, limited value added products such as cheese, butter and powdered milk worth US\$ 82.8M were imported to meet rising domestic demand.

Despite the fact that Pakistan's ranking is amongst the highest in the region and the world, the country has not been able to make efficient use of resources to fill up its demand and supply gap for dairy value added products. In past few years, the focus has been on the import of these products rather than exporting to the world market. Some of the main reasons for the gap are efficiency losses in production, lack of awareness in farmer's/ producer's communities for increasing milk yield, limited integration within the dairy value and supply chain, policy issues and resource constraints to implement initiatives at macro level.

Development of an integrated dairy sector to produce value added products such as butter, whey, yogurt, cheese etc., compliant with international food safety standards is important to enhance trade opportunities for Pakistan in the global market for export. Similarly, exploiting the potential of producing value added products within the country may reduce import of these products from the world.

This study aims to highlight supply and trade related information in different categories of cheese. An assessment of Pakistan's cheese production and trade structure has been conducted in consultation with stakeholders in the public and private sectors to evaluate the performance of the sector, applicability and relevance of the existing situation to foster growth and obtain viable investment options that can be recommended to emerging as well as existing entrepreneurs and relevant institutions for inclusion in their vision and agenda.

¹ *Economic survey of Pakistan, 2022-23*

² *Economic Survey of Pakistan, 2022-23*

³ *Economic Survey of Pakistan, 2022-23*

⁴ *Dr. M. Younas. 2013. The Dairy Value Chain. A Promoter of Development and Employment in Pakistan. ICDD Working Paper.*

6 Value Chain of Pakistan's Dairy Sector

Livestock is an important sector of Pakistan's agricultural mix and holds significant value in the rural socioeconomic system as there is a large population of livestock well adapted to the local environmental conditions. More than 8 million small and landless rural-based farmers are directly or indirectly involved in livestock farming hence making it an ideal sector for alleviating poverty in the country especially in rural areas. Since, the sector's contribution to agri GDP is almost 62.7% witnessing a growth rate of 3.78 % per annum in 2022-23 compared to 2.25% during last year⁵, it is expected that overall growth in agriculture would be mainly led by this sector⁶.

Milk is a primary commodity of dairy sector with almost 15% annual increase in demand within the organized dairy industry. The industry requires milk production and supply to keep pace with the growing demand of the population in conjunction with maintaining efficient supplies. Since more than 83% of milk animals in the national herd are raised and bred by subsistence farmers, with limited interest in increasing productivity and limited networking in public and private sectors, the overall goal of achieving higher productivity in milk production seems to be difficult.

Not only milk but other value added dairy products extracted are also necessary to fulfil nutritional requirements of consumers. These include butter, cheese, ghee, yogurt, khoya, and flavored milk made through the use of traditional as well as modern methods. Traditional methods are mostly employed by farmers to fulfil their subsistent needs. They also sell these products to support their household income. In the organized sector, these products are produced and packed through use of industrial processes and sold at a commercial scale to the consumers located in various parts of the country. Dairy manufacturers are located mainly in the province of Punjab and have efficient distribution networks across the country.

On the other hand, there is high dependence on imported dairy products such as cheese due to the fact that the quantity, quality and variety of locally produced cheeses do not cater to the needs of consumers. Imported cheese, mostly in processed powder form, is consumed as an ingredient by many restaurants, bakeries etc. Imports are also used as a balancing tool to bridge domestic demand and supply gap in cheese consumption.

⁵ Economic Survey of Pakistan, 2022-23

⁶ Economic Survey of Pakistan, 2022-23

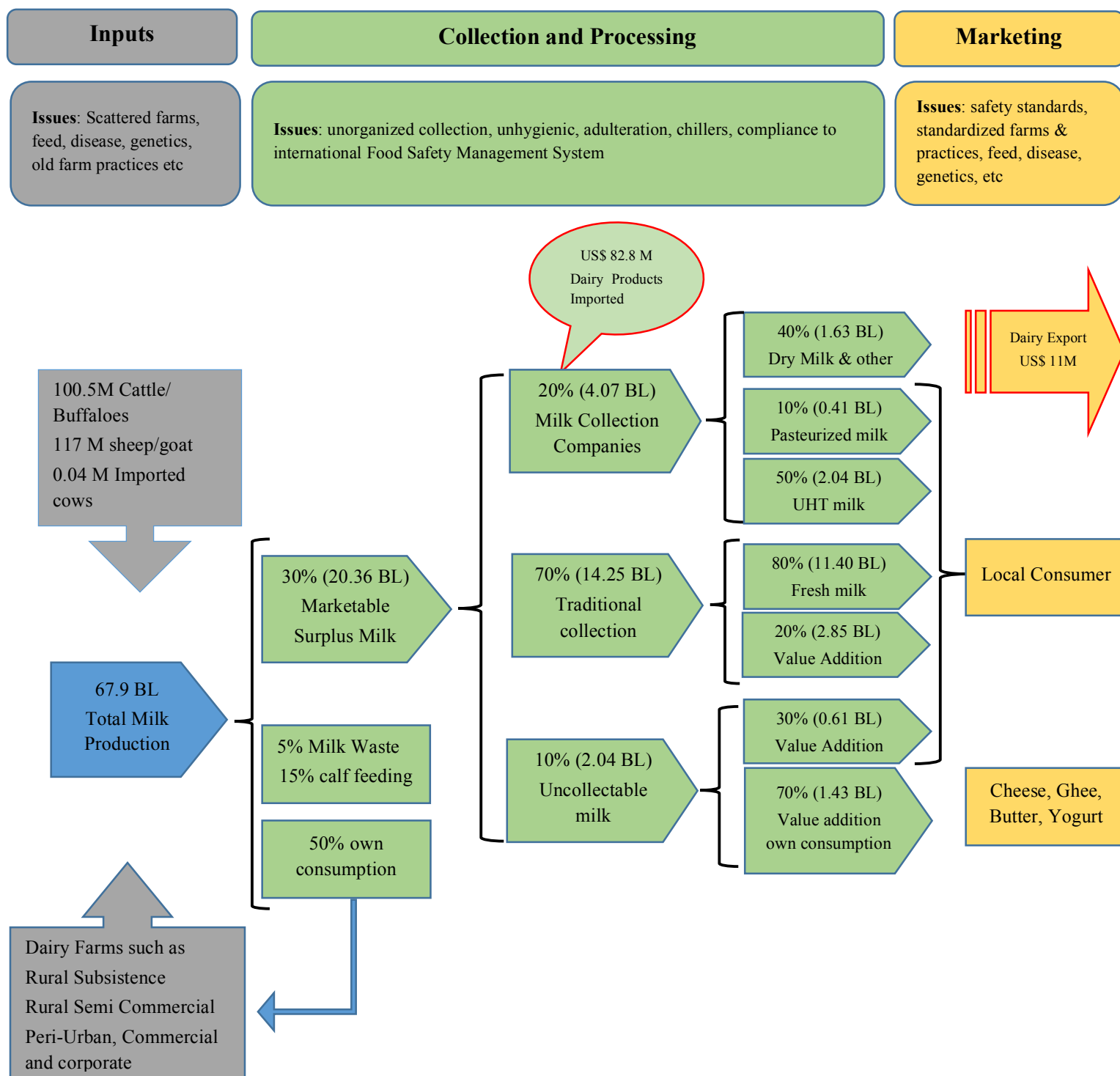


Figure 1: Value Chain of Dairy Sector in Pakistan (Ref: Economic survey of Pakistan, 2022-23)

6.1 Types of Farming Systems

In the past, livestock sector has remained a subsistent sector where small holders have been raising animals for acquiring meat, milk and dairy products mainly for their own consumption and also to receive cash income through small-scale domestic selling. However, this context has lately changed and now farm animals are also raised on semi-commercial and commercial scales to provide fresh or pasteurized milk and other related by-products such as cheese, yogurt, cream etc. The dairy sector of Pakistan is a mix of producers including small, medium and large farmers with varying land and animal holdings with different production capacities. The sector consists of;

- a) Subsistence farmers having less than five animals with low productivity and limited access to resources such as nutritious feed, breeding and veterinary health facilities.
- b) Medium and large size farmers especially located in peri-urban areas with relatively higher access to resources and facilities. These farmers have access to breeding services, better health facilities for their animals, nutritionally balanced feed and better market access through a more structured value chain.
- c) Dairy processing companies located near the peri-urban farms and milk producers with developed supply chain, producing value added products.

6.2 Milk Production and Consumption

Milk production accounts for approximately 80% of total production in rural areas which are geographically dispersed and scattered throughout the country. The production of milk is labour intensive and involves manual methods of milking the animals. Approximately 50% of total milk production in rural areas is consumed at source while the remaining is marketed through distribution channels of milk traders (dodhis).

Milk is also produced in peri-urban farms operated by medium and large-scale farmers having access to better value chain and distribution systems. Marketable milk is mainly obtained from cows and buffalos and distributed to consumers through use of conventional as well as modern marketing channels. It accounts for 97% of total milk produced from cows, buffalos, sheep and camels. Recently, there has been a rise in milk production from pure-bred and cross bred imported cows with high milk yields. These cows are raised in structured and organized farms located near the urban areas. Much of the milk produced at these centers is collected by large milk producing plants for commercial sales. This trend has become popular with the passage of time resulting in import of cows from Denmark, Sweden and Australia. It is pertinent to mention that 30% of the milk available for human is consumed in urban areas and 70% in rural population. Around 6-7% of total milk production is processed and marketed through formal channels.

6.3 Milk Collection

A variety of marketing channels are employed being used to procure and market raw milk. This variation is due to different production systems at various locations of the country. Marketing channels involve purchase of fresh milk from rural areas or remote milk pockets, and its supply to consumption centers on a daily basis, either for raw milk use or for conversion into milk products at small-scale dairy shops.

6.3.1 Informal Channels

Approximately 70% of marketable surplus milk (which is only 30% of total milk production)⁷ is collected and marketed through informal channels dominated by the traditional milk collection agents (Dodhi). They serve as a main source of procuring milk and have proven to be the most reliable link between the farmers and consumers. On the basis of scale of operations, they can be categorized in following groups;

- (i) Small Milk Collection Agent (Katcha dodhi) performing door-to-door collection of up to 100 litres milk
- (ii) Medium Milk Collection Agent (Pakka dodhi) involved in daily milk collection and distribution of 400-800 litres
- (iii) Large Milk Collection Agent or Contractors involved in milk collection mainly from medium-sized dodhis with daily average collection and distribution of 40-70 mounds⁸.

Small and medium milk collection agents sell more than 80% of milk collected to contractors, 10% to collection and procurement centers of processing plants and approx. 5% to local confectioners and bakers. On the other hand, large contractors sell 90% of milk procured to milk retail shops, milk processing plants and large-size bakers and confectioners⁹. However, the variation in the quality of milk and loss of milk during transportation reduces the supply in terms of quantity of high quality milk required by dairy processors; ultimately resulting in increased retail price to consumers.

6.3.2 Formal Channels

As quality of milk is the main yardstick for production of value-added processed milk (in UHT or pasteurized form), the milk processing units, wherever convenient, prefer to have direct procurement channels. However, as milk production is geographically dispersed, milk processing units have to rely on conventional milk collection and distribution agents.

Large milk and dairy producing companies are now moving towards integrated dairy value chain, ensuring consistent supply of desired quality of milk in turn satisfying customer needs and increasing market share. Such companies have set out quality criteria and therefore the suppliers including small and medium milk collection agents (dodhi) and large milk collection contractors are bound to conform to these standards. This approach has enabled contractors to adopt measures including use of refrigerated containers and farm cooling tanks that has helped in use of systems

⁷ SMEDA Dairy Sector Analysis based on official and industry figures

⁸ One Maund= 37.3242 litres

⁹ Dr. M. Younas. 2013. *The Dairy Value Chain. A Promoter of Development and Employment in Pakistan. ICDD Working Paper.*

to ensure appropriate storage and preservation of fresh milk. Primary results of the formal processing industry are visually attractive as tetra-packaged UHT/ pasteurized milk and other dairy value added products such as cheese, butter, yogurt etc. are considered more hygienic and safer for use by consumers. These products are stored in the company's warehouses and supplied to retail outlets throughout the country by employing an advanced and well-managed distribution network.

6.4 Issues

The current scenario of dairy sector does not promise much to meet existing and anticipated domestic demands unless major reforms are introduced within the sector. Conventional milk production, collection and distribution does not meet the quality and hygiene standards which are further aggravated by improper facilities of storage and transportation and adulteration of milk. Some major limitations of the sector include:

- Limited outreach of public sector initiatives to facilitate in distant locations.
- Limited awareness of farm productivity, milk safety and quality issues and standards for milk production, handling and processing/ value addition of milk etc.
- Lack of awareness of Pre-Requisite Programs (PRPs) such as Good Husbandry Practices, Good Manufacturing Practices, Good Hygienic Practices etc. as per minimum standards set by Codex Alimentarius.
- Low milk output per animal on farm level due to conventional animal husbandry practices and poor farm management resulting in inadequate feeding, poor breeding and Artificial Insemination cover, insufficient disease cover, failure to control mastitis etc.
- Limited implementation and adherence to standard food safety management systems and regulations in milk production, processing and marketing.
- Lack of knowledge and trainings of skilled and semiskilled workers for required food safety standards for value addition of milk through churning (butter, butter milk fat products, Ice cream etc.), evaporation (dry or condensed milk), pasteurization/UHT (fermented products, yogurt, buttermilk, cheese, sour cream) and homogenization (skimmed milk, fortified milk, flavored milk, whipped cream etc.).
- Absence of proper pricing structure as farm gate price of milk varies with seasons (summer, winter) in the traditional marketing systems (milk traders have advance milk supply commitments with farmers as well as processors).
- Lack of knowledge for packaging and branding to make products distinct from others and fetch premium prices due to their likeness by consumers.
- Unable to explore export market.

These issues make it difficult to achieve desirable growth and trade targets unless policy measures are taken to improve the sector's growth. Plentiful opportunities are available in the sector to integrate and produce high value added products that can not only cater to domestic demand of a large customer base but may also provide openings for exporting them to the international markets where food security is a rising concern.

6.5 Standardization and Compliance

The presence of an appropriate and well placed standardization and monitoring regime is key to enhance growth potential of dairy sector which may further make it competitive in the export markets regulated by quality and standardization principles. Pakistan does not have an integrated legal framework but has a set of laws addressing various aspects of food safety management at least to the minimum level of Codex Alimentarius¹⁰. The Codex Alimentarius focus on international food standards, guidelines and codes of practice with the goal to protect the health of consumers and ensure fair practices in food trade. These laws if properly enforced may create the desired impact. There are four laws that specifically deal with food safety from production to processing and marketing.

- a) The Pure Food Ordinance 1960: aims to ensure purity of food being supplied to people in the market and, therefore, provides base for prevention of adulteration.
- b) The Cantonment Pure Food Act, 1966: caters to preparation and sale of food in cantonment areas only.
- c) Pakistan Hotels and Restaurant Act, 1976: regulates the rates and standard of service(s) by hotels and restaurants. It also controls the sale of food or beverages that are contaminated, not prepared hygienically or served in unhygienic and unsafe utensils.
- d) Pakistan Standards and Quality Control Authority (PSQCA) Act, 1996.

6.5.1 Pakistan's National Standards

Pakistan's national standards cover food products mandatory for human safety and public health reasons, under the Compulsory Certification Mark License Scheme. These products whether imported or domestic, must meet Pakistani standards, which are generally harmonized with international requirements and have a certification Mark issued by the Pakistan Standards and Quality Control Authority (PSQCA). PSQCA is a national standardization body, governed by the PSQCA Act, 1996, with which domestic manufacturers and exporters must be registered to ensure compliance. It is also a member of International Organization for Standardization (ISO) and is the apex body to formulate or adopt international standards. It also serves as;

- Focal point for national, regional and international organizations & institutions such as ISO¹¹, Codex Alimentarius and World Trade Organization (WTO)¹².
- National Enquiry Point (NEP) for WTO Agreement on Technical Barrier to Trade (TBT).

The authority has the mandate to inspect and test products and services, including food items, for their quality, specification and characteristics during use, and for import and export purposes. It introduces measures through standardization regarding consumer safety and health and establishes procedures for conformity assessment compliant with national & international standards.

¹⁰ www.codexalimentarius.net. Codex Alimentarius-Milk and Milk Products (2nd Edition). 2011. Rome Italy

¹¹ www.iso.org

¹² www.wto.org

6.6 Regulations

Currently, the Federal Government regulates Pakistan's food imports whereas food safety standards are regulated by Provincial Governments (e.g. Punjab Food Law, Annex 1). The Pure Food Laws (PFL) of 1963, revised as Pakistan Pure Food Laws, 2011 is the basis for existing trade-related food quality and safety legislative framework. It covers 104 food items falling under nine broad categories such as;

- a. Milk and milk products
- b. Edible oils and fat products
- c. Beverages
- d. Food grains and cereals
- e. Starchy food
- f. Spices and condiments
- g. Sweetening agents
- h. Fruits and vegetables
- i. Miscellaneous food products

The regulations also address purity issues in raw food and deal with additives, food preservatives, synthetic colors, antioxidants and heavy metals.

6.6.1 Federal Ministries and Bodies Concerned

The Federal Government's primary concern is shelf life regarding imported food. Federal import regulations require that imported food products have at least 50 percent of original shelf life remaining at the time of import. To ensure shelf life requirements are met, correct labelling is critical. Each retail pack must have the production and expiration dates printed on the label. In addition to shelf life and labelling, certain products are banned for religious reasons. The import of food products containing pork or pork products is prohibited. Meat and dairy products may be imported if certified to be "Halal". Commercial import of alcoholic beverages or products containing alcohol is also prohibited.

(Please see 'Annexure II, List of relevant departments and ministries').

7 History and Definition of Cheese

Cheese is considered an important food item with high nutritional value and is available in great diversity of flavors, texture, tastes, varieties and shapes. Approx. 2,000 individual varieties¹³ of cheeses are being produced in the world, classified on the basis of their form, manufacturing, ripening and chemical composition. Cheese is more compact with a longer shelf life as compared to any other dairy product, hence contributing to its worth and value for portability, long life and high content of fat, protein and minerals.

Cheese manufacturing is one of the classical examples of milk preservation. It is formed by coagulation of the protein 'Casein' present in milk obtained primarily from cows, buffalo and very little from goats and sheep. Fat content and protein present in milk are found in various proportions. During cheese production, the milk is usually acidified, and coagulated by adding the enzyme after which, solids are separated and pressed into the final form of cheese.

History of cheese making dates back to 6000-7000 BC. According to an ancient legend, it was made accidentally by an Arabian merchant who put his supply of milk into a pouch made from a sheep's stomach, as he set out on the day's journey across the desert. The rennet in the lining of the pouch, combined with the heat of the sun, caused the milk to separate into curd and whey. That night he found that the whey satisfied his thirst, and the cheese (curd) had a delightful flavor that satisfied his hunger. Travelers from Asia are believed to have carried the art of cheese making to Europe. Italy is believed to have become the cheese-making center of Europe in later years. Cheese making continued to flourish in Europe and became an established food. Cheese making practices quickly spread in the world, but until the 19th century it remained a local farm industry. It wasn't until 1851 that the first cheese factory in United States was built in New York.

There are many definitions of cheese, however, Food and Agricultural Organization (FAO) Code of Principles defines cheese as 'the fresh or matured product obtained by the drainage (of liquid) after the coagulation of milk, cream, skimmed or partly skimmed milk, butter milk or a combination thereof'.



Figure 2: Typical Fresh cheese

Another definition defines the types of cheeses made from the liquid whey obtained during the manufacturing process by defining; 'whey cheese is the product obtained by concentration or coagulation of whey with or without the addition of milk or milk fat'. There are many other definitions that define cheese as per updated cheese manufacturing techniques in detail; however, the general concept remains the same.

¹³ United States Department of Agriculture, USDA

7.1 Classification of Cheese

Due to diversity of cheeses, the need of classification was prompted with the objective to effectively describe and compare cheese varieties from different regions and origins. Several approaches to the process exist depending upon need for the classification. Marketers and traders of cheese often classify cheese by country of origin, which is logical in order to create a merchandizing image. However, it creates ambiguity and overlap in the characteristics of many cheese varieties. More systematic classifications that use composition, firmness and maturation agents as criteria are discussed in following sections of classification;



Figure 3: Different kinds of Cheese

7.1.1 General Classification

It is estimated that 2,000 different cheese varieties have been developed; approx. 500 varieties have been described and recognized by the International Dairy Federation (IDF, USA). The cheese varieties may be classified as per following criteria;

- Country or region of origin
- Animal milk type
- Fat content
- Methods of making
- Texture
- Length of ageing

These criteria are either being used singularly or in combination. The method most commonly and traditionally used is based on moisture content, which is then further discriminated by fat content and curing or ripening methods.

Cheese types categorized in following classification are either 'Natural cheeses' produced by acid or enzymatic clotting of milk or of milk fractions or 'Processed cheeses' produced by further processing of natural cheeses. Categorization by composition obviously groups cheeses of greatly different flavor characteristics into a single class. This approach is useful for regulatory purposes and for comparing physical properties of cheese types. The term, water in fat free substance, is relevant since it is effectively a ratio of water content to the protein (caseins) content; the latter being the structural matrix of cheeses. Firmness of cheeses is closely related to that ratio but is also influenced by the percentage.

Table 1: Classification of Cheeses (based on composition, firmness and maturation agents)

Cheese Type	Category	Sub-Category
Soft Cheese (50% to 80 % moisture)¹⁴	<i>Unripened - low fat¹⁵</i>	Cottage Quark Baker's
	<i>Unripened - high fat</i>	Cream Neufchatel
	<i>Unripened stretched curd or pasta filata cheese</i>	Mozzarella Scamorze
	<i>Ripened by external mold growth</i>	Camembert Brie
	<i>Ripened by bacterial fermentation</i>	Kochkgse Handkgse Caciotta (ewe or goat)
	<i>Surface-ripened</i>	Liederkrantz
Semi-soft Cheese (39 %-50 % moisture)	<i>Ripened by internal mold growth</i>	Blue ¹⁶ Gorgonzola Roquefort (sheep's milk)
	<i>Surface-ripened by bacteria and yeast (surface smear)</i>	Limburger Brick Trappist Port du Salut, St. Paulin Oka
	<i>Ripened primarily by internal bacterial fermentation but may have surface growth</i>	Minster Bel Paese Tilsiter
	<i>Ripened internally by bacterial fermentation</i>	Pasta Filata Provolone Low-moisture Mozzarella
Hard Cheese (maximum 39% moisture)	<i>Internally ripened by bacterial fermentation</i>	Cheddar Colby Caciocavallo
	<i>Internally ripened by bacterial fermentation plus CO₂ production resulting in holes or "eyes"</i>	Swiss (Emmental) Gruyere Gouda Edam Samsoe
	<i>Internally ripened by mold growth</i>	Stilton

¹⁴ Categorizing cheeses by firmness is a common but inexact practice. The lines between "soft", "semi-soft", "semi-hard", and "hard" are arbitrary, and many types of cheese are made in softer or firmer variations. The main factor that controls cheese hardness is moisture content, which depends largely on the pressure with which it is packed into molds, and on aging time.

¹⁵ Some cheeses are categorized by the source of the milk used to produce them or by the added fat content of the milk from which they are produced. While most of the world's commercially available cheese is made from cows' milk, many parts of the world also produce cheese from goats and sheep. Double cream cheeses are soft cheeses of cows' milk enriched with cream so that their fat content is 60% or, in the case of triple creams, 75%. The use of the terms "double" or "triple" is not meant to give a quantitative reference to the change in fat content, since the fat content of whole cows' milk is 3%-4%.

¹⁶ Blue cheese is a general class of cheeses produced from milk of cow, goat or sheep, having *Penicillium* cultures added so that the final product is spotted or veined throughout with blue, blue-gray or blue-green mold, with distinct smell. Some are injected with spores before the curd or have spores mixed in with the curds after they form. These are typically aged in a temperature-controlled environment such as a cave. Its characteristic flavor tends to be sharp and a bit salty due to which, these are often considered an acquired taste.

Very Hard Cheese (maximum 34% moisture)	<i>Asiago Old</i> <i>Parmesan, Parmigiano, Grana Romano</i> <i>Sardo</i>	
Whey Cheese	<i>Heat and acid denaturation of whey protein</i>	Ricotta (60 % moisture)
	<i>Condensing of whey by heat and water evaporation</i>	Gjetost (goat milk whey; 13% moisture) Myost, Primost (13-18% moisture)
Spiced Cheese	<i>Caraway - caraway seeds</i> <i>Noekkelost - cumin, cloves</i> <i>Kuminost - cumin, caraway seeds</i> <i>Pepper - peppers</i> <i>Sapsago - hard grating, clover</i>	

Table 2. Classification of Cheese by Manufacturing and Maturation Processes

Cheese Type	Category	Sub-Category
Natural Cheeses	<i>Cheese varieties in which milk is clotted by acid</i>	<ul style="list-style-type: none"> • Cottage cheese • Baker's cheese • Cream cheese • Neufchatel cheese
	<i>Cheese varieties in which milk is clotted by proteases:</i>	<ul style="list-style-type: none"> • Cheddar cheese • Colby and stirred curd (granular) cheese • Surface-ripened cheeses - Brick cheese, Limburger cheese, Port du Salut, Bel Paese, Tilsit cheeses • Other semi-soft cheeses - Edam, Gouda, Monterey, Munster cheeses • Cheeses with eyes - Swiss, Gruyere, Samsøe • Italian type <ul style="list-style-type: none"> a) Very hard (grating) - Parmesan, Romano b) Other hard - Asiago, Fontina c) Pasta Filata - Provolone, Mozzarella • Mold-ripened <ul style="list-style-type: none"> a) Blue, Roquefort b) Cheese with surface mold - Camembert, Brie, Coulommiers
Process Cheese ¹⁷	<i>Processed Swiss, processed Cheddar, etc.</i>	
	<i>Cold-pack cheese</i>	

¹⁷ Processed cheese is made from traditional cheese and emulsifying salts, often with the addition of milk, more salt, preservatives, and food coloring. It is inexpensive, consistent, and melts smoothly. It is sold packaged and either pre-sliced or unsliced, in a number of varieties. It is also available in aerosol cans in some countries.

7.1.2 Harmonized System (HS) Classification

The Harmonized System (HS) is an international nomenclature defined by the World Customs Organization (WCO) for the classification of products. It allows participating countries to classify traded goods on a common basis for customs purposes. At the international level, the HS for classifying goods is a six-digit code system¹⁸ used for trading of different commodities. Following classification depicts the specific categorization for 'Cheese and Curd' as per HS codes.

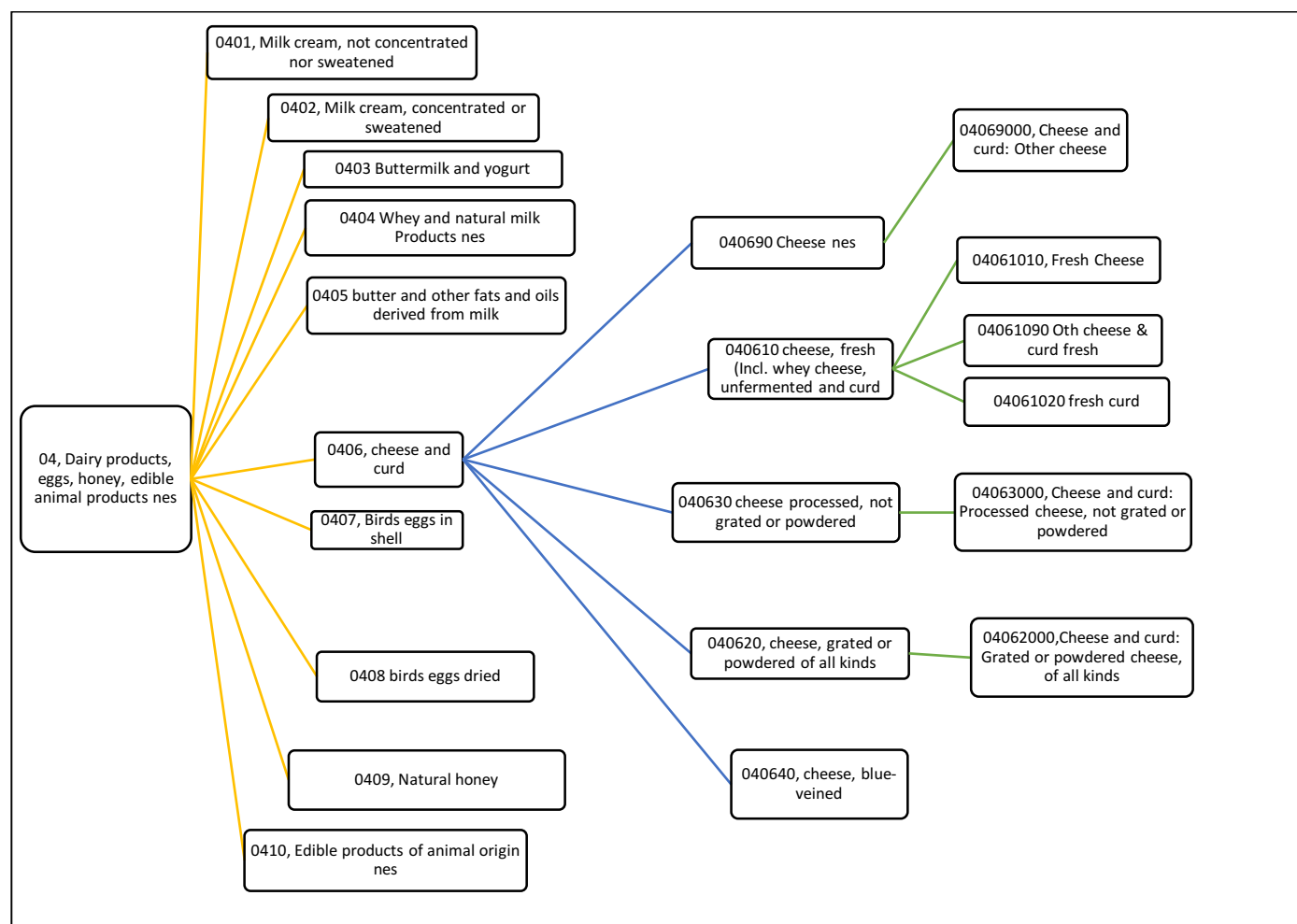


Figure 4: Cheese Trade Classification (HS Codes)

¹⁸ The six digits of a product code can be interpreted by groups of two digits. The first two digits (HS-4) identify the chapter the good is classified in, e.g. 04 = Dairy products, eggs, honey, edible animal products nes. The next two digits in HS 04 identify groupings within that chapter, e.g. 04.06 = Cheese and Curd. The next two digits are even more specific, e.g. 04.06.10 = cheese, fresh (Incl. whey cheese, unfermented and curd... Up to the HS-6 digit level, all countries using the Harmonized System classify products in the same way.

7.1.3 Selection of Product for Study

For the purpose of this study, following HS codes are considered;

Table 3: Cheese and Curd- HS Codes

Description	Definition
HS 04 (Two digit level)	The first two digits identify the chapter of the good considered for classification i.e. HS 04 means ‘Dairy products, eggs, honey, edible animal products nes’.
HS 04 06 (Four digit level)	Cheese and Curd
HS 04 06 10 (Six digit level)	Cheese, fresh (Incl. whey cheese, unfermented and curd)
HS 04 06 30 (Six digit level)	Cheese processed not grated or powdered

7.2 Characteristics of Some Famous Varieties of Cheese

7.2.1 Mozzarella

Mozzarella cheese is one of the most popular cheese varieties in the world because of its primary use as pizza topping and other foods due to which its demand has increased manifold in the recent past. It is included in the group of “Pasta filata” or stretched cheese in which the curd is produced as normal process of cheese making then kept in hot water or whey to consolidate into a solid mass, subsequently, stretching of this mass converts the curd into a uniform and elastic cheese in consistency. Stretching is a treatment that renders the curd elastic which is a unique quality attribute of Mozzarella cheese.



Figure 5: Mozzarella Cheese

Its physical characteristics such as body, texture, melting ability, stretch ability and colour are altered by the factors like milk composition, starter culture and ripening conditions prevalent during the cheese preparation process. It can be prepared from milk of various animal species such as cow, buffalo, goat and sheep. Traditionally, it was made from buffalo milk which was preferred due to its characteristic flavor. The flavor and texture of fresh Mozzarella is different from processed, sliced or shredded as fresh Mozzarella is moist, soft, quick to melt and delicate in taste. However, Mozzarella does not maintain ideal freshness beyond 12-24 hours. Guidelines set by the USA¹⁹ indicate that a low moisture Mozzarella cheese shall contain moisture 45% to 52% and milk fat 30% to 45% on dry weight basis. Low moisture part skim Mozzarella is mostly utilized in the pizza industry due to exceptional properties of melt ability, stretch ability and elasticity.

¹⁹ United States Department of Agriculture, USDA

7.2.2 Cheddar

Cheddar is a hard type of cheese which originated in the village of Cheddar, England. It has high nutritional value owing to the concentration of caseins which contain various levels of essential amino acids, fat and small amounts of minerals (calcium, sodium, potassium) and vitamins (retinol, riboflavin, pyridoxine and cyanocobalamine). Owing to higher concentration of nutrients, it is an important component of a balanced diet. Quality of Cheddar cheese depends upon starter cultures, manufacturing technology and composition of milk. Milk composition is influenced by the species, physical characteristics, health, feed, weather conditions and lactation stage of the milking animal. Cheese is prepared from milk having dynamically balanced mixture of protein, fat, carbohydrates, vitamins, minerals and water. During ripening, Cheddar cheese experiences biochemical modifications and transformations because of various biochemical activities (e.g. glycolysis, proteolysis and lipolysis).



Figure 6: Cheddar Cheese

Cheddar cheese varies in flavor depending on the length of aging and their origin. As cheddar slowly ages, it loses moisture and its texture becomes dry and crumbly. The sharpness in taste becomes noticeable at 12 months (old cheddar) and 18 months (extra old cheddar). The optimal aging period of cheddar cheese is 5-6 years; however, for most uses three-year-old cheese is fine and five-year-old cheddar can be saved for special occasions.

7.2.3 Cream Cheese

Cream cheese is considered to be a fresh type of cheese as it is not processed through aging. The flavor is subtle, fresh and sweet having light tangy taste. It spreads easily at room temperature, and has a smooth and creamy texture. It is made by adding cream to cow's milk, which gives it richness but is not ripened, limiting its shelf life. It is usually white in color and is available in low fat or non-fat varieties.

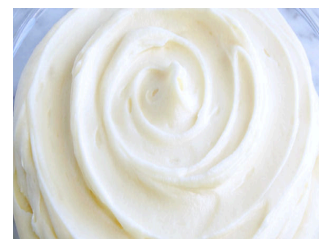


Figure 7: Cream Cheese

7.2.4 Feta Cheese

Feta cheese is one of the oldest cheeses which originated from Greece and is formally accepted as a 'Greek-Only Cheese'. It is soft and usually made from milk of sheep or both sheep and goat, however, off late cow's milk is also being used to produce Feta. It is white in color, a little sour to the taste and rich in aroma.



Figure 8: Feta Cheese

7.2.5 Goat Cheese

Goat cheese comes in variety of forms, softness and distinctive flavors which is due to the tangy flavor of goat milk. It can also be made in hard aged varieties as well as semi firm cheeses like feta. It is common in the Middle East, Africa, and some Mediterranean countries, where the hardy goat survives in areas where cows cannot.

Its flavor is very strong and some consumers may find it disagreeable, however, in majority of the cases, the particular flavor is sought after in famous goat dairies. Its strong flavor is caused by hormones when milk producing goats are kept with bucks. In addition, the cheese quality is influenced by what the goats are eating which other ruminants do not eat.



Figure 9: Goat Cheese

7.2.6 Swiss Cheese

Swiss cheese is a general name for numerous types of cheese that were initially prepared in Switzerland. Swiss cheese is made from cow's milk, lightly flavored, sweet and nutty. It is known for being glossy, light or pale yellow and having large holes in it which is a result of carbon dioxide releases during the process of maturation.



Figure 10: Swiss cheese

7.2.7 Vegetarian Cheese

Vegetarian cheese is the type of cheese which is not curdled by enzymes from animal origin. The term 'Rennet' is popularly used by cheese makers to coagulate milk, forming curds. Most vegetarian cheeses are coagulated with plants, fungi or bacteria. There are two types of rennet in use by cheese producers: microbial and vegetarian. Microbial rennet consists of enzymes that come from either bacterial or fungal origin. Many strict vegetarians prefer to avoid cheese with this kind of rennet altogether, even though animals are not involved in any way. There are specific plants that also have enzymes essential to coagulate milk. Plants commonly used as coagulants are fig tree bark, thistle and mallow.



Figure 11: Vegetarian Cheese

7.2.8 Processed Cheese

Processed cheese (also known as prepared cheese) is made from cheese with added emulsifiers, saturated vegetable oils, extra salt, food colorings, whey or sugar. As a result, many flavors, colors, and textures of processed cheese exist. It is inexpensive, consistent, and melts smoothly. It is sold in packaged form, either pre-sliced or unsliced, in a number of varieties. It is also available in aerosol cans in some countries.



Figure 12: Process cheese

8 Production Technology

Basic technology for production of all types of cheese is the same with relatively small changes resulting in significant differences in the final product. The skill of cheese manufacturing consists of some key factors such as;

- Composition of milk
- Extent of acid production
- Moisture
- Curd handling
- Ripening conditions of cheese

Unlike other dairy products, cheese is biologically and biochemically active and consequently undergoes changes in flavour, texture and functionality as a function of storage. In cheese manufacturing, preservation of the most important constituents of milk (i.e. fat and protein) are exploited by two principles of preservation, i.e. lactic acid fermentation, and reduction of water activity through removal of water and addition of salt.

The general process flow is shown in the following figure;

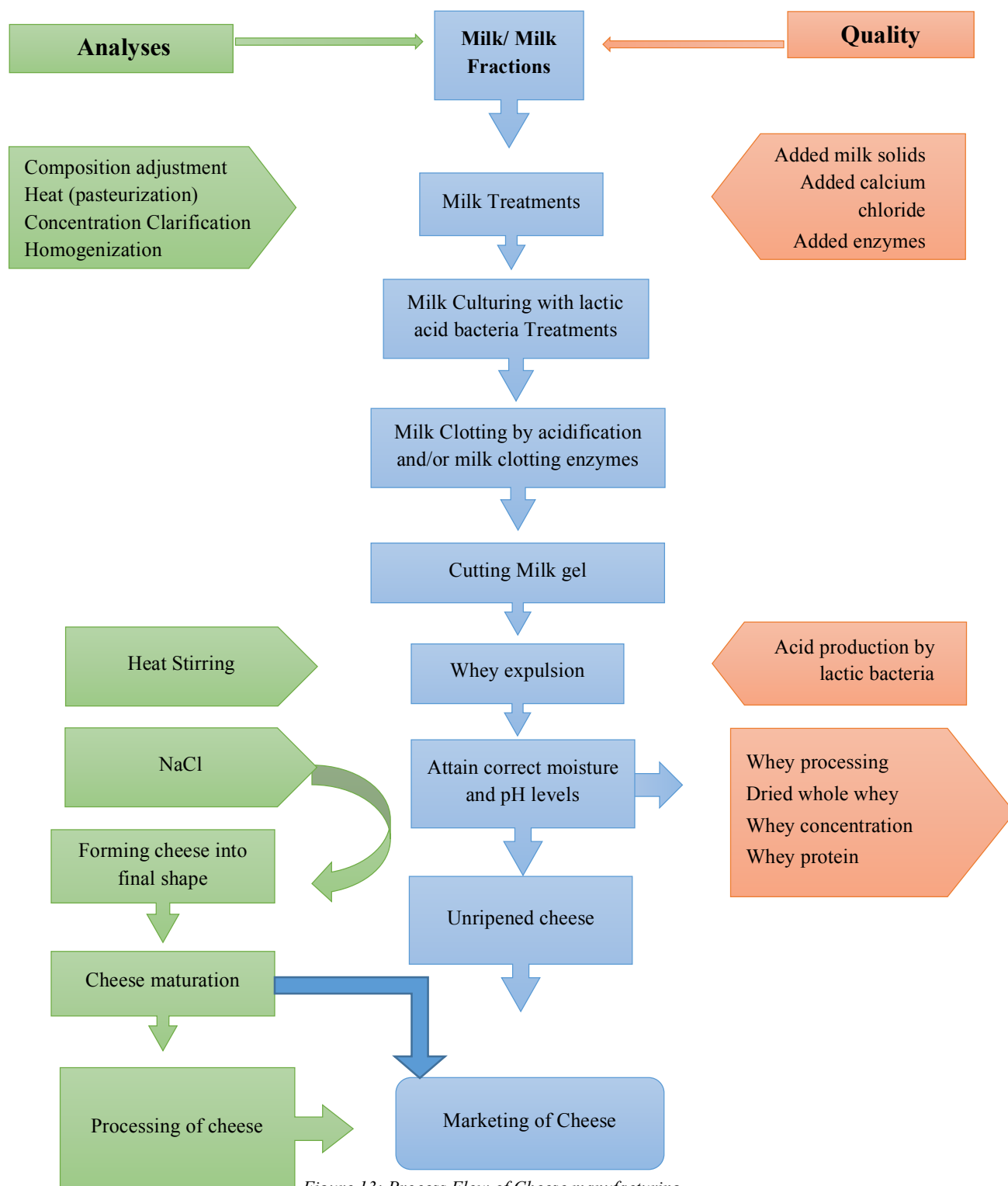


Figure 13: Process Flow of Cheese manufacturing

Details of the process flow are as follows;

8.1 Curdling

This step involves separation of the milk into solid (Curd) and liquid (Whey) through acidification (souring) of the milk and addition of Rennet enzyme. Rennet sets the cheese into a strong and rubbery gel compared to the fragile curds produced by acidic coagulation alone. It also allows curdling at a lower acidity, which is important because flavor-making bacteria are inhibited in high-acidity environments. The acidification can be accomplished directly by the addition of an acid, such as vinegar, in few cases such as 'Paneer'. More commonly used starter bacteria are employed instead which convert milk sugars into lactic acid. The same bacteria (and enzymes they produce) also play a large role in the eventual flavor of aged cheeses.

Most cheeses are made with a starter bacteria from the *Lactococcus*, *Lactobacillus*, or *Streptococcus* families. Swiss starter cultures also include the bacteria called *Propionibacter shermani*, which produces carbon dioxide gas bubbles during aging, giving Swiss cheese or Emmental its holes (called "eyes").

8.2 Curd Processing

At this point, the cheese has set into a very moist gel. Some soft cheeses are now essentially complete as these are drained, salted and packaged. For other types, the curd is cut into small cubes to allow the excess water to drain from the individual pieces of curd.

Some hard cheeses are then heated to temperatures in the range of 35–55 °C (95–131 °F) which forces more whey from the cut curd. It also changes the taste of the finished cheese, affecting both the bacterial culture and the milk chemistry.

Addition of salt plays an important role in cheese production besides adding flavor. It preserves cheese from spoiling, draws moisture from the curd, and firms the cheese's texture in an interaction with its proteins. Some cheeses are salted from the outside with dry salt or brine washes. Most cheeses have the salt mixed directly into the curds. There are other techniques which influence a cheese's texture and flavor. Some examples are:

- **Stretching:** (Mozzarella, Provolone) the curd is stretched and kneaded in hot water, developing a stringy, fibrous body.
- **Cheddaring:** (Cheddar) the cut curd is repeatedly piled up, pushing more moisture away. The curd is also mixed (or *milled*) for a long time, taking the sharp edges off the cut curd pieces and influencing the final product's texture.



Figure 14: Un-drained curd broken down by rotating mixers



Figure 15: Curd Processing

- Washing: (Edam, Gouda, and Colby) the curd is washed in warm water, lowering its acidity and making for a milder-tasting cheese.



Figure 16: Cheddaring of Curd



Figure 17: Stretching of Curd

Most cheeses achieve their final shape when the curds are pressed into a mold or form. More the pressure applied, the harder the cheese becomes as the pressure drives out moisture. Special molds are designed to allow water to escape and the curd is unified into a single solid body.

8.3 Ripening and Aging

A newly formed hard cheese is usually salty yet bland in flavor and rubbery in texture. Normally cheeses are left to rest under controlled conditions that may last from a few days to several years. This process is referred to as 'Aging' or 'Ripening'. As cheese ages, microbes and enzymes transform texture and intensify flavor, which is largely a result of the breakdown of casein proteins and milk fat into a complex mix of amino acids, amines and fatty acids.

Some cheeses have additional bacteria or molds intentionally introduced before or during aging. In traditional cheese making, these microbes might be already present in the aging room; they are simply allowed to settle and grow on the stored cheeses. More often, prepared cultures are used, giving more consistent results and putting fewer constraints on the environment where the cheese ages. These cheeses include soft ripened cheeses such as 'Blue' and 'Rind-washed' cheeses.



Figure 18: Parmigiano-Reggiano in modern factory

8.4 Machinery and Equipment Requirements

The following machinery is sufficient to process 1000 liters of milk to produce mozzarella cheese in one batch.

Table 4: Details of Typical Machinery and Equipment for Cheese Production Unit	
Production Rate	1,000 Liters/Batch
Raw Materials	Raw Cow Milk
Percentage of Fat	3.5% – 4%
Final Product	Mozzarella Cheese
Product Packaging	Mozzarella Cheese Manual packaging , Vacuum packaging
Production Area	100-2000 Sq. m. Personnel: 3- persons
Electricity	380 V 50 Hz Storage Temperature: +4 C
Production quantities	Soft Cheese - 5,000L=800Kg-1,000kg/Shift Packed in Vacuum

Equipment List			
Sr#	Equipment	Description	Quantity
1	Soft Cheese VAT	Volume: 1,000 Liters • Double Jacket • Body SS ²⁰ -304 • Heated by Hot water lines • Automatic Temperature Controllers • Automatic Cutting • Inlet 1.5” • Outlet 4”	2 units
2	Cheese working table	Body: SS-304 Water outlet Size: 1.4 x 0.7 x 1 meter	2 units
3	Cheese Cooker Hobart Machine	Body SS-304 01 Unit	1 unit
4	Cooling Vat	Body: SS-304 (500 Liters)	1 unit
5	Cheese Press Mechanical	• Type: Pneumatic • Body: SS-304 • Molds: SS -304 - 20 units • Pressure controller • Pneumatic Cylinder	3 units
6	Cheese Accessories	• Cheese whey Screen/Mesh • Curd Cutter • Whey strainer • Cheese Shovel • Curd Cutting Tools	1 set

²⁰ Stainless Steel

		• Mixing Tools	
7	Cheese Slicer	Type: Manual cutting Body: SS-304	1 unit
8	Cheese Moulds	Material: Plastic Moulds Size: As Per client	25 units
9	Milk Transfer Pumps (Used)	Production rate: 2,500 Liter/Hour Used • Full Sanitary • Centrifugal Type • Material SS-304 • Pressure 2 Bar	2 unit
10	Control Panel	Automatic Control Panel which controls entire Receiving Section: • Relay Logic • Agitator controllers • Pump controllers • Alarm indicators • Voltage safety • On/Off switches • Full electrical components • Water proof control panel	1 unit
11	Set of product Transfer System, Pipes and Valves	All the equipment to be fully welded, connected between each other as per standards, sanitary instruction and work efficiency	As per actual
12	Vacuum Packaging Machine	Heavy duty SS304 • Table Unit up to 0.5kg • Manual Packing	1 unit

Total price of above-mentioned cheese plant machinery is estimated to be approximately Rs. 3.3 million²¹ exclusive of taxes. It is recommended to build the plant as per recommendations of a dairy sector expert. Generally, the terms and conditions for project installation as per sector norms are as under;

- Down payment: 50 %
- Payment (within 7 days): 45%
- Payment after installation and start-up: 5%
- Engineering, installation and commissioning: 5% of total equipment cost
- Delivery: 90-120 days from date of down payment
- Guarantee: 12 months starting from delivery

²¹ The prices of machinery and equipment are as of June 2023 and may vary subject to location, inflation etc.

The recommended practices as per sector norms for project installation and relevant technical trainings include following important points;

- Project plan and drawings according to client demands for floor plan, equipment, drainage, electricity, ventilation, water supply etc.
- Provision of updated operation manuals, literature and knowledge
- Welding, installation and set-up of control panel, equipment and running at designated site of project
- Provision of technical support and training to staff after installation
- After sales services regarding training of staff for equipment, operation, process and management
- One- year guarantee of equipment starting after installation

*Note: Client will provide building, water and power supply, raw material etc.
Provision of accommodation, food and transportation to staff during installation process.*

9 Pakistan's Market for Cheese

In recent years, the consumption and demand of cheese in Pakistan has increased many folds, opening opportunities for existing and potential investors to invest in cheese processing units. Dairy sector supplies the best quality milk to provide raw material i.e. milk for cheese production. Local production of cheese may help in import substitution of cheese as import of cheese has been showing an increasing trend in last five years.

Since milk is the largest and single most important commodity in dairy, there is an opportunity for milk producers and processors to add value by processing milk into cheese. Cheese is widely used in hotels, restaurants, fast food corners and airlines, shipping lines and households. The food processing industry of Pakistan is growing roughly at 10% to 15% annually²². Growing popularity of Western-style cuisine, increasing urbanization, and increasing two-income families are fueling this demand. Local pizza restaurants are opening almost in every corner of the road, which increases the demand for mozzarella and cheddar cheese, interestingly local pizza industry uses locally made mozzarella and cheddar cheese (50:50 ratio); hence there is potential in the growth of the local market.

Local demand for cheese has grown in the recent years, however, the local manufacturers are unable to meet supply-demand gap, which in turn is being filled by the imported cheese. There is a potential to capture the local market share by producing cheese which is at par with its imported counterparts albeit at a reasonable price. In recent years, the Pakistani market has been changing and developing rapidly in terms of lifestyle and associated tastes in food cuisine. Many food products, once considered a luxury, are being used regularly by a larger section of the middle and lower income groups i.e. pizza, burgers, lasagna etc. and cheese is a main ingredient of such items.

Realizing the potential of Pakistani market, foreign companies have started retail operations in the local market. For example, the German-based Metro Group and Holland based Makro, wholesalers of food and non-food products are operating their stores in Pakistan and offering thousands of products at favorable wholesale prices under one roof. To carry out their operations, they require a huge supply chain and engagement with many suppliers of different products to satisfy customers' requirements including frozen products.

With the increasing popularity of pizza, the use of Mozzarella cheese is increasing day by day due to the opening of multinational pizza restaurants. The quality of locally produced mozzarella is not comparable with the imported cheese. Though import of mozzarella in Pakistan is not known exactly but statistics collected from large multinational pizza restaurants shows that its import is more than 760 ton per annum²³.

²² NARC, Pakistan Report

²³ NARC, Pakistan Report

9.1 Pakistan's Existing Cheese Production

In year 2022-23, approximately 67.9 million tons of milk was produced; 60% of which was contributed by buffaloes and 37% by cows²⁴. Other species like sheep, goat and camel contribute to remaining milk production. Out of the total milk channelized for processing, very small quantities are used in the production of local products such as cheese (Paneer), and sweets (Khoya, Rubri, Burfi etc.).

Worldwide, majority of cheese varieties are produced primarily from cow milk whereas buffalo milk ranks after it. About 80% of the world's buffalo milk is produced in India and Pakistan. According to FAO²⁵, buffalo is an important but 'under-valued asset' for production of milk and milk products such as cheese. On account of its composition, buffalo milk is more appropriate for soft and hard type of cheeses as it has higher in fat, lactose, caseins, calcium, magnesium and phosphate than cow. Similarly, the capacity of milk to be acidified is better for buffalo's milk as compared to cow.

There is limited production of cheese and other value added dairy products in Pakistan due to lack of knowledge and expertise, dietary habits of consumers and high end price of locally manufactured cheese as well as the imported varieties. However, in recent years, it has been observed that many cheese manufacturing units have been established within dairy industries for pizza and other fast food industries due to its rising demand. Almost 5,000 tons²⁶ cheese is consumed annually whereas its production is 2,500 tons per annum. Production of mozzarella cheese in Pakistan is only 90–100 tons per year in which imported enzyme cultures are used during production process, therefore, increasing its cost of production and retail price.

9.2 Existing Players

The dairy industry has been growing by 20–25 % annually during the past 5 years, and the commercial sector is heavily investing in the development of a farm-to-factory cold chain distribution system. At the moment there are 15-20 milk processing plants in the country, mainly producing UHT milk, milk powder, yogurt and cheese. The industry is dominated by the private sector with multinational as well as national companies involved. *Nestlé* is the largest company in dairy business. In the past, a dairy cooperative model named *Idara-e-Kissan* (producing "Halla" brand) has been the only dairy cooperative collecting and processing milk in central Punjab region.

In Pakistan, since, the size of the local market is growing due to changing eating habits, increasing per capita income, and growing number of two-income families, the sale of imported Mozzarella and other kinds of cheese to fulfil local market demands is being done e.g. at Metro²⁷. Some of following processing companies are producing cheese locally;

²⁴ FAO Study

²⁵ FAO (Food and Agriculture Organization)

²⁶ National Agricultural Research Council (NARC), Islamabad

²⁷ www.metro.pk

- Haleeb foods²⁸ has been operating to the industry since 2007 and produces cheddar cheese.
- Adam's Milk Foods (Pvt.) Ltd.²⁹ is producing and selling different varieties of cheese locally.
- Noon Pakistan Ltd.³⁰ commenced its operation in June 1972 and its products namely milk powder, butter and cheese are marketed throughout Pakistan as "Nurpur" brand.
- Accha Foods Pvt. Ltd.³¹ is producing and selling different varieties of locally made cheese.
- Artisans Cheese Factory³² is producing and selling different varieties of cheese locally.



Figure 19: Some Pakistan's Local Cheese Brands

²⁸ www.haleebfoods.com

²⁹ www.adams.pk

³⁰ www.nurpurfoods.com

³¹ www.acchaemart.com

³² www.artisancheesefactory.pk

- Al Marai³³, Arla and Puck³⁴, Happy Cow³⁵, Kraft³⁶ and many more imported brands capture major share of Pakistani cheese market.



Figure20: Some Imported Brand of Cheese

³³ www.almarai.com

³⁴ www.arla.com

³⁵ www.happycow.at

³⁶ www.kraftheinzcompany.com

10 Pakistan's Trade: Cheese and Curd (HS 0406)

Important Points:

- The primary source of trade data is www.trademap.org.
- The trade data of following 6-digits HS categories of cheese are described in particular.
 - Processed Cheese: HS 040630
 - Fresh Cheese: HS 040610

Due to increasing demand and limited production, Pakistan imported 3,049 tons of cheese from various countries worth US\$ 6.85 Million in year 2021.

Table 5: HS 0406-Pakistan's Import- 2021

HS Code	Imported Products	Quantity (Ton)	Value (US\$ M)	Share (%)
'040630	Processed cheese, not grated or powdered	930	2.89	61%
'040610	Fresh cheese "unripened or uncured cheese", incl. whey cheese, and curd	388	1.14	24%
'040620	Grated or powdered cheese, of all kinds	142	0.50	10%
'040690	Cheese (excluding fresh cheese, incl. whey cheese, curd, processed cheese, blue-veined cheese ...	52	0.22	5%
Total		1,512	4.75	

A decreasing trend in import may be seen within last 5 years from 2017 to 2021. In 2021, major share of import overall for HS 0406 was contributed by Denmark (48%), Austria (41%) and Saudi Arabia (10%).

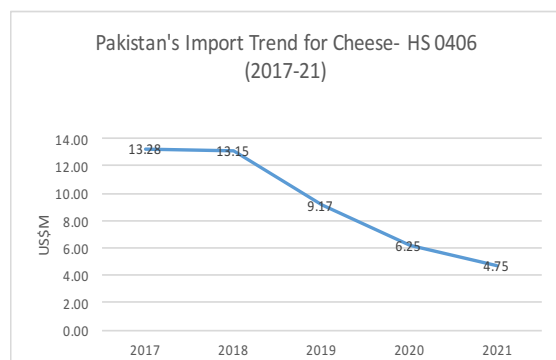


Figure 21: Pakistan's Import Trend 2017-21 for HS 0406

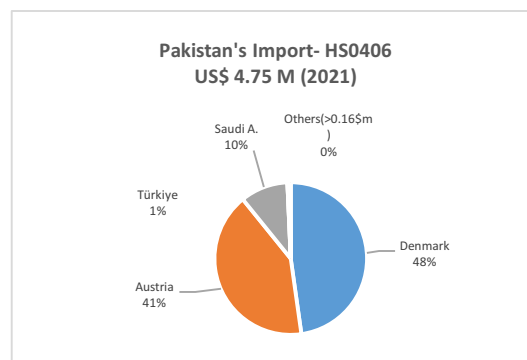


Figure 22: Pakistan's Import of Cheese 2021

During the last few years (2017-21), the import share of Denmark, Austria, Saudi Arabia, Türkiye, UK, New Zealand and France have seen downward trends caused probably by Covid 19 and import restrictions.

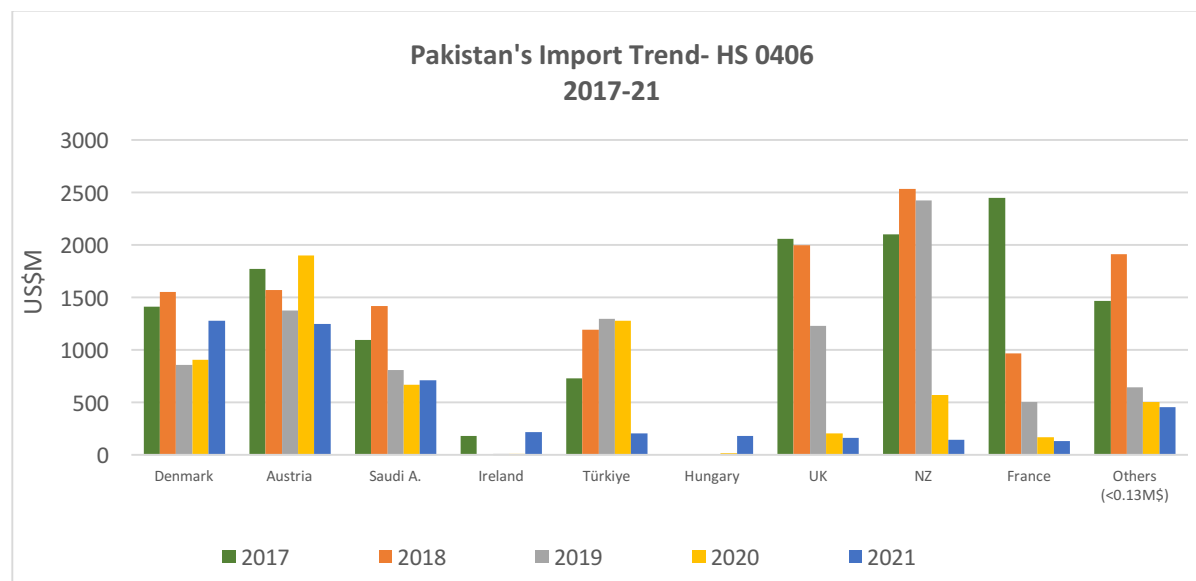


Figure 23: Trend of Pakistan's Import from partner Countries (2017-21)

As far as imported cheese categories are concerned, in year 2021, out of total US \$ 4.75 M, the share of processed cheese was 61% whereas for fresh cheese it was around 24%. Limited quantities of powdered (5%) and grated cheese (10%) were also imported.

Due to major trade of Pakistan taking place in two categories of cheese i.e., Processed Cheese (HS 040630) and Fresh Cheese (HS 040610), this study highlights the trade figures for the two categories in the following sections.

10.1 Pakistan's Import for Processed Cheese (HS 040630)

Due to restrictions on import of processed cheese, import vales have decreased gradually from US\$ 5.34 M in 2017 to 2.89 M in 2021. Major trade partners for Pakistan's import include Austria, France, Denmark, Saudi Arabia, UK, Egypt and USA.

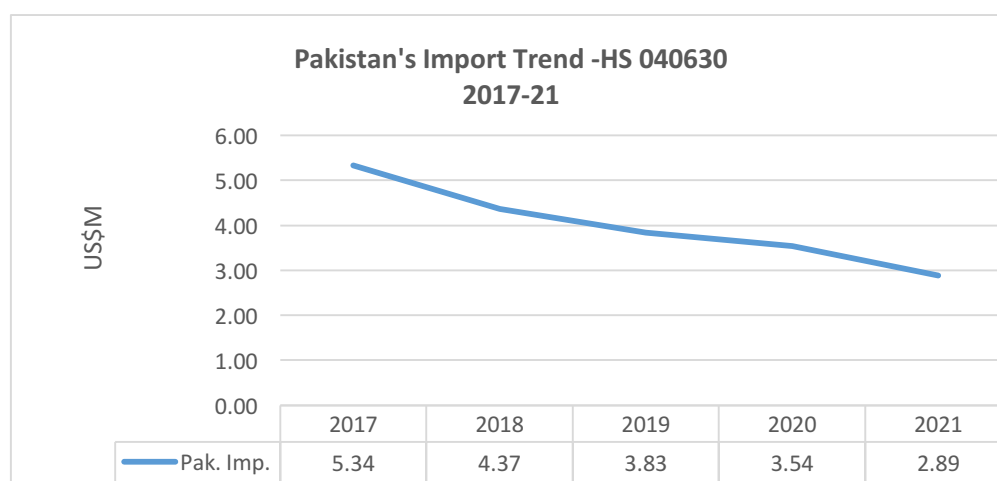


Figure 24: Pakistan's Import Trend 2017-21 for HS 040630

Following table shows the import partners of Pakistan for HS 040630;

Table 6: HS 040630-Pakistan's Import Partners- 2021			
Exporting Countries	Quantity (Tons)	Value (US \$ M)	Share (%)
Austria	438	1.24	42.8%
Saudi A.	163	0.71	24.6%
Denmark	198	0.56	19.4%
Türkiye	57	0.16	5.6%
EU	26	0.07	2.5%
UK	17	0.04	1.5%
UAE	13	0.04	1.3%
USA	7	0.03	1.2%
Germany	4	0.01	0.5%
Others(<13k\$)	7	0.02	0.6%
Pakistan's Total Import	930	2.88	

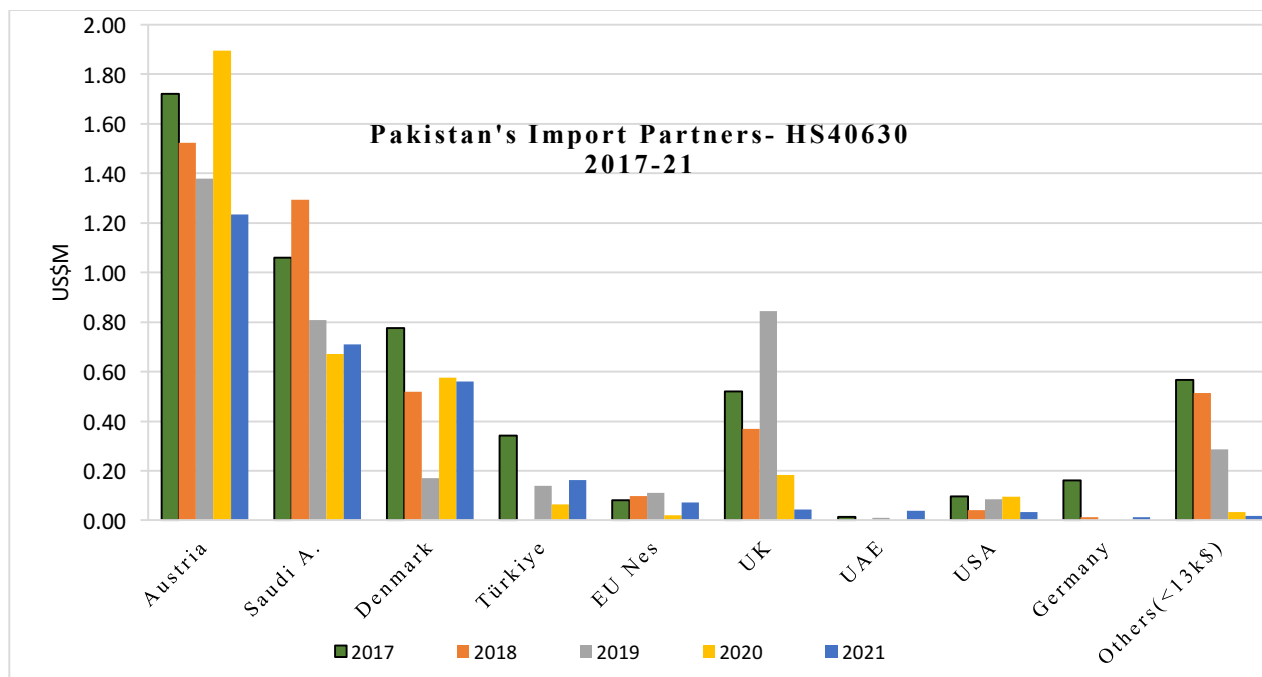


Figure 25: Pakistan's Import Partners-HS 040630 during 2017-21

It may be seen from the graph that import from Austria, Saudi Arabia, UK and Denmark show fluctuations during 2017 to 2021.

10.2 Pakistan's Import of Fresh Cheese (HS 040610)

The statistics in the study provide an insight into the fact that most of the domestic demand is not met from domestic supplies in dairy and other value added products. This is either due to incapacity to fully cater to the domestic cheese requirements or that Pakistan does not specialize in production of cheese. Another reason contributing to higher imports is the high cost of establishing milk pasteurization plants along with cheese plants and their viability from a sustainability point of view.

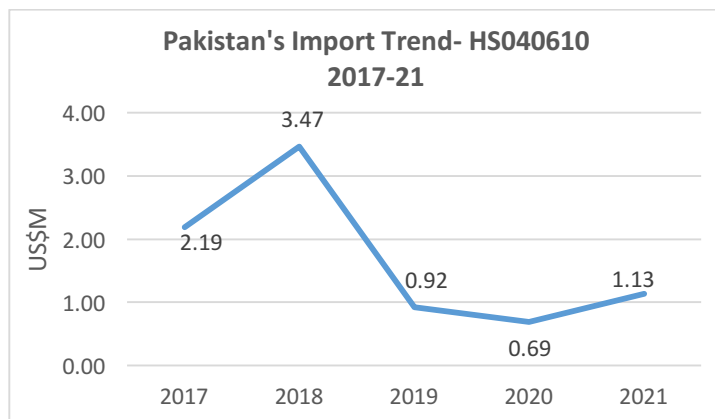


Figure 26: Pakistan's Import Trend for HS040610-2017-21

Pakistan imported 388 tons of cheese categorized under HS 040610 worth US\$ 1.13 M in 2021. The import trend for the same product from 2017 to 2021 shows fluctuation in growth of value, which increases in 2019 and 2020 and almost doubles in 2021. Local producers and dealers import cheese from different countries in sizeable quantities and build their stocks for use in multiple ways that result in a sharp rise of import volumes and value.

Exporting Countries	Quantity (Tons)	Value (US \$ M)	Share (%)
Denmark	210	0.60	52.6%
Hungary	61	0.18	16%
Germany	35	0.10	9%
UK	24	0.07	6.1%
UAE	22	0.07	5.7%
Italy	11	0.03	2.9%
EU	10	0.03	2.7%
France	2	0.02	1.9%
Others(<22k\$)	13	0.03	3.1%
Total Import	388	1.13	

Pakistan imported 388 tons of cheese worth US\$ 31.13 M from different countries in 2021. Major contributing countries are Denmark (52.6%), Hungary (16%), Germany (9%), UK (6.1%), UAE (5.7%) and Italy (2.9%) during this year.

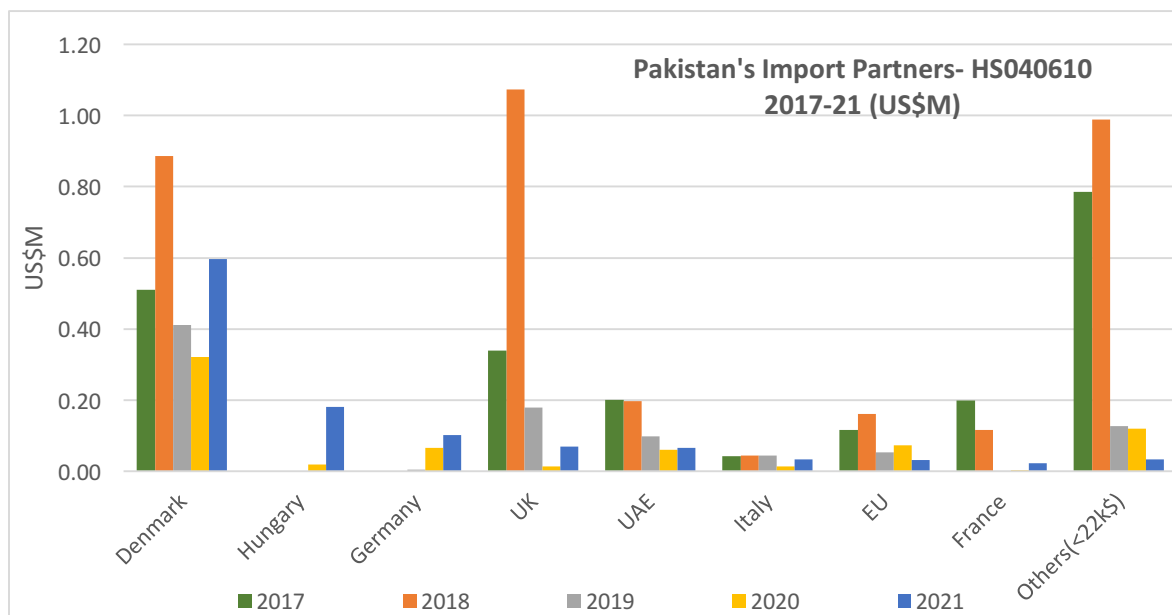


Figure 27: Pakistan's Import Partners for HS 040610

The trends also reflect that the demand and supply gap of cheese may further widen due to increasing demand and insufficient domestic supplies to meet the requirements of growing population. In addition to cheese, other dairy value added products such as cream powder, milk cream and butter are imported, even though they can easily be prepared locally if the dairy industry had diversified to produce a variety of value added products.

The above-cited situation can be managed effectively if the dairy sector is enabled to generate surplus milk through efficient production system and with use of appropriate and modern technology driven farming methods. These, coupled with policy initiatives and strong implementation strategies, will enable the value added dairy industry to produce a variety of dairy products, which will cater to domestic requirements and produce surplus for exports.

11 Global Market for Cheese

The primary source of trade data is sourced from International Trade Centre³⁷. The trade data of following 6-digits HS categories of cheese are described;

- i. Processed Cheese: HS 040630
- ii. Fresh Cheese: HS 040610

The consumption of cheese in the form of pizza toppings, cheese blends, salads, sandwiches and stuffing has increased due to dietary likeness, and cheese quality. The increase in production of cheese is estimated about 4% per year from the last thirty years in the world as consumer is now highly conscious about diet and health.

11.1 Global Imports

In year 2021, the total global imports of cheese and its products were US\$ 36.98 Billion presenting 36.3% of total imports of products under HS 04³⁸ category.

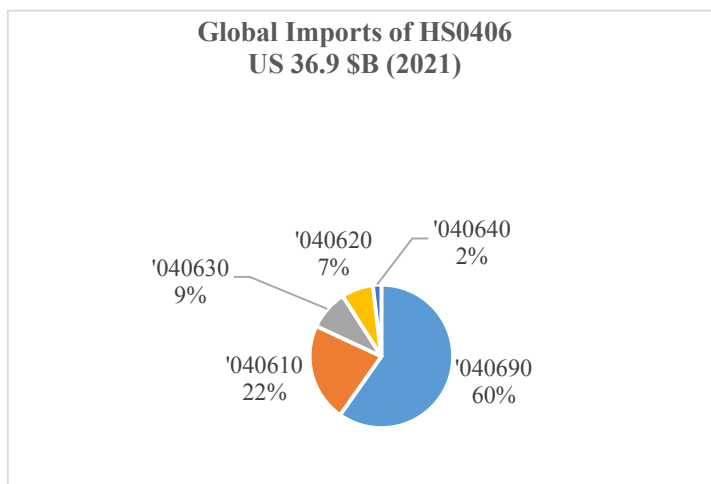
Table 8: HS 04-Global Import-2021				
HS Code	Product Label	Value (US\$ B)	Share %	Growth in value 2017-21 (% p.a.)
	Dairy Products			
'0406	Cheese and curd	36.98	36.3%	4%
'0402	Milk and cream, concentrated or containing added sugar or other sweetening matter	24.11	23.6%	6%
'0401	Milk and cream, not concentrated nor containing added sugar or other sweetening matter	10.58	10.4%	0%
'0405	Butter, incl. dehydrated butter and ghee, and other fats and oils derived from milk; dairy ...	10.05	9.9%	-2%
'0404	Whey, whether or not concentrated or containing added sugar or other sweetening matter; products ...	5.63	5.5%	6%
'0403	Buttermilk, curdled milk and cream, yogurt, kephir and other fermented or acidified milk and ...	5.03	4.9%	1%
	Non- Dairy Products			
'0407	Birds' eggs, in shell, fresh, preserved or cooked	4.77	4.7%	3%
'0409	Natural honey	2.70	2.6%	3%

³⁷ www.trademap.org

³⁸ Dairy Products, eggs, honey, edible animal products nes

'0408	Birds' eggs, not in shell, and egg yolks, fresh, dried, cooked by steaming or by boiling in ...	1.12	1.1%	-1%
'0410	Turtles' eggs, birds' nests and other edible products of animal origin, n.e.s.	1.03	1.0%	11%
Total Global Imports (HS04)		102		

The top imported product in cheese sub-category in 2021 is cheese nes (HS 0406) having share of 60%, followed by fresh cheese (22%), processed cheese (9%), grated cheese (7%) and blue veined (2%).



Following table shows that global imports of HS 040610 and 040630 increased by 14% and 8% respectively during 2021;

Table 9: HS 0406-Product-wise Global Import- 2021

HS Code	Product Label	Value (US\$ B)	Share (%)	Value Growth 2020-21 (% p.a)
'040690	"Cheese (excluding fresh cheese, incl. whey cheese, curd, processed cheese, blue-veined cheese ...	22.05	59.8%	9%
'040610	"Fresh cheese ""unripened or uncured cheese"", incl. whey cheese, and curd"	8.18	22.2%	14%
'040630	Processed cheese, not grated or powdered	3.32	9%	8%
'040620	Grated or powdered cheese, of all kinds	2.65	7.2%	15%
'040640	"Blue-veined cheese and other cheese containing veins produced by ""Penicillium roqueforti""	0.70	1.9%	12%
Total Global Imports		36.9		

The major importing countries for HS 0406 includes Germany with 14% share followed by France, Italy, UK, Belgium and USA with 6.5%, 5.8% and 5.4% shares respectively.

Table 10: HS 0406- Top Global Importers -2021				
Importing Countries	Quantity (M Tons)	Value (US \$ B)	Share (%)	Value Growth 2020-21 (% pa)
Germany	913.58	5.16	14.0%	9%
France	431.35	2.39	6.5%	15%
Italy	516.33	2.15	5.8%	13%
UK	403.49	2.01	5.4%	-9%
Belgium	409.59	1.93	5.2%	17%
USA	187.80	1.54	4.2%	25%
Netherlands	382.26	1.52	4.1%	8%
Spain	312.06	1.34	3.6%	13%
Others (<13.4\$B)	3874.34	18.94	51.2%	9%
Total Global Import	7430.8	36.98		

11.2 Global Exports

In year 2021, the total global exports of cheese and curd category were US \$ 26.83 Billion which is 35.8% of total imports in Dairy category (HS 04). The global export of the product was also observed with increasing trend with 12% in growth of value during year 2020-21.

Table 11: HS 04- Global Exports- 2021

HS Code	Product Label	Value (US\$ B)	Share %	Value Growth 2020-21 (% , p.a.)
	Dairy Products			
'0406	Cheese and curd	37.27	36.5%	12%
'0402	Milk and cream, concentrated or containing added sugar or other sweetening matter	24.27	23.8%	14%
'0401	Milk and cream, not concentrated nor containing added sugar or other sweetening matter	10.37	10.2%	15%
'0405	Butter, incl. dehydrated butter and ghee, and other fats and oils derived from milk; dairy ...	10.06	9.8%	17%
'0404	Whey, whether or not concentrated or containing added sugar or other sweetening matter; products ...	5.65	5.5%	14%
'0403	Buttermilk, curdled milk and cream, yogurt, kephir and other fermented or acidified milk and ...	4.95	4.8%	9%
	Non- Dairy Products			
'0407	Birds' eggs, in shell, fresh, preserved or cooked	4.69	4.6%	14%
'0408	Birds' eggs, not in shell, and egg yolks, fresh, dried, cooked by steaming or by boiling in ...	1.15	1.1%	12%
'0409	Natural honey	2.72	2.7%	17%
'0410	Turtles' eggs, birds' nests and other edible products of animal origin, nes	1.04	1.0%	6%
	Total Global Export	1.04		

It is obvious from the figure that a major part of exported cheese is HS 040690 (58 %) followed by HS 040610 (24%), HS040630 (8%), HS040620 (8%) and HS 040640 (2%).

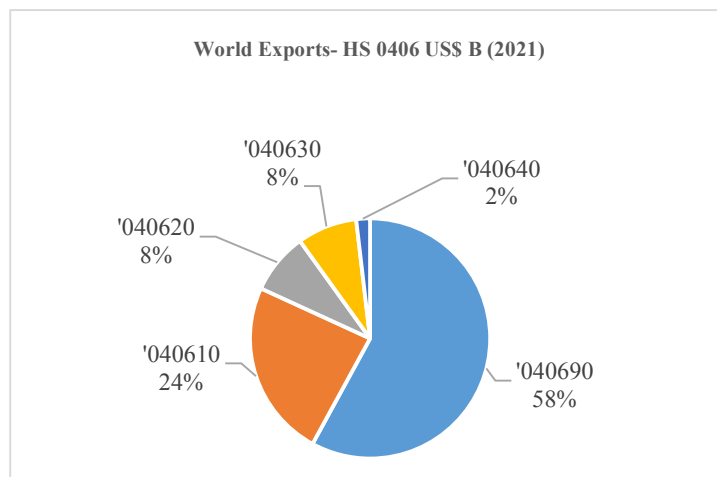


Figure 29: Global Exports of HS 0406-2021

The major exporting countries in global export of HS 0406 are Germany having share of 14.5%, followed by Netherlands, Italy, France and USA with share of 12.3%, 11.7%, 10.2% and 4.8% respectively. Following table represents the global top exporters for HS 0406;

Exporting countries	Quantity (M Tons)	Value (US\$ B)	Share (%)	Value Growth 2020-21 (% p.a.)
Germany	1364.61	5.42	14.5%	13%
Netherlands	943.57	4.58	12.3%	9%
Italy	535.53	4.37	11.7%	20%
France	665.30	3.80	10.2%	8%
USA	404.89	1.80	4.8%	12%
Denmark	401.49	1.76	4.7%	10%
New Zealand	373.55	1.48	4.1%	12%
Belgium	292.25	1.28	3.4%	19%
Ireland	268.21	1.25	3.4%	6%
Belarus	298.25	1.19	3.2%	12%
Others (<1190\$m)	1929.28	10.33	27.7%	
Total Global Export	7476.93	37.26		

12 Recommendations

A supply-demand gap of 10-15% offers attractive opportunities for investments in the dairy sector. Currently, investment opportunities are present in commercial dairy farming and value addition of milk in cheese as cheese market is developing rapidly and demand for cheese especially in fast food is increasing. To fulfil the growing demand, many foreign companies have established their supplies in retail stores in Pakistan e.g. Metro, Hyper star where enough space is allocated to attract a large number of consumers. On the other hand, due to limited number of cheese production units, especially Mozzarella and Cottage cheese, there is ample opportunity for new food processors to enter this rapidly developing consumer market and position themselves suppliers of high quality cheese.

The feasibility studies and current experience of entrepreneurs in the dairy sector show that the sector can provide good profit margins and return on investment as compared to prevalent trends in other enterprises³⁹.

Following recommendations may be considered;

- i. Improvement in farm practices through adoption of best farm practices for housing, feeding, reproduction and milk hygiene etc. to optimize milk productivity of cows and buffaloes, improving dairy farm economics.
- ii. Public and private sector efforts targeting the improvement of farm productivity, veterinary health and marketing should be harmonized at national and regional levels.
- iii. Improvement in efficiencies related to milk procurement, transportation and distribution chains starting from farm to table, as milk is highly perishable commodity.
- iv. Development of advanced extension programs aiming at provision of vocational training to master trainers and experts and networking them with other marketing linkages so as to introduce and familiarize them with the practical field.
- v. Creating awareness on modern value addition in dairy such as cheese production through best practices and adoption of technology. The trainings may be organized by private dairy industries, academia and R&D organizations.
- vi. Creating awareness for wholesome and hygienic dairy product at the level of SMEs through implementation of modern food safety management practices including Pre-Requisite Programs (PRPs), HACCP, ISO certification etc. This will create a healthy competition not only within the country's dairy market but also facilitate participation in international trade.
- vii. Promotion of Business-to-Business (B2B) matchmaking particularly for local businesses for exploring international markets. Aggressive and steady marketing efforts are required to establish presence in international commodity markets.

³⁹ NARC report on cheese prefeasibility

13 Useful Links

Government of Pakistan	www.pakistan.gov.pk
Ministry of Industries & Production	www.moip.gov.pk
Small & Medium Enterprises Development Authority (SMEDA)	www.smeda.org.pk
Ministry of National Food Security & Research	www.mnfsr.gov.pk
Ministry of Education, Training & Standards in Higher Education	http://moptt.gov.pk
Government of Punjab	www.punjab.gov.pk
Government of Sindh	www.sindh.gov.pk
Government of Khyber Pakhtunkhwa	www.khyberpakhtunkhwa.gov.pk
Government of Balochistan	www.balochistan.gov.pk
Government of Gilgit Baltistan	www.gilgitbaltistan.gov.pk
Government of Azad Jamu Kashmir	www.ajk.gov.pk
Trade Development Authority of Pakistan (TDAP)	www.tdap.gov.pk
Security Commission of Pakistan (SECP)	www.secp.gov.pk
Federation of Pakistan Chambers of Commerce and Industry (FPCCI)	www.fpcci.com.pk
State Bank of Pakistan (SBP)	www.sbp.org.pk
Punjab Small Industries Corporation	www.psic.gop.pk
Sindh Small Industries Corporation	www.ssic.gos.pk
Punjab Vocational Training Council (PVTC)	www.pvtc.gop.pk
Technical Education and Vocational Training Authority (TEVTA)	www.tevta.org
Livestock & Dairy Development Department, Government of Punjab.	www.livestockpunjab.gov.pk
Punjab Industrial Estates (PIE)	www.pie.com.pk
Faisalabad Industrial Estate Development and Management Company (FIEDMC)	www.fiedmc.com.pk
Punjab Board of Investment & Trade (PBIT)	www.pbit.gop.pk
Sindh Board of Investment (SBI)	www.sbi.gos.pk
Pakistan Agricultural Research Council (PARC)	www.parc.gov.pk
National Agricultural Research Centre (NARC)	www.parc.gov.pk
Punjab Livestock & Dairy Development Board (PLDDB)	www.plddb.pk
University of Agriculture, Faisalabad	www.uaf.edu.pk
Lasbela University of Agriculture, Water & Marine Sciences, Lasbela	www.luawms.edu.pk
Sindh Agriculture University, Tondojam	www.sau.edu.pk
Gomal College of Veterinary Sciences, Dera Ismail Khan	www.gu.edu.pk
KPK Agricultural University, Peshawar	www.aup.edu.pk
Pir Mehr Ali Shah Arid Agricultural University, Rawalpindi	www.uaar.edu.pk
University College of Veterinary & Animal Sciences, Islamia University Bahawalpur (IUB)	www.iub.edu.pk
University of Veterinary & Animal Sciences (UVAS), Out Fall Road, Lahore	www.uvas.edu.pk
Bahauddin Zakariya University (BZU) Multan	www.bzu.edu.pk
Dairy & Rural Development Foundation (DRDF), Lahore	www.dairyproject.org.pk
Agribusiness Support Fund (ASF), Lahore	www.asf.org.pk

14 References and Websites

- Economic Survey of Pakistan 2022-23
- FAO (Food and Agriculture organization of United Nations) 1987, Pakistan Livestock Sector Study Report of the FAO/ADB Cooperative Program Investment center Vol. 1& 2 FAO, Rome.
- Dr. M. Younas. 2013. The Dairy Value Chain: A Promoter of Development and Employment in Pakistan. ICCD Working Paper. Paper No. 9
- Food Safety and Agricultural Health Standards: Challenges and Opportunities for Developing Country Exports, World Bank 2005
- Food Safety Legislation in Pakistan: Identifying entry points for public interventions, Mazhar Siraj, Research fellow CRCP
- Federal Bureau of Statistics, Govt. of Pakistan.
- Anonymous, Food Outlook, in Food Outlook Global market analysis, FAO (Food and Agriculture Organization): Rome, Italy, 38-41 (2011).
- Market Access Requirements, CBI Market Information Database
- Pakistan Country Overview 2006, World Bank
- Pakistan rural based food processing Industry 2001. APO, Abdul Hafeez Chaudhary, MoIP&SI
- Pakistan's Agro Based Exports & Sanitary and Phyto-Sanitary Compliance: A Joint World Bank and UNIDO Report.
- Darya, D. (2006), The White Revolution, Pakistan Dairy Development Company's Publication
- IFQC Ltd. River court Business Centre, Riverlane, Dundalk, Co.Louth, Ireland. Tel: 042 9320912 Email: info@brc-ireland.com
- 9 cheese. Norman F. Olson, Madison, Wisconsin State, USA
- Zia, Umm and Mahmood, T (2011), Dairy Development in Pakistan, Food and Agriculture Organization (FAO)
- Raja, R.H., (2003) Pakistan Smallholder Dairy Production and Marketing, Islamabad, Ministry of Food, Agriculture and Livestock (Livestock Wing)
- Jalil, Hamid and Rehman, Hafeez (2009), Analysis of Milk Production System in Peri-Urban Areas of Lahore (Pakistan), A Case Study, Pakistan Economic and Social Review, Volume 42, No. 2 (Winter 2009)
- Riaz, Khalid (2008), A Case Study of Milk Processing: The Idara-e-Kissan Cooperative, The Lahore Journal of Economics, 13:1 (Summer 2008)
- Afzal, M (2008), Corporate Dairy Farming in Pakistan: Is there a Future? Livestock and Dairy Development Board, Islamabad, Pak. J. Agri. Sci. Vol. 45(2)
- Burki, Abid and Khan, Mushtaq (2004), The State of Pakistan's Dairy Sector: An Assessment, The Pakistan Development Review, 43:2 (Summer 2004)
- J.E Austin Associates, Strategic Working Group. 2006. The White Revolution, Strategic Plan for the Pakistan Dairy Industry

- www.ldb.org.pk/ Livestock and Dairy Development Board of Pakistan
- www.trademap.org
- www.wikipedia.com
- www.codexalimentarius.net
- www.cbi.nl
- www.faostat.fao.org/ Food and Agriculture Organization of United Nation
- www.tdap.gov.pk/ Trade Development Authority of Pakistan
- www.usda.gov/ United States Department of Agriculture
- www.trtapakistan.org

15 Annexures

15.1 Annexure I: Punjab Food Authority

The Punjab Food Authority has been established under the "Punjab Food Authority Act 2011" to ensure availability of safe and wholesome food for human consumption. The basic purpose is to lay out standards for food articles and to regulate their manufacturing, storage, distribution, sale and import. Its main functions are;

- Formulate standards, procedures, processes, and guidelines in relation to any aspect of food including food business, food labelling, food additive, and specify appropriate enforcement systems.
- Specify procedures and guidelines for setting up and accreditation of food laboratories;
- Formulate method of sampling, analysis of samples and reporting of results;
- Specify licensing, prohibition orders, recall procedures, improvement notices or prosecution.
- Provide scientific advice and technical support to the Government in matters related to food.
- Collect and analyze relevant scientific and technical data relating to food.
- Establish a system of network of food operators and consumers to facilitate food safety and quality control;
- Organize training programmes in food safety and standards.
- Promote general awareness as to food safety and standards.
- Registration, licensing and other services.
- Certify food for export.

Lahore is the first notified district that comes under the operational jurisdiction of the Punjab Food Authority. It is now expanded to whole of the Punjab. A variety of enforcement tools have been discussed in the Act, 2011 such as;

- Improvement notice
- Imposition of fine through ticketing,
- Seizure of food items
- Sealing of premises
- Prosecution in the courts of law,
- Emergency prohibition orders, under section
- Recall a substandard food item.

Food Surveillance

It involves surveillance of all the steps involved in the manufacturing, transportation, storage and marketing of food items. International best practices are adopted in order to ensure traceability of raw material as well as the finished products.

- Transportation and storage under adequate environment and controlled conditions, is also part of the food safety regime.
- On Spot Testing Through Rapid Testing Kits
- To check the quality of food items through “on the spot kits”.
- Kits are used to detect various adulterants in milk, spices, tomato ketchup and also rancidity in cooking oil and ghee.
- Instead of archaic practice of drawing samples across the board, the field teams draw samples of only those food products and send them to the laboratory, which fail to pass the rapid testing tests.
- Raids at Entry Points of Lahore
- During the milk raids rapid tests are applied to check the possible adulteration of milk with water, urea, formalin, detergents and starch. Samples of only those vehicles had been drawn and sent to the laboratory, which had failed to pass rapid testing.
- Shops / Road Side Vendors
- Rectifications ---- by way of issuing improvement notices.
- The field teams issue guidance on food safety and personal hygiene to these vendors.

15.2 Annexure II: Relevant Ministries and Departments

Ministry	Departments	Functions
Ministry of National Food Security and Research	Animal Husbandry Commissioner	Acts as Chief Veterinary Officer, caters for disease surveillance and control, epidemiology, drugs, vaccines, dairy sector initiatives
	Animal Quarantine Department	caters to animal health conditions for import and export, meat inspection for exported meat/ casings, controls at border inspection posts Under Animal Quarantine (Import and Export of Animal Products Ordinance, 1979)
	National Veterinary Laboratory	caters disease surveillance, veterinary drug testing, vaccination quality, residue testing, import/export controls at border
	Department of Plant Protection	Import/export controls at 26 borders, Inspection posts for plant pests/diseases, Operates under Plant Quarantine Act 1976. Responsible for authorization of pesticides (Pesticide Ordinance 1971)
	Grain Quality Testing Laboratory	Sampling, Testing for import and export of grains (and other foods), Pesticide residue, Aflatoxin testing
	National Animal and Plant Health Inspection Service (NAPHIS)	Responsible for development of policy, Initiate legislation, Ensure efficient enforcement.
Ministry of Science and Technology	Pakistan Standards and Quality Control Authority (PSQCA)	National standardization body responsible for enforcement of standards, inspect and test products and services, including food items, for their quality, specification and characteristics during use, and for import and export purposes
Ministry of Health	National Institute of Health	Communication with provinces on food safety
Ministry of Commerce	Customs Department	Ensure that imported food items meet Pakistan's labelling and shelf-life requirements, are not on the list of banned items, and are assessed the appropriate tariffs.
Provincial Governments	Department Of Health	Department of Health: Food safety in retail/catering and processing establishments for national market.
	Department of Plant Protection	Plant pest & disease surveillance, Control on use and distribution of pesticides
	Livestock/Dairy Departments	Meat & dairy inspection at farm/ slaughterhouse/ dairy, Poultry and eggs inspection at producer level

15.3 Annexure III: Contact Details of Machinery Suppliers

Sr. #	Contact Details
1	Dairy Engineering Technology Head Office: 17 K/3 WAPDA Town Lahore. Work Shop: 239-B Sunder Industrial Estate Lahore. Email: Dairy_engineering@yahoo.com Mob: +92 322-7821080, +92 300-8420884.
2	ESET Private Limited 24-A-2, Pakistan Expatriates Co-Operative Housing Society Limited, Valencia Housing Scheme, Lahore-53704, Pakistan Telephone: +92 321 5286070 Email: info@eset.com.pk Web: www.eset.com.pk
3	Azhar and Co. Display: 19 - Main Brandeth Road, Lahore. Office: Suite # 4, 1 st Floor, Al-Karim Center, Rehman Street # 5, Main Brandeth Road, Lahore. Phone: +92-42-3764 1060 & +92-42-3763 6437. Fax: +92-42-37661379. E-mail : info@azharco.com , professionalinterest@hotmail.com Web: www.azharco.com
4	Al-Madina Engineering & Dairy Equipment near Canal Bridge G.T Road, District Okara, Punjab Phone: +92-44-2527118, +92-44-2528818, +92-301-73-11-730 Fax: +92-44-2525818 E-mail: al_madina75@hotmail.com , al_madina75@yahoo.com Web: www.al-madina.net.pk