

The White Revolution

"Dhoodh Darya"

White Paper on Pakistan's Dairy Sector



A publication of
Pakistan Dairy Development Company

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The White Revolution- Dhoodh Darya

June 2006

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TABLE OF CONTENTS

<i>Para No.</i>	<i>Description</i>	Pg
	EXECUTIVE SUMMARY	6
 CHAPTER-1		
1.0	<i>Introducing Dairy Pakistan - A Pathway to Progress</i>	16
1.1	<i>Dairy Pakistan Governance and Management (Brief)</i>	16
1.2	<i>Farm Management and Dairying Research Institute</i>	18
 CHAPTER-2		
2.0	<i>Overview of Pakistan's Milk Economy- Present Scenario</i>	19
2.1	<i>Milk Production</i>	19
2.2	<i>Structure of Dairy Farming in Pakistan (Comparative to other countries)</i>	20
2.3	<i>Smallholding Farms</i>	21
2.4	<i>Economies of Scale and Mechanized Farms</i>	23
2.5	<i>Milk Collection and Distribution system</i>	24
2.6	<i>Processed Milk Industry (Business Environment and Constraints)</i>	26
2.7	<i>Processors and Consumers</i>	29
2.8	<i>Adulteration and Hygiene Issues</i>	30
2.9	<i>Seasonality</i>	30
2.10	<i>Milk Pricing & Profitability in a Competitive World</i>	30
2.11	<i>External Influences</i>	31
 CHAPTER-3		
3.0	<i>White Revolution (Dhoodh Darya)</i>	33
3.1	<i>Specific Targets of the White Revolution</i>	37
3.2	<i>Modus Operandi to Unlock the Potential – The Eight-point Strategic Agenda of the White Revolution.</i>	37
3.2.1	<i>The most important point of the Strategic Agenda of the White Revolution will be the successful implementation of the Dairy Development Projects.</i>	37
3.2.2	<i>Creating Rural Entrepreneurs</i>	37
3.2.3	<i>Developing the Value Added Market – innovation in health, pleasure and presentation</i>	38
3.2.4	<i>Organizing the informal sector into documented formal economy and to formalize the role of the middlemen</i>	39
3.2.5	<i>Propagating quality and implementation of pasteurization laws:</i>	39
3.2.6	<i>Mapping Increased Supply Pockets and special incentives for NWFP and AJK</i>	39
3.2.7	<i>Attracting foreign investments and joint ventures and encouraging Existing Processors to increase investment in the sector</i>	39
3.2.8	<i>Dairy Pakistan - creating a monitoring and implementation Mechanism for the White Revolution</i>	39
3.3	<i>White Revolution (Dhoodh Darya) promises to empower rural Pakistan</i>	39
 CHAPTER-4		
4.0	<i>Strategy in Action – Strategic Initiatives by Dairy Pakistan</i>	43
4.1	<i>Small Holder Dairy Project</i>	43
4.2	<i>Dairy Technology Program</i>	43
4.3	<i>Diversified and Accessible Dairy Micro-financing Committee:</i>	43
4.4	<i>Dairy Quality Standardization and Monitoring Mechanism</i>	44
4.5	<i>Dairy Media Campaign – “Dhoodh Darya”</i>	44
4.6	<i>Dairy Business Advocacy Program:</i>	45
4.7	<i>Dairy Cold Chain and Innovative Protective Materials</i>	45

CHAPTER-5

5.0	<i>The tax, the tariff and the trade”- Policy needs analysis for the Dairy Sector – a case for Business advocacy</i>	46
5.1	<i>Zero Rating Of Sales Tax On Dairy Products</i>	46
5.2	<i>Zero Rating Of Customs Duty On Raw Materials For Packaging Supplies To Dairy Industry</i>	47
5.3	<i>Processing Equipment, Plant and Machinery</i>	48
5.4	<i>Dairy Farming and Extension Services</i>	49
5.5	<i>Import of Semen</i>	50
5.6	<i>Import of Vaccines:</i>	50
5.7	<i>Tariff Rationalization for the dairy sector</i>	51

CHAPTER-6

6.0	<i>Creating Dairy Entrepreneurs, Empowering Small Holding Farmers and Developing Dairy Infra-structure</i>	52
6.1	<i>Milk Collection Tanks</i>	52
6.2	<i>Model Dairy Farms</i>	53
6.3	<i>Farmer Technical Training Program</i>	55
6.4	<i>Farm Management and Dairying Research Institute</i>	56
6.5	<i>Mobile Milk Collection Units program</i>	57
6.6	<i>Review of Support Services Technical (Animal health care) Training</i>	59
6.7	<i>Farm Input Stores for farmer Small Holding Farmer Facilitation</i>	59
6.8	<i>Livestock Housing</i>	61
6.9	<i>Biogas</i>	61
6.10	<i>Indigenous Breeds</i>	61
6.11	<i>The Value of Buffalo Milk</i>	62
6.12	<i>Boosting Herd Numbers and Genetic Diversity through Imports</i>	63
6.13	<i>Developing Milk Pockets</i>	63

CHAPTER-7

7.0	<i>Business Model Program</i>	65
7.1	<i>Creation of Rural Entrepreneurs</i>	65
7.2	<i>Finance and the Middleman</i>	65

CHAPTER-8

8.0	<i>Cold Chain vs. Warm Chain</i>	67
8.1	<i>Approaches</i>	67
8.2	<i>Integrated approach</i>	68

CHAPTER-9

9.0	<i>Increasing the National Herd Size and Genetic Potential Through Animal Imports</i>	71
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CHAPTER-10

10.0	<i>Adulteration and Hygiene Issues for Milk and Proposal for Pasteurization Law</i>	72
10.1	<i>Summary</i>	72
10.2	<i>Adulteration and Hygiene Issue</i>	72
10.3	<i>Strict Compliance for quality and implementation of Pasteurization laws</i>	72
10.4	<i>Dairy Quality Standardization and Monitoring Mechanism</i>	72
10.5	<i>Dairy Food Safety Standards and Pasteurization</i>	73

CHAPTER-11

11.0	<i>Conclusion</i>	74
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ANNEXURE	<i>Proposed Pasteurisation Law</i>	77
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ANNEXURE	<i>Dairy Safety Standards for milks and milk products</i>	84
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ACRONYMS

GOP:	Government of Pakistan
IFCN:	International Farm Comparison Network
SWOG:	Strategic Working Group
USD:	US Dollars
OMC:	Organized Milk Collection Model
PVD:	Primary Village Dairy
PDM:	Progressive Dairy Markaz
PSQCA:	Pakistan Standards and Quality Control Authority
WTO:	World Trade Organization
GAWALLA:	A person who collects milk from the farmers and supplies to cities



TABLES AND FIGURES

Table/Figure No.	Table Contents
Figure 1-A	Organogram of Dairy Pakistan
Table 1-B	Function wise organogram
Table 2-A	Milk Economy Overview
Table 2-B	IFCN Dairy Farm Categories in Pakistan
Table 2-C	Milk Production per Animal Kg/Lactation
Figure 2-D	Milk collection and distribution system
Table 2-E	Share of UHT Processed Milk in Real GDP
Table 2-F	Processor Capacity
Table 2-F (i)	Milk powder statistics
Table 2-G	Global Dairy Demand
Figure 2-H	Pakistan – 4th largest milk producing country
Table 3-A	Nestle Milk District Model
Figure 3-B	Empowering Rural Pakistan
Figure 5-A	Job creation
Figure 5-B	Packaging recommended for tax exemption
Table 5-C	Tax exemption/ reduction in processing
Figure 5-D	Farming and extension services
Table 6-A	Project Phasing

Executive Summary

The White Revolution – Dhoodh Darya

The White Revolution is at hand! Traditionally symbolized as the "Doodh Darya" meaning the "river of milk", this is a vision to re-engineer Pakistan's dairy sector, transforming it to become one of the world's most competitive dairy sectors (local market) with a possibility of being an exporter in the long run. It envisions the dairy sector to serve as an **"engine of economic growth"** for the country and to take the responsibility to **"drive the development the socio-economic landscape of rural Pakistan"**.

Objectives of the White Paper

This draft paper is aimed at disseminating information on the untapped potential of the dairy sector in Pakistan. The paper gives detailed information, consolidated and obtained from different stakeholders. These include the industry, farmer groups, government departments, development institutions, earlier research papers, consultants and independent opinion holders. Additionally a thematic strategy is also proposed, both at the policy level (Bridging the government with the dairy sector for supportive policy), and at the implementation level (Bridging the farmer with the market mechanism and the industry). The overall focus will be development of the dairy farmer in terms of socio-economic growth, providing the industry, potential investors and rural entrepreneurs a viable market mechanism and creating a strong platform for all dairy stakeholders. The central platform mobilized and structured for the effort is "Pakistan Dairy Development Company" registered as a guaranteed limited company, generally known as "Dairy Pakistan". This platform consists of representation and policy support from the Government, Industry and the farmer groups whereby the core lead is provided by the private sector by virtue of their expertise.

The essence of the paper revolves around four major issues: a) *The statistics and rationale of the informal dairy sector*; b) Government Policy support for the sector (through supporting laws and supportive policies for Tax, Tariff and trade); c) Linking the farmer to the market mechanism by utilizing expertise of the industry and leveraging the farmer, and d) proposing dairy development projects as practical solutions for injecting funding and technical capacity into the dairy sector in order to enhance the capabilities of farmers to a level where they can meet the challenges of the potential dairy market.

BRIEF

Pakistan with current estimates is the 4th largest milk producing country in the world with 33 Billion litres of milk produced annually. The potential is huge but the sector operates mostly in the informal economy and needs a consistent effort to formalize and be able to contribute better to the national economy. Out of the total milk produced, 97% is in the informal sector (i.e. loose milk consumed in the villages and or sold in the cities through "Gawallas" in unhygienic conditions and without any quality standards). There are 8 Million farming households in Pakistan with a total herd size of 50 million animals. 97% of these farmers are not linked to formal markets and hence are not progressing in economic terms. Moreover, the overall animal herd of Pakistan is thinly spread across thousands of square kilometres with an average of 2 to 5 animals per household. Dairy farming practices are very old and traditional and need overhauling. To formalize and improve the industry, a private sector led Pakistan Dairy Development Company has emerged with guarantee backup by government of Pakistan. . The platform proposes to improve the dairy sector through improved research facilities, training and capacity building of farmers, training veterinarians, improving the cold chain through milk chillers, promoting healthy pasteurised milk, develop model commercial dairy farms, focus on breed improvement, facilitation of credit financing to dairy farmers and linking the rural area based farmer to the market mechanism.

*This will improve and formalize the dairy sector. The White Revolution is targeted to achieve an annual production of **40 billion liters** of milk by 2015, it aims to create an additional **3 million jobs** in the formal economy and provide an estimated **350 million rupees per day** in cash flow to farmers in the sector or to say that an additional formal economy of **3 Billion US\$** will be developed for the rural economy. The potential is there but needs technical support from the industry, strategic support from dairy experts, policy and infrastructure from the government and specific projects funding from the international donor agencies. The potential is estimated on the basis of the fact that livestock and agriculture sector contributes over 10% to the GDP, and a milk economy that in value terms is 27.7% of the total agriculture sector. It is an untapped market, expected to grow an additional 3 billion liters in the next few years at a growth rate faster than most sectors, and 30% by 2015.*

This will enable farmers to successfully sustain themselves as private entrepreneurs in the "White Revolution". The benefit will initially be for the local Pakistani market and in long term, the possibility of developing linkages with other markets in other regions will be explored.

The Economic Benefit (Over a decade)

With an estimated 33 Billions Liters of annual milk production from 50 million animals managed by approximately 8 million farming households, according to latest statistics Pakistan is the 4th largest milk producing country in the world. It has a livestock and agriculture sector contributing over 10% to the GDP, and a milk economy that in value terms is 27.7% of the total agriculture sector. It is an untapped market, expected to grow an additional 3 billion liters in the next few years at a growth rate faster than most sectors. Undeniably, a sector with such credentials can bring about not just a radical change but also a dairy revolution in the country



The annual milk production of 33.6 billion liters in Pakistan is shared between a 71.1% share for the rural economy and a much smaller urban share of 29%. Only 3% of the total production of milk is processed and marketed through formal channels. For the other 97%, a multi-layered distribution system of middlemen has evolved to supply milk. The contribution of the formal sector processed milk to real GDP in Pakistan is 0.43% in 2004-05. Despite only a small percentage (3%) of milk being processed, the (UHT) market is growing at a steady rate of 20% a year. Presently 97% of raw milk produced in the rural economy is not linked to the market mechanism because of a number of reasons (defined ahead in this paper). Due to this reason, the dairy sector in the rural economy is not making a significant impact in the

National economy in accordance with its potential and also with the quantity of milk, which is available.

The White Revolution is targeted to achieve an annual production of **40 billion liters** of milk by 2015; it aims to create an additional **3 million jobs** in the formal economy and provide an estimated **350 million rupees per day** in cash flow to farmers in the sector.

The Dairy Vision till 2015

Given success of the programs discussed in this paper, what might the dairy industry look like in the year 2015?

- The formal sector to be 40% of the total dairy industry.
- Low cost but good quality pasteurized milk to be available in cities and towns accounting for 70% of Pakistan's population.
- Pakistan's dairy industry meets the needs of consumers, thus minimizing imports.
- The range of goods offered to consumers is as wide as in say the markets of the Gulf.
- The well being of farmers throughout Pakistan is enhanced, and dairying is acknowledged to be a profitable enterprise.
- Dairying will have lifted millions of farmers above subsistence levels of activity.
- A thriving commercial dairy farming sector will be in place.
- Well-regarded Research Institutes will be active in their chosen fields, with a focus on meeting the needs of farmers.
- Quality of some sectors of the industry will be such that exports are viable.



- Dairying will be practiced across Pakistan, in a manner that contributes to balanced regional development.
- An integrated rural support economy will be in place, with contractors supplying support services.
- Education for professional service providers will be broader than at present, producing qualified experts capable of providing advice to farmers across a range of farming related matters.
- Boosted by a greater contribution to GDP from dairying, rural infrastructure will be much improved from the present.
- Large farms and milk colonies will be generating part of their own energy needs through biogas.
- The linkage between the dairy industry and micro-finance providers will enhance the living standards of millions of smallholder farmers.
- An industry with a greater proportion of milk handled by the formal sector, and with consumers more aware of product quality standards, will be attractive to foreign investors.

Current Bottlenecks and Problem Areas

Broadly speaking, the following are some of the more important problem areas:

- Poor profitability for farmers.
- Lack of contact for farmers to the market mechanism.
- Poor infrastructure in rural areas.
- Lack of education among the farming population, making it difficult to change farm management systems.
- Lack of knowledge about optimal feed.
- Lack of a cold chain to protect milk quality.
- Consumers are unaware of the quality of the milk they are buying, and most cannot afford the higher cost/higher quality presentations offered by the processing industry.



- Adulteration.
- Lack of access to well trained support service staff such as veterinarians.
- Despite the huge volume of milk produced in Pakistan, processors find it hard to procure sufficient milk to meet consumer demand, increasing demand for imported products.
- The product range offered to consumers is not well developed.
- Insufficient research facilities to drive productivity and enhanced farming systems through the industry, and to drive genetic gain.
- Lack of pasteurization law and strict implementation mechanism of milk food safety standards.

At the highest level, it is considered that the problems that need to be faced if a developed dairy industry is to be built are as follows:

- Profitability
- Quality
- Meeting the needs of the “the 95%”

Note:

1-It is expected that with improved and demonstrable profitability, further investment in farming will solve issues relating a shortage of milk. Thus, the need to increase milk production, especially over summer, is considered a secondary rather than a primary matter.

2-“The 95%” is the approximate proportion of the population, which struggles to afford current presentations supplied by the market by the formal sector.

Strategic Recommendations

- Via Dairy Pakistan's Model Farm program, identify best practice farm management systems, taking into account regional variation and farm sizes, and disseminate these practices through the industry.
 - Critically, these farm management systems must enhance profitability.
- Via Dairy Pakistan's Cooling Tank program, working in conjunction with several other initiatives, improve the quality of milk delivered to consumers and processors.
- Through both incentives and penalties, discourage adulteration and encourage respect for milk throughout the supply chain.
- Identify a model for delivering cost effective pasteurized milk to a much higher proportion of Pakistan's population, and implement.
- Improve the service offered by supporting functions, and improve access to these support services:
 - By reviewing professional education methods and improving if necessary.
 - By building upon present training initiatives.
 - Achieving integration of the many providers of training at various levels, in order that common understanding and improved effectiveness is enabled.
 - And by achieving access to more of rural Pakistan to these support functions.
- Achieve co-ordination between the many programs now operating to improve the performance of dairying in Pakistan, and among parties leading these programs.
 - This includes the need to recognize dependencies; phasing will be required owing to both any such dependencies and the need to build institutional capability.
- Build the case for improved infrastructure in dairying areas.
- Build a thriving commercial dairy farming sector, by implementation of modern but localized farming systems, based on robust financial analysis and performance.
- Establish additional research institutions.
- Build the human resources of the industry.
- Create conditions under which further investment in the industry, whether from domestic or foreign sources is attracted.
- Ensure at the least that Pakistan can meet the needs of its consumers without need for imports.
- Achieve linkage between the formal sector and micro finance providers, such that the financial well being of farmers and farming communities is enhanced.
- Build a network of rural entrepreneurs operating in support of the farming community.
- Implementation of the proposed pasteurization law and enforcement of quality standards for milk.

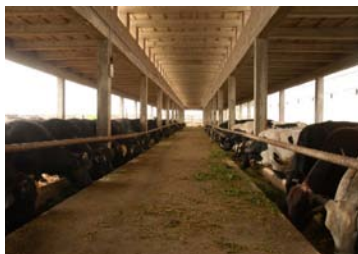


Critically, Dairy Pakistan must cater to a wide variety of stakeholders, including Government, donor agencies, processors, people working within the industry, consumers and no doubt most importantly the dairy farmers of Pakistan. Strategies will be modified and change over time, but the goal of driving the development of the dairy industry to the satisfaction of these stakeholders, in a balanced and fair manner, must remain paramount.

Specific Dairy Development Agenda (Mid term - three to seven years)

Proposed Projects

Dairy Development Projects are designed to deliver a number of specific development models through investment in infrastructure and human capital. That is



1. **2440 model farms** will be established, to introduce enhanced farm management and to demonstrate commercially viable dairy farms with best farm practices.

2. **6330 cooling tanks** (Milk Chillers) will be provided under a 100% soft loan scheme. The majority of these tanks will be used to

create additional collection centres, thus enhancing the opportunity for farmers to link to the market, and improving milk quality by chilling a greater proportion of milk.



3. **2100 mobile milk** collection units will be provided under the rural entrepreneurship program.
4. A **Farm Management and Dairying Research Institute** will be established under "Dairy Pakistan" with a focus to do research & development and disseminate research based practical measures, which are adoptable at the grass root level farmers; Projected analysis reveals that if only 5% of 15,000,000 farmers increase their yield by 50% (to 6.3 kg) the total milk supply will increase by 1,575,000 kg per day. This is a long term project and needs specialized planning and deliberation.

5. **Farmer Technical Training Program** will be initiated as a vocational training program and will be implemented in two phases. In Phase-I a capacity building model for planning and developing master trainers will be applied and a process of model dairy farms will be established and in Phase-II basic Vocational training for farm management and animal health care will be provided to approx 288,000 farmers and 10,000 dairy technicians. (Micro financing will be furnished to interested technicians after training on a 30% grant and 70% soft loan mechanism to establish their skill based small business.



6. **Review of Support Services Technical (Animal health care) Training:** The existing support services like animal health care, veterinary cover and access to the right medicines and vaccination in far flung areas needs to be reviewed and capacities needs to be built. Once the right capacities are built, then a mobile access project for animal health care will be launched. This project will ultimately lead to static and mobile veterinary dispensaries, which will create an enabling environment to provide services to 14.2 million animals (This is envisaged as a long term process).



7. **Farm Input Stores** for farmers: In order to ensure availability of balanced nutrition for 1.5 million animals, a total of 690 bulk farm input stores will be established resulting in improving milk yield per animal (Micro credit facilitation will be provided).



8. **Livestock Housing:** This project will focus on the development of standard designs for livestock housing.

9. **Biogas project** will be planned and initiated to provide both low cost energy and a reduction in pollution in areas with dairy concentration (as it is in these concentrated areas that high volumes of dung are created).

10. **Indigenous Breeds:** Modern breeding methods and research will be focused under this project to protect indigenous breeds while improving the milk yield of these breeds.

11. **The Value of Buffalo Milk:** Needs to be reviewed and comparative initiatives be taken in relation to value of cow milk.

12. **Boosting Herd Numbers** and Genetic Diversity through Imports and establishment of commercial breeding facilities.

13. **Developing Milk Pockets:** It is considered that there may be milk pockets throughout Pakistan that are distant from formal processors but accessible to underserved regional markets. A number of projects will be undertaken to develop a full potential of these milk pockets in terms of development and accessibility.



Readers are reminded about the three main problems to be solved if a developed dairy sector



The following diagram illustrates firstly how the identified programs will help to solve the problems, and secondly indicate how the programs act in concert – individual programs will not supply an easy solution.

Integrated approach to dairy sector development:



Information Campaign (For Consumers, Farmers and Industry)

An information campaign (primarily at awareness level) on quality of milk, animal health care, basic farm management, information related to breeds and market linkages will be undertaken by Dairy Pakistan through print and electronic media for overall dairy sector development. This will enhance the confidence of the masses in the White Revolution; "Dairy Pakistan" in a joint effort with the Federal and Provincial

Governments will carry out a media campaign called the Dhoodh Darya Media Campaign – (DMC) for a period of five years 2006-2011. The information campaign will educate the consumers on health risks of unhygienic loose milk encourage farmers or groups of farmers to develop a cold supply chain and adopt best farm practices to economically benefit from production of more milk and developing better quality supply mechanism.

The financial as well as technical support required and available will be highlighted through media campaign so as to enable all stakeholders to benefit from the dairy development agenda.

Policy Support

A good level of policy support is also requested from the government for developing the dairy sector. The main recommendations are as follows,

- a) Zero Rating tax regime for value added dairy products, to allow specific dairy related inputs to be tax and duty-free.
- b) To allow import of raw and packaging material at 0% duty currently based at 25%. Special incentives to be provided to licensing, quality productions, setting up of corporate dairy farms and a special tax incentive to be given for setting up processing units in earthquake hit AJK and NWFP, this will create livelihood opportunities in the regions and increase milk supply pockets.

Infrastructure support by the government (e.g. farm to market roads etc)

It is a relevant fact that no development model can work without the support of the government and there are certain things, which are basic essentials for the dairy development model:

- a) Farm to market roads.
- b) Provision of energy and water connections in villages.
- c) A reasonable electricity tariff for milk chillers.
- d) Acknowledging social collateral for farmers for obtaining financial services for dairy development.

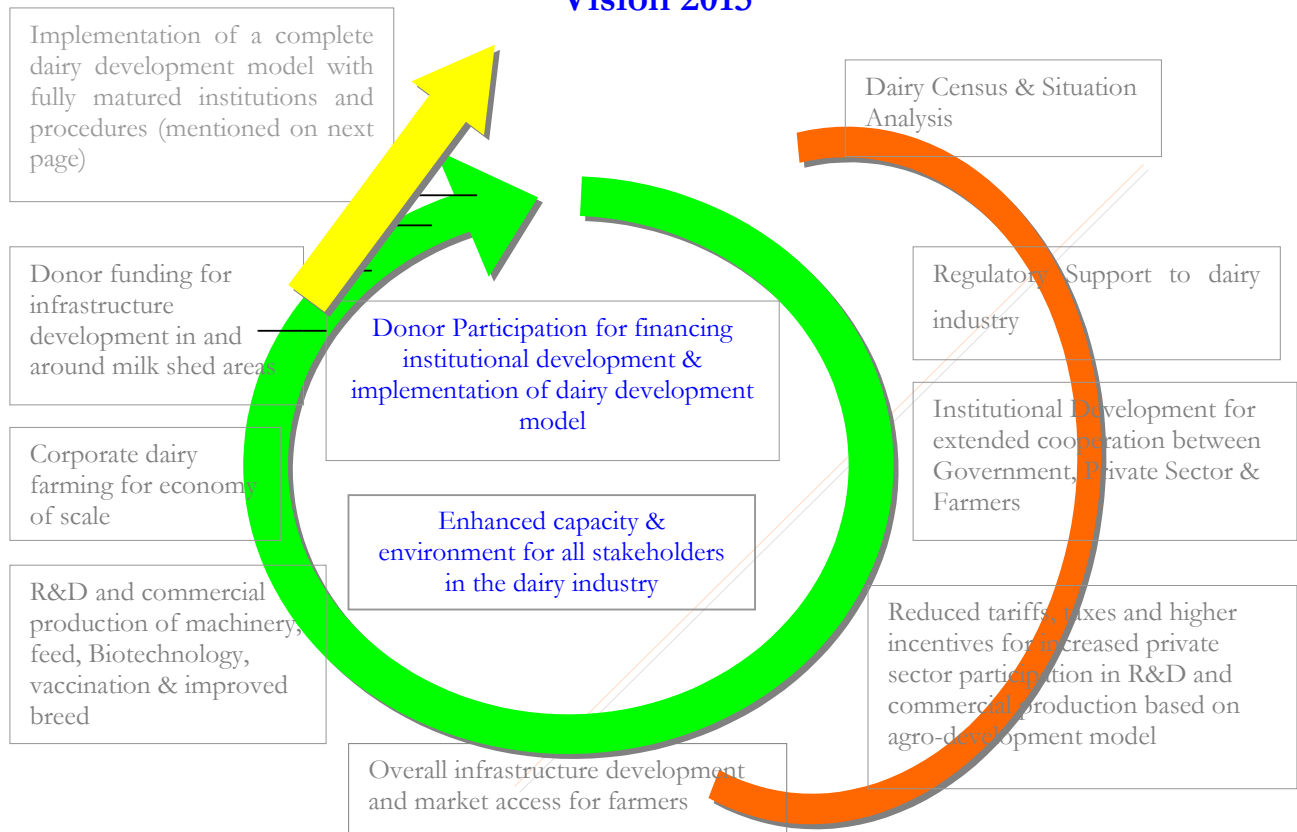
Conclusion

It is important to note that development of the dairy industry is a journey of many small steps. Cognizance must be given to the present state of the industry and the consumer habits. It is not possible to leap to developed world dairying – the basics must be focused on first, and then a logical progression followed.

It should also be recognized that the identified programmes build upon each other. There is no one program, which will provide a permanent and effective solution. Rather, effort and progress must be spread across a broad front.

The White Revolution is an opportunity to deliver change and modernization to the dairy industry, and therefore unlock the potential of the dairy industry of Pakistan. This White Paper is intended to illustrate how the combination of many programs can drive development of the dairy industry. Successful development will benefit the many millions of farmers, and the even more millions of milk consumers.

Dairy Pakistan Vision 2015

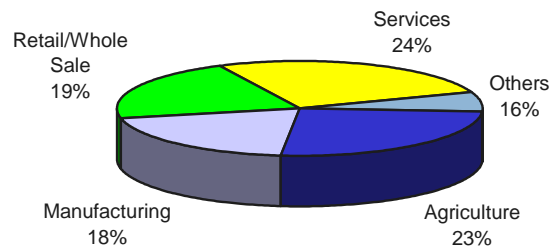


- Private sector participation**
- Government sector initiatives & support for dairy industry**
- Results to be achieved at the end of the process**
- Donor agencies participation**

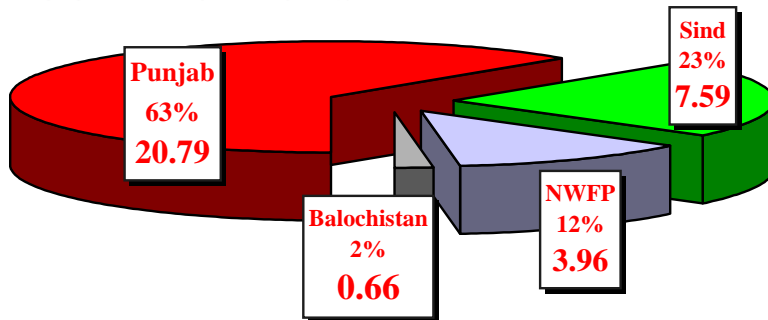


THE STARTING POINT TODAY

AGRICULTURE IN ECONOMY AND CURRENT MILK QUANTITIES AVAILABLE IN PAKISTAN



33 Mio Tons



CHAPTER-1

1.0 Introducing Dairy Pakistan - A Pathway to Progress

Dairy Pakistan has been established as a public-partnership to co-ordinate the dairy development activities of the private sector. It is a one-voice confederation of dairy stakeholders, representing the functional and geographic range of players of the sector. Dairy Pakistan wishes to establish a strategic direction for realising the White Revolution. Dairy Pakistan is determined to establish one of the best Private-Public Partnership cultures. The process was initiated by the Industry in partnership with the government while strategic support was provided by the Dairy Strategic Working Group (SWOG) of United States Aid Agency Program.

Dairy Pakistan is a company registered under section 32 of the companies Ordinance 1984. The company since its inception in 2005 has helped organize the Dairy Sector by providing it with one voice, gaining support from relevant government Ministries, commissioning several studies and reports on various agendas, including the instant strategy paper for the whole sector. New roles and tasks have been prescribed to the Company. The following programs will be carried out under the auspices of the Company.

- To promote development and upgrading of the dairy supply chain in Pakistan by supporting and facilitating the farmers, processors and other stakeholders across the value chain.
- To support growth of the dairy sector by way of supporting and facilitating business development services for enterprises across the dairy value chain.
- To promote milk and other value added dairy products.
- To formulate, with the necessary consultation among stakeholders, an Industry Development Strategy and to coordinate and drive implementation of the same.
- To initiate and support the entire dairy value chain to enhance sector competitiveness through innovation and research.
- To facilitate and support new technologies for improving productivity of enterprises across the dairy value chain for greater sector competitiveness.

1.1 Dairy Pakistan Governance and Management (Brief)

Dairy Pakistan is formally incorporated as a Limited company named "Pakistan Dairy Development Company". A Board of Directors governs the company with representatives from the industry, farmer groups, academia and the government. A specially designated Chief Executive Officer who brings in decades of professional dairy sector experience manages the company. Additionally all the necessary support functions in terms of technical, finance and general management are in place.

Institutional capacity is critical to the ability of Dairy Pakistan to lead development of the dairy industry as described in this paper. It must be recognized, however, that Dairy Pakistan can only build its resources at a rate consistent with available funding and with projects agreed to be supported by funding providers. It is the intention of Dairy Pakistan to utilize the greatest possible proportion of the available funding in its early years on actual development programs rather than on its own structure. Therefore, Dairy Pakistan intends to take a stepwise and modular approach to build the necessary human resources as required by the pace of the development program.

As an example of the modular approach, within the Model Farm program, Dairy Pakistan foresees that additional team leaders can be recruited as necessary, with farm production officers then recruited to support the team leader. It is anticipated that one Team Leader can manage 10 Farm Production Officers, and each Officer can supervise 10 Model Farms; thus appointment of a new Team Leader can result in 100 new model farms per year. With experience, it is expected that the number of farms managed by each Farm Production Officer will increase. The same holds for the Cooling Tank Program.

As an example of the stepwise approach, designed to keep costs down in order to free resources for development program, is found with functions such as Human Resources – Dairy Pakistan will outsource this function until its staff numbers warrant bringing the function in-house.

Clearly, support functions will be built upon at the necessary pace to manage the intended growth of Dairy Pakistan.

The planned organogram, if support and funding is gained for all the projects within this paper is as follows:

FIGURE 1-A: Organogram of Dairy Pakistan

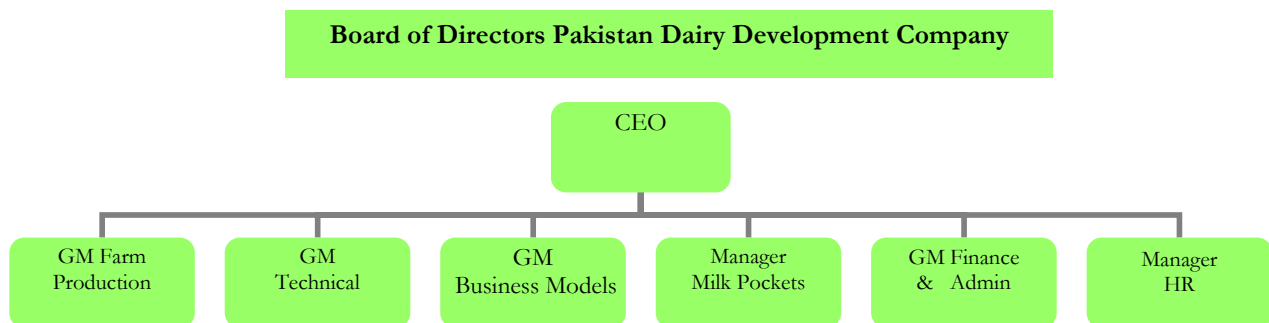
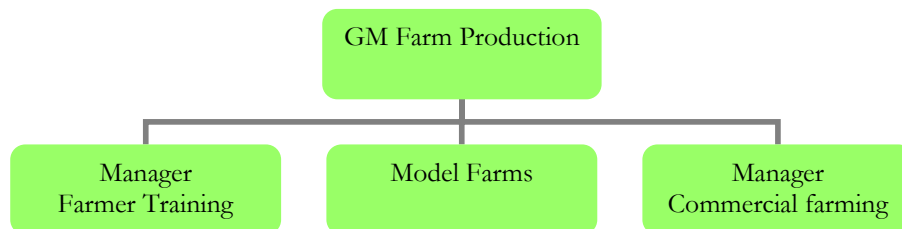
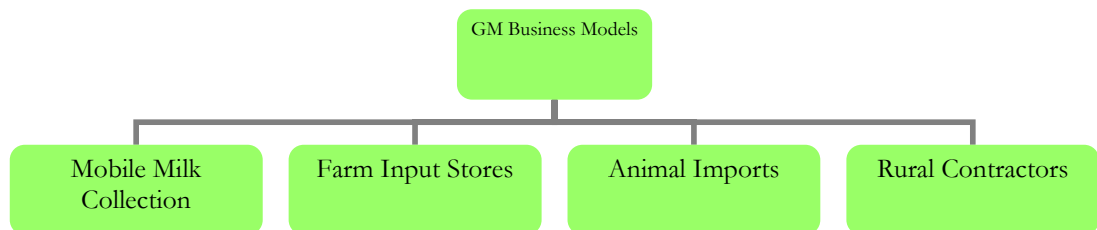
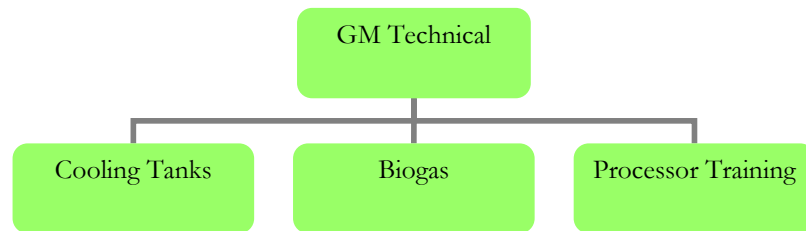


FIGURE 1-B: Function-wise Organogram





1.2 Farm Management and Dairying Research Institute:

CEO and GM Farm Production are on the Board of Directors of the Institute. (Detailed organogram of the institute is being prepared)



CHAPTER -2

2.0 Overview of Pakistan's Milk Economy- Present Scenario

The Pakistan dairy industry faces multiple challenges – improving the lot of smallholder farmers through enhanced profitability and rural infrastructure, significantly improving quality through the supply chain and to the final consumer, and potentially facing increased competition from international suppliers of dairy products.

Hence, there is an imperative need to re-engineer Pakistan's dairy industry; both at farm and processor level. This paper seeks to investigate the tools that could bring about such change. We believe achieving the strategic change outlined in this paper for the dairy industry may prove challenging for at least some sectors. Major effort is required to achieve the scale and cost competitiveness necessary to continue to successfully compete in a globalising and demanding world, while at the same time the interests of the millions of smallholder farmers must be catered for, and a more prosperous future made available to them.

It is important conditions are in place to ensure decisions about scale, the number and product portfolio of processing plants are made in a rational manner; this is needed to maintain price competitiveness and market growth. Small niche players will also have substantial growth opportunity in the Pakistani dairy market and their growth will be an added asset. In the absence, at present, of a cold chain; presentation and packaging methodologies will be explored for longer shelf life of products.

The major challenge is to upgrade small holding farmers by solving their productivity and farm management constraints, and at the same time substantially increasing the number of commercial farms.

Lastly, investing in dairy infrastructure and the dairy workforce in rural and urban areas cannot be overemphasized. Without doubt such developments will revolutionize rural Pakistan and improve the quality of life of millions of farmers. An improved dairy infrastructure less dependant on the middlemen will support the farmer to connect directly to processors and the consumer.

With this backdrop we seek to investigate the current state of affairs of Pakistan's dairy sector.

2.1 Milk Production¹

Pakistan is the 4th largest milk producing country in the world with dairy as one of the fastest growing sectors of the country. An estimated 33 billion litres of annual milk is produced from approximately 50 million animals managed by 8 million farming households. In the year 2004-05, the contribution of the livestock sector to Pakistan's GDP was at 11% per cent, while the processed milk sector contributed about 0.43 per cent. The milk economy represents 27.7%² of the total value of the agriculture sector.

¹ The source of all figures on the page is EDS Tetra Pak 2004, Pakistan Economic review 2005, Calculations by Dairy SWOG

² Pakistan Economic Survey 2004-05 based on 27 Billion Liters worth Rs 540 Billion @ Rs 20 per liter milk average price (Market price year 2005- 2006).

TABLE- 2.A

Milk Economy Overview
33.6 billion liters produced
27 billion liters available for human consumption
7.9 billion liters urban share
19.1 billion liters rural share
6.5 billion liters is household use
1 billion is processed
190 ltr/capita/yr consumed
90 ltr/capita/yr consumed as informal (Loose) milk
7ltr/cap/yr of formal sector (UHT) milk consumed
Low Productivity = 1333 liters/animal/yr
15-19% wastage from spoiling
National herd constitutes of 70% buffalo
67% of production in Punjab

Overall, the contribution of dairying to the national economy is of the order of Rs.540 billion (with 97% as informal non-documented economic activity), and is expected to grow at 4% per year under current scenario. If the process is accelerated with process improvement and focus improvements identified through this White Paper, a growth level of 20% can be achieved.

Being a highly perishable commodity and produced primarily in the heart of the rural environment, milk reaches the consumer only with much difficulty and increased cost. Urban usage of milk is only 30% with the formal milk processing industry handling only 2 to 3 % (around 1 billion liters) of total milk production of the country. For the other 97%, a multi-layered distribution system of middlemen has evolved for milk supply. An estimated 20% of current milk production is lost from income generation due to fragile infrastructure facilities required for a highly perishable commodity like milk. As a result of these factors, Pakistan is a net importer of milk and milk products. An important goal for the dairy industry of Pakistan is to meet the needs of the people of Pakistan, such that while imports are welcome they are not necessary.

Small and marginal land-holding farmers and landless labourers dominate milk production in Pakistan. These small holding farmers usually practice dairy farming as a by-product of the crop sector.

2.2 Structure of Dairy Farming in Pakistan (Comparative to other countries):

Dairy Farming has always been considered as a by-product of cropping in Pakistan; it is not an independent activity as in Europe and other countries with developed industries. This parallel application of two kinds of farming is described as mixed farming. The benefits of mixed farming include: the waste or farm residue of agri-farms is utilized in dairy farms; likewise, dairy farm residue is utilized in agri-farms thus minimizing losses to farmers. However, the weakness is that in the absence of enhanced management techniques for dairying, its profitability relative to other forms of farming has been

overshadowed. This has hampered the growth of a specialized sector with specific dairy innovative techniques.

The vast majority (about 70%) of dairy farmers in Pakistan are smallholding farmers. Up to 43% of dairying households in Pakistan maintain herd sizes of one to two animals while another 28% of the households maintain herds ranging from three to four animals³. Some 90% of milk production comes from smallholding farmers. Many believe that only large mechanized farms are the solution to increased profitability and quality. While this is true for many US, EU and other developed countries having achieved a level of farm mechanization, the challenge is to achieve the goals of profitability and quality while recognizing the situation in Pakistan.

In Pakistan, a two-tiered action plan is required: to develop systems, which provide profitability for the smallholder and maintain quality through the supply chain, while assisting the development of larger scale commercial farms. We believe the co-existence of both kinds of farms is the reality of dairying in Pakistan and development efforts must provide solutions for both smallholders and commercial farmers. The Chinese model of farm development may provide a good example.

Milk production in China is very diverse. There are large farms, usually owned by dairy processors that utilize some of the latest management, feeding, and milking technologies. These farms do not, however, account for the bulk of milk production in China. Smallholding production co-exists with large farms.

In China, either small farmers bring their cows to the station or the cows are housed near the milking facility – to allow cows managed by households to be milked by machine and have the milk go directly to a refrigerated bulk tank. There are also a growing number of medium-sized specialized household farms with 200-1000⁴ cows. These are often private farmers within reasonable transportation distances from major consuming areas. These farmers also have mechanized milking, cold storage, and highly productive animals (5000-7000 litres/head/year). Hand milking and un-refrigerated milk collection continues, but less and less of the resulting milk is making its way into urban areas and into the processing sector.

2.3 Smallholding Farms:

Despite dairy farming being a by-product of cropping, many farmers have self-selected themselves into dairying and have been able to improve their economic status. This has been proved by two country experiences namely India and Kenya - in both countries smallholding farmers have benefited substantially by dairy farming. Many farmers secure reasonable returns in dairy farming; resulting in the economic uplift of rural areas.

The small scale of dairy farming results in constraints, which remain unaddressed because of lack of resources. The small size of the farms leaves a big question mark about farm economics and how to implement better technology for the 70% of smallholding farmers in Pakistan. The small holding farms have been analyzed by the IFCN⁵ as four dairy farm categories belonging to four typical farm sizes given in table 2-B:

**Table 2-B
IFCN Dairy Farm Categories
in Pakistan**

PK-3: Is a rural farm with 3 ha of land and 3 buffaloes.

PK-10R: Is a rural farm with 6 ha of land and 10 buffaloes.

PK-10U: Is a peri-urban landless farm with 10 buffaloes.

TABLE: 2-B

³ Livestock Census 1996, Agricultural Census Organization, Statistics Division, Government of Pakistan.

⁴ Medium sized is in the context of Chinese farm size

⁵ IFCN International Farm Comparison Network

It is said that farms having land to grow crops and forage (PK-3 and PK-10R) were relatively most competitive. The PK-10R farm is said to be most viable farm size, and has the potential of challenging competitors in export markets⁶. Such farms make effective use of technological advances in breeding practices, e.g., artificial insemination, to improve their herd quality. Some of them have also installed their own pasteurization or processing equipment. However, there are only 23% of farmers who fall in the PK-10R category, whereas 70% of the farmers have less than four animals.

Low animal productivity, lack of balanced animal feed, poor animal hygiene, lack of water availability and lack of new animal-breeding methodologies are some of the problems inherent in smallholding farm economics.



Pakistan's huge animal population of 50 million suffers from low productivity compared to global players although it is quite reasonable in comparison to the rest of Asia (shown in Figure 1 below). It is estimated that Pakistan has three times the animals that Germany has, but yields are one fifth of Germany's and one third of New Zealand's representing a significant loss in potential economic and social value.⁷ This low productivity has several causes.

The main cause is imbalanced feeding; Pakistan faces shortages of fodder and water two-three times a year. In addition to shortages, feeding of animals is practiced according to the farmers experience and tradition, without any training or knowledge of ration formulation based on production levels. The buffalo in this sense is an easy animal and has relatively modest nutritional requirements. However, cattle require a balanced fodder containing appropriate amounts of concentrate and forage. This is important for efficient rumen digestion and metabolic balance. Technology driven fodder preservation systems (silage) are needed to ensure availability of feed despite seasonality issues.

Unhygienic animal care is an additional issue. Smallholding farmers generally tie their animals within the house premises or in premises where animals cannot move freely. Sustainable agriculture training should be encouraged for a long-term rural vision.



TABLE- 2-C

Milk Production Per Animal Kg/Lactation

Country	Cattle	Buffalo
Bangladesh	207	407
Bhutan	257	400
India	987	1,450
Nepal	415	850
Pakistan	1,195	1,909
Sri Lanka	627	496
Australia*	4,926	
New Zealand*	3,947	

Source:

1) FAO, 2004

2) *Mr. Collin's Report Feb, 2005

⁶ Abid Burki, The State of Pakistan's Dairy 2004

⁷ IFCN, 2003



Lack of drinking water for animals is a big problem. It is said that if only water was readily available to the animals, productivity could increase by as much as 7%. This demonstrates that even simple infrastructure and management solutions could lead to improved productivity.

Comparisons show that the role played by indigenous breeds such as Sahiwal, Red Sindhi, Neeli and other breeds native to Pakistan is useful and, properly managed, this role should become more than useful and indeed important. They have traits, which are important under local conditions, such as resistance to heat and disease. These native breeds need further improvement. We feel a public private sector partnership program could encourage local breeding systems. To this effect a Pakistan Breed Improvement Project should be commissioned by Dairy Pakistan⁸.

Dairy Pakistan should take upon itself to carry out a project specifically designed to cater to the needs of Smallholding Farmers, more details are discussed hereafter in chapter 3.



2.4 Economies of Scale and Mechanized Farms

It is accepted globally that a “leaner” yet ‘bigger’ dairy industry is much more productive than small farm holdings. Contrary to this belief we suggest mechanization is not an alternative but can be a complement to smallholding farms. Mechanization is understood as loss of jobs for farmers. This may be true for the crop sector; however, in dairy farming this is not always the case. Given Pakistan’s spread of smallholdings and very low level of existing mechanization; job losses are unlikely to happen. Empirically, any job loss phase comes only after a degree of mechanization has been reached. The Chinese model discussed in section 1.2 is an example of how big dairy farms create jobs and can provide services to the small holding farmers.

The role of “mechanization” also needs consideration. Firstly, the asset base of farms must be appropriate to their needs – over capitalization will result in unprofitable farming. Secondly, it should be emphasised that the issue is management, and that mechanization is necessary to support modern management, no more and no less.

A developed dairy industry including mechanised farms can create eight types of different entrepreneurs in the village. The kind of services required includes animal care, herd managers, equipment contractor, equipment maintenance service, milkmen services, milk tank care, barn construction services, animal feeding etc. The commercial farm serves as the hub of the locality while the spokes *the small holding farms* get support from the hub. Service providers become available, which would not otherwise be the case.

At the end of the day we are convinced the ultimate driver of sustainability will be economics. All dairy businesses should be given the chance to thrive, and mechanized dairy farms should not be impeded from growing in scale. Ultimately a profitable business is the one that is most likely to fulfil rural sustainability. Those involved in drawing up local plans must not attempt to inhibit scale, as this will ultimately restrict profitability and hence reduce investment in the industry, and leave it more open to competition from imports.

⁸ The program should develop farmers having good genetic material pool. It will help to select good genetic material initially from the total champions. Each farmer should have a minimum 200 adult female animals. A total 100 farmers for each breed may be selected in the country. The program should be designed to provide benefits to all stakeholders namely farmers, insemination companies, GoP and the milk industry.

The large-scale rural farms producing on a commercial basis in Pakistan are among the lowest cost farms in the world, driven by low cost of labor and feed. This has been reported in **IFCN⁹ 2004**. While still limited in number, the big commercial farms of Pakistan have major economic benefits. Existing commercial farms need to boost their current level of mechanization, automation and refrigeration (cold chains), in order to be more productive. By providing the scale and capacity to invest, the large farms will assist existing and emerging product and market opportunities for Pakistan's Dairy sector.

2.5 Milk Collection and Distribution system

While the structure of the dairy processing industry has improved dramatically, milk collection and distribution is fragmented compared to systems found in other countries. There is a need to improve the supply chain from farmer to consumer in Pakistan.

There is very limited data available on the routes to market or the distribution channels employed in Pakistan. Most of the milk produced in the farms is consumed at the household level. The surplus is marketed at the local markets in form of liquid milk or purchased by milk collectors and transported to urban areas through different distribution channels.

The milk supply and marketing chain involves different players such as milk collectors (dodhis), traditional cream manufacturers and "Khoya" (milk concentrate for local sweets) makers and retailers. *(The traditional cream and khoya is often very unhygienic and is made in dirty work conditions hence is a danger to human health).* Dodhis or milk collectors play an important role in collection and the marketing chain of the dairy sector of Pakistan. The dhodhi community may even



reach a million in number. Based on their financial and technical abilities, they can be classified in three groups of small, medium and large-scale milk collectors. The small-scale milk collectors collect an amount of 200-400 kg milk per day from different farms, often in remote areas. Some of them make long-term contracts at a predetermined price offering a share of the milk price in advance to the

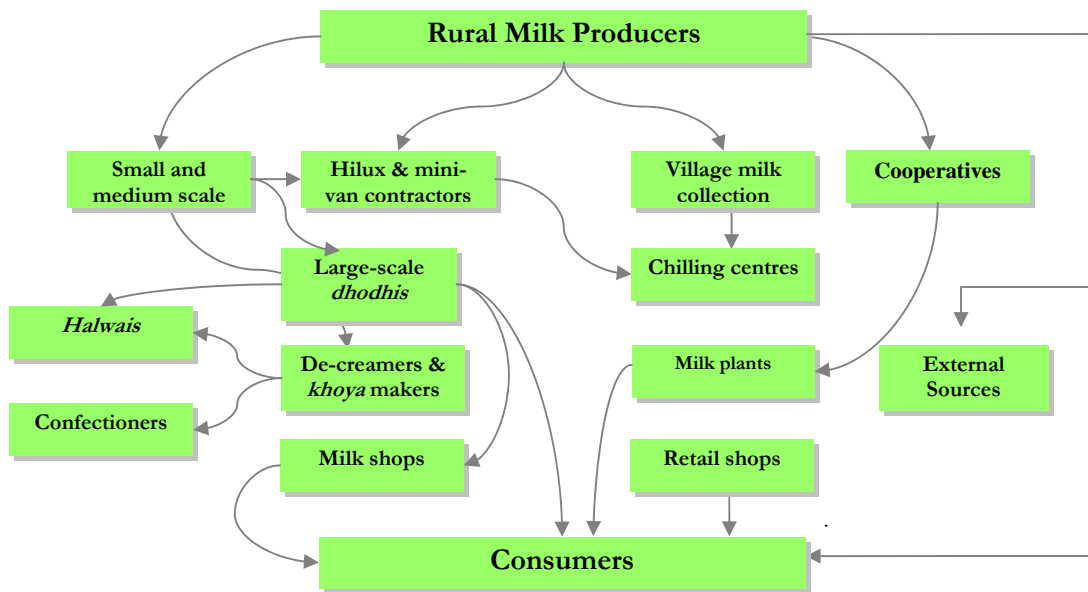
farmers. In small towns, they may directly market the milk, but in larger urban areas, they sell the milk to the large collectors. Medium scale milk collectors collect 400-800 kg milk per day in a manner similar to the small milk collectors, but on a larger scale. This group may carry out door to door milk delivery and marketing in some nearby urban markets using different means of transportation. Large-scale milk collectors collect 1.5 to 3 tons of milk/day, purchased often from the small and medium scale collectors and act as middlemen between them and retail shopkeepers. Large scale milk adulteration is practiced mostly by this group of large scale milk collectors.



The rural supply chain for processed milk industry has three patterns: milk collection through third-party milk collectors; self-collection system of dairy plants and farmer cooperatives. Third party collection and self-collection are the more prevalent collection systems, whereas to date dairy co-operative systems have failed to succeed in Pakistan. The **Figure 2-D¹⁰** below highlights the collection and distribution pattern of rural Pakistan.

⁹ International Farm Network Comparison, 2005

¹⁰ The State of Pakistan's Dairy, Abid A. Burki, Mushtaq A. Khan, Faisal Bari, July 2000

FIGURE 2-D (Milk Collection & Distribution System)

Of the total milk sold by the farmers, 15 - 19% is thought to be wasted en route-to-market due to spoilage from a lack of proper cooling, storage, and transport systems. There is an imperative need to prevent the wastage of milk, which is the result of a poor cold chain. Milk being a highly perishable commodity does not give many choices for storage or channels; consequently, the unorganized middlemen as a speedy substitute to a cold chain dominate the supply chain. Both investment and regulation are required to develop the cold chain, which will help consolidate the milk collection system. The cold chain infrastructure is envisaged as a means to create rural entrepreneurs in the rural economy. Improved supply chains may reduce milk collection costs faced by the processing industry, presently averaging around 16% of the factory gate costs (with the remainder being the price paid for the milk). We also believe dairy farmers should be encouraged to become more flexible in collection hours to allow longer hours for collection of milk that will ensure cold chain tankers run as economically as possible.

This brings us to the most complicated issue of Pakistan's Dairy supply chain namely; achieving a "Level Playing Field" between the middlemen *Dhodhis* and the processors. At present, middlemen play a critical role in the Pakistan dairy industry: Without them, a far smaller proportion of milk would find its way from the farmer to the consumer. To varying extents, processors rely on dhodhis collecting milk and transporting it to collection centers. It is well known that adulteration of milk occurs in Pakistan on a broad scale. The general view is that much of this adulteration occurs after the farm gate and before processors receive it, i.e. when the milk is in the control of middlemen. Further, it is probable that middlemen do not pay tax as per the more formal sectors of the industry.



The above factors create a situation under which middlemen have unfair advantages over the formal sector, and in addition contribute to poor quality milk to the detriment of consumers (especially those who cannot afford the higher quality presentations provided by the processors) and to the medium term development of a robust dairy industry. In this situation Dairy Pakistan as the voice of various stakeholders believes that the role of middlemen should be "regularized", i.e. middlemen should be encouraged to respect the milk they are handling. Such "encouragement" could take several forms, both direct and indirect:

- Better regulation and enforcement could be established to make adulteration less easy and punished to a greater extent.
- Dairy Pakistan and other industry participants could fund a marketing campaign to educate consumers on the dangers of loose milk.
- Zero rating of the industry will reduce some of the advantages achieved by the tax avoidance thought to be practiced by at least some middlemen.
- Dairy Pakistan's Cooling Tank program will result in more collection centers being established, thus improving access for farmers who wish to deliver milk to processors directly.
- Farmers delivering directly need to earn a higher price for their milk than those supplying through middlemen.

Some of these actions will have greater or lesser impact:

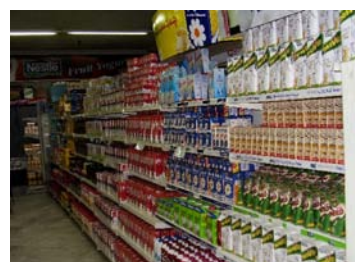
- Often in developing countries (and indeed in developed countries), a regulatory approach creates as many problems as it solves. Regulation can be a source of corruption. Adequate regulation is already in place, which should, in theory, protect milk quality. Further regulation is unlikely to change present practices.
- A marketing campaign may be successful over a prolonged period, but within the constraints of present limited funding availability for Dairy Pakistan, it is probable that higher priorities should be met first. Dairy Pakistan will, however, play a co-ordinating role with other industry participants, should they wish to fund such a marketing campaign.
- Zero rating is an important step in achieving a level playing field.
- Dairy Pakistan's Cooling Tank Program is another important step.

It should be noted that the intent of Dairy Pakistan is not to cut all middlemen out of the industry; however, illegal actions such as adulteration and desirably tax avoidance should be made more difficult to undertake. Middlemen who wish to respect milk, the farmers who provide it and the consumers who drink it, are a welcome part of the industry. However, none of the above or even all of the above steps is likely to succeed in changing the role of middlemen, for there is another important function they provide, and that is the provision of credit. Dairy Pakistan intends to explore with institutions, both national and international, the alignment of the operation of collection centres with the provision of micro-credit. Only with such credit facilitation will genuine alternatives to the middlemen exist. It is probable that present interest rates on credit supplied by middlemen are onerous, so the suggested integration between the operations of collection centres and credit provision could have a major impact on the welfare of especially small farmers.

2.6 Processed Milk Industry (Business Environment and Constraints)

The processors remain a key driver of the dairy industry with constant reinvestments and diversification of product portfolio. The processors have a small share of 3-4% of the total produced milk, whereas they invest the most and pay the highest taxes. The eight major dairies of the country include Nestlé, Nirala, Halla, Noon, Milac, Dairy Bell, Dairy Crest and Premier, while other smaller ones have also emerged. Nestle is the biggest processing industry of the sector, collecting over 1000 tons of milk daily.

This company intends to invest an additional US\$ 480 million over a period of five years. Similarly Haleeb, Noon Dairy, HALLA (Idare-e-Kisan), Dairy Crest, Nirala Dairy and Premier Dairies are continuously investing to upgrade their plants.



Smaller processors manufacturing traditional sweets (Nirala) or organic product lines can create success stories both in domestic and possible export markets. We feel much attention and focus is given to the large plants, while niche players should also be encouraged. A technology-led and innovative product mix approach can create a high margin niche in dairy plants.

Due to the lack of a cold chain and refrigeration systems in Pakistan, pasteurized milk has had substantial market failure. On the other hand UHT and powdered milk with longer shelf life have proved to be good alternatives to expensive cold chains. A successful example of pasteurized milk is India, the reason being a well designed and effective cold chain. It is interesting to note that some of the deepest rural areas of India are connected to the consumer through railway based cool tanks. In China, in most urban centers UHT is preferred, but in more outlying areas milk powder may be consumed for convenience. The adoption of UHT technology and new packaging technologies in China has enabled the transport of milk from northern provinces to the population centers. Companies like Yili and Mengniu (based in Inner Mongolia) were able to rapidly enter markets on the coast and in the south. In Pakistan, UHT and powdered milk is likely to be the only means of providing an alternative to “loose milk”, especially in NWFP and Balochistan.



Of the different types of processed liquid milk, UHT milk packs are by far the most popular products. The contribution of UHT processed milk to real GDP in Pakistan has gradually increased from only 0.117% in 1994-95 to 0.201% in 2001-02¹¹ shown in Table 2-E. Moreover, the share of UHT processed milk in livestock GDP has also gone up to 2.2%, and is consistently growing.

Share of UHT Processed Milk in Real GDP¹² TABLE 2-E

Year	GDP deflator at constant 1980-81 prices	Real GDP at constant factor cost (Rs million)	Nominal price of UHT milk (Rs/liter)	UHT milk supplied (million liters)	Market value of UHT milk (Rs. million)	Real value of UHT Milk (Rs. million)	Share of UHT milk in real GDP
1994-95	312.60	534861	25.00	78.63	1965.75	628.83	0.117
1995-96	338.48	570157	25.55	91.42	2335.81	690.08	0.121
1996-97	388.00	579865	25.66	106.29	2727.4	709.20	0.122
1997-98	413.39	600125	25.66	123.58	3170.06	766.84	0.128
1998-99	437.59	625233	29.33	143.68	4214.13	963.03	0.154
1999-00	449.77	649656	30.00	167.04	5011.2	1002.70	0.154
2000-01	476.92	664048	30.00	194.22	5826.6	1221.7	0.184
2001-02	492.01	686382	30.00	225.81	6774.3	1376.86	0.201

Undoubtedly, capacity utilization of the processing sector is effected negatively by seasonal milk supply. While difficult to quantify accurately, it is clear that there is a cost associated with the lower

¹¹ *The State of Pakistan's Dairy*, Abid A. Burki, Mushtaq A. Khan, Faisal Bari, July 200

capacity utilization that is borne by the processors. Put simply, those with higher capacity utilization levels are able to make their investment in plant and equipment work harder for them, and produce greater quantities of product. In some cases, lower capacity utilization (shown in TABLE 2-F below) enables processors to switch between products in response to short term market trends. Improved capacity utilisation will arise from higher milk production over summer, which will occur as a result of better farm management and more cows.

TABLE 2-F

Processor Capacity¹³

Processors	Capacity (Million liters)	Capacity Utilization		Average Monthly
		Flush	Lean	
Nestle	1.3	1.3	0.78	1.04
HFL	0.9	0.9	0.54	0.72
Millac	0.3	0.3	0.18	0.24
Vita	0.05	0.03	0.018	0.024
Halla	0.15	0.15	0.09	0.12
Prime	0.1	0.1	0.06	0.08
Nurpur	0.15	0.15	0.09	0.12
Nirala	1	0.1	0.06	0.08
Dairy Crest	0.15	0.15	0.09	0.12
Engro	0.35	0	0	0
K& K	0.4	0	0	0
Butt Dairies	0.06	0.06	0.036	0.048
Munno Dairies	0.02	0.02	0.012	0.016
Khi Dairies	0.1	0	0	0
Military	0.18	0.18	0.108	0.144
Total	5.3	3.44	2.064	2.752

TABLE 2-F (i) - Statistics of Milk powder (As of 2005)

Processors	No of Spray Driers Plants (Capacities not declared)	Quantity of Milk powder processed (All brands) per year	
Nestle	2	19,182	
Milac	1	} 2300 tons	
Haleeb	1		
Noon	1		
Premier	1		
Prime	1		
KNK	1 (Not in Use)		
Engro	1 (Not in Use)		
Pakistan Army	2		
Total (In Pakistan)	11		21,482 Tons
Imported milk Powder	-		10,000 Tons

Source: Estimates 2005, (Tetra Pak, Nestle Marketing division)

Despite being only 5% of the total milk economy, the processors face the highest tax constraints. The majority of Pakistani consumers continue to use loose milk. However, in urban areas the trend is reversing and processed milk consumption is growing more than 20% per year.

¹³ Source, Dairy SWOG, Strategic Paper on Pakistan's Dairy Sector, 2006

Additionally, Metro, Carrefour and Makro are expected to enter Pakistan's retail sector. This should give an additional boost to dairy marketing. From an advertising and marketing point of view, changes in retail formats, in particular due to the emergence of these supermarkets, will create new marketing channels for companies from outside the region to access consumers in Pakistan. Advertising and promotion of dairy products will intensify, and there will be both increased challenge and opportunity for the processors to improve product portfolios.

2.7 Processors and Consumers

The processed milk sector of Pakistan contributes 0.43% to the GDP, and this is likely to grow in the coming years. Growing urbanization and globalization are changing lifestyles in Pakistan. Dairy as a sector has the ability to influence this change, and indeed the industry must change with changes in society, or it will stagnate. The processing sector can play a critical role in creating a consumer pool for itself in the new urbanized Pakistan.

A product category penetration report from 2005 shows that in the food basket, the highest penetration is achieved by tea 97%, loose milk 93% and rice 92%¹⁴. This trend shows the scope and opportunity of milk as a staple diet higher than even rice. The report further suggests that powdered milk and UHT are likely to be two winners for urban milk demand. In other words the processor industry should concentrate in the value added segment.

The key focus should be to add value to base products by various means and to create points of difference in the products wherever possible. This is achieved through a number of measures including:

- Branding, (Pakistani local UHT producers and ethnic sweet producers have followed MNCs in effective branding; this trend should continue and spread more in smaller players).
- Flavor: innovations and research in improved flavor
- Functionality: Consumer interest in diet and health relationship, aging populations, and advances in food technology all create opportunity. China's dairy industry has been very successful at creating such functional products; designer milk powders – special fortified formulations for infants, young children, teenagers, adults, and seniors – and these products are able to capture segments of the market that consume dairy products for their health benefits.
- Segmentation/customization: specific food designs for Pakistani consumers in rural and urban areas (processors should not rule out the potential of the rural dairy market). Dairy consumption should grow as retailing improves in rural areas, rural incomes rise, and availability and the variety of dairy products continues to improve. However, it could be a very gradual process, taking years for the average rural household to reach the ability to pay for processed dairy products that consumers in urban areas had when dairy consumption took off a decade ago.
- Development of specific food solutions, for health, diet control etc.
- Organic products; this is a potential growth area but completely neglected by the processors in Pakistan.
- Packaging; improved packaging solutions will be the key to introducing the above trends in the local market.

The optimal product portfolio for each individual market will clearly depend on that market's stage of development and sophistication. At the risk of being overly optimistic, we believe value added products are likely to be long-term winners and even functional and organic foods have the potential of 2-5% growth till 2015.

2.8 Adulteration and Hygiene Issues

For better growth of the sector, high rates of adulteration and extremely unhygienic practices need to be regulated and otherwise discouraged: Adulteration of milk is one of the most serious issues that the dairy sector of Pakistan is facing today, causing not only major economic losses for the processing industry, but also major health risks for consumers.

¹⁴ Research carried out by AC Nielsen 2005



Due to the numbers of smallholding farmers, milk handling processes in the traditional system are extremely unhygienic and there is insufficient enforcement of standards, resulting in poor quality products. In order to keep milk temporarily “fresh”, middlemen commonly add ice to the milk, which results in dilution of milk solids by up to 30%. In addition, microbiological contamination due to ice being made from poor quality water is frequent. Compounding the problem, middlemen may attempt to counter the dilution by adding vegetable oil, whey powder and other ingredients to improve the solid content of the milk. Antibiotics and peroxide are also often used as preservatives. Processors report it is a constant battle against the innovation demonstrated by adulterators in terms of the adulterants added to milk.

Regulation may help to control the adulteration but the root cause of such adulteration is the lack of developed milk collection/logistical systems. Only a small percentage of the milk is properly collected.

2.9 Seasonality

Production of milk falls to 55% of peak production at its lowest point in mid-June, while the demand increases 60% during this time compared to December when the milk supply is ample.

The huge difference between lean and flush seasons is a significant problem. During the lean season, when the availability of the milk is very limited, the price goes up. During lean periods there is insufficient milk on the market and some of the processors have to close down their factories. The raw milk quality is not good and that makes the shelf life of the packed milk very limited. Farmers have adjusted their calving patterns for the lowest cost production and hence concentrate calving for winter milking. Counter cyclically, dairy consumption increases during summer with higher consumption of yogurt, ice cream, and other refreshing dairy products.

The seasonal fluctuation in milk production occurs due to lower water and fodder availability, and importantly the prevalence of buffaloes in the national herd.

2.10 Milk Pricing & Profitability in a Competitive World

While different payment measures and fluctuating exchange rates mean that direct comparisons are not available, it is known that the price presently paid for milk in New Zealand, Australia, Argentina, Brazil and Uruguay is of the order of \$US0.18 per litre. Given the costs of transport and customs tariffs, this means that for domestic products to be competitive with imports in a sustainable manner, milk may need to be produced in Pakistan at perhaps Rs14.7/l **at the processor's gate**. With present milk collection costs, this implies a farmgate price of less than Rs12.3/l, if the milk is collected from the farmer – any costs associated with the activities of middlemen must either form part of the 16% allowed in this calculation for collection costs, or further reduce the farmgate price received by the farmer. It should be noted that if customs tariffs on dairy products were reduced below present official rates for any reason, the price at which milk must be produced would need to reduce by a similar proportion. (Note: the above calculation is for cow's milk; the price for buffalo milk can be determined by adjustments for additional milk solids). It should be noted that the above is a theoretical calculation, in order to provide a caution that it is unwise to think that the profitability of dairy farming can be solved by increasing the price to the farmer without taking into account the international environment. The actual price paid is, of course, a reflection of supply and demand factors, including seasonal factors.

Dairy Pakistan's aspiration is to achieve farming and logistical systems, which provide good profitability to the farmer at the above milk price level. Factors, which will be important if this goal is to be attained, include the following:

- Farming systems, with a particular emphasis on appropriate asset base and fodder enhancement
- Reducing losses due to poor quality
- Higher volumes per farm and per local area, which reduce milk collection costs.

- Tightening of margins taken by some participants in the collection chain at present.
- Improved genetics.
- Improved infrastructure to ensure milk can always be collected, water is available and the cheapest form of energy is always available.

Awareness of the need to compete in a liberalizing world should underpin the approach to all development throughout the industry.

2.11 External Influences:

According to Fonterra, the largest dairy exporter in the world, India and Pakistan may become future dairy exporters¹⁶ subject to realistic development of the dairy sectors of these two countries. It is estimated that world dairy consumption will grow 2.0% from 2005 to 2010. In terms of global trade, with demand in China growing at 14%, in South East Asia at 5%, and in the Middle East & North Africa at a similarly high rate, these are likely to be the demand hubs. The current global dairy trade accounts for 7% with 93% being consumed domestically. The low percentage of dairy trade reflects the perishability of milk, along with barriers to trade, especially protectionist measures in markets such as the EU, USA and Japan. Empirically, growth is strongest in the dairy sector where barriers are lowest; South East Asia including China with relatively low tariff protection of 12% has the highest consumption growth rate of 5%, while Japan with high tariff protection rates of up to 244% has a low growth rate of 2%.

Demand by value will continue to be dominated by developed countries mainly Western Europe (100 USD billions) and North America (58USD billions). The global dairy trading regime will substantially change in the years to come. EU the biggest dairy exporter is already in partial retreat, and the level of subsidized exports should further reduce due to reform of the Community Agriculture Program (CAP). Oceania (New Zealand and Australia), also a major dairy exporter region, may grow supply at lower rates in the past. The dismantling of the EU subsidy regime via CAP reform is likely to reshape global dairy trade.

Global Dairy Demand Average Annual Growth in Dairy ¹⁵ Demand 2003 – 2010 TABLE-2 G	
China	- 14%
South East Asia	– 5%
Middle East & North Africa	– 3.5%
Latin America	– 3%
North America	– 1%
EU	– 1%
Rest of the World	– 2%

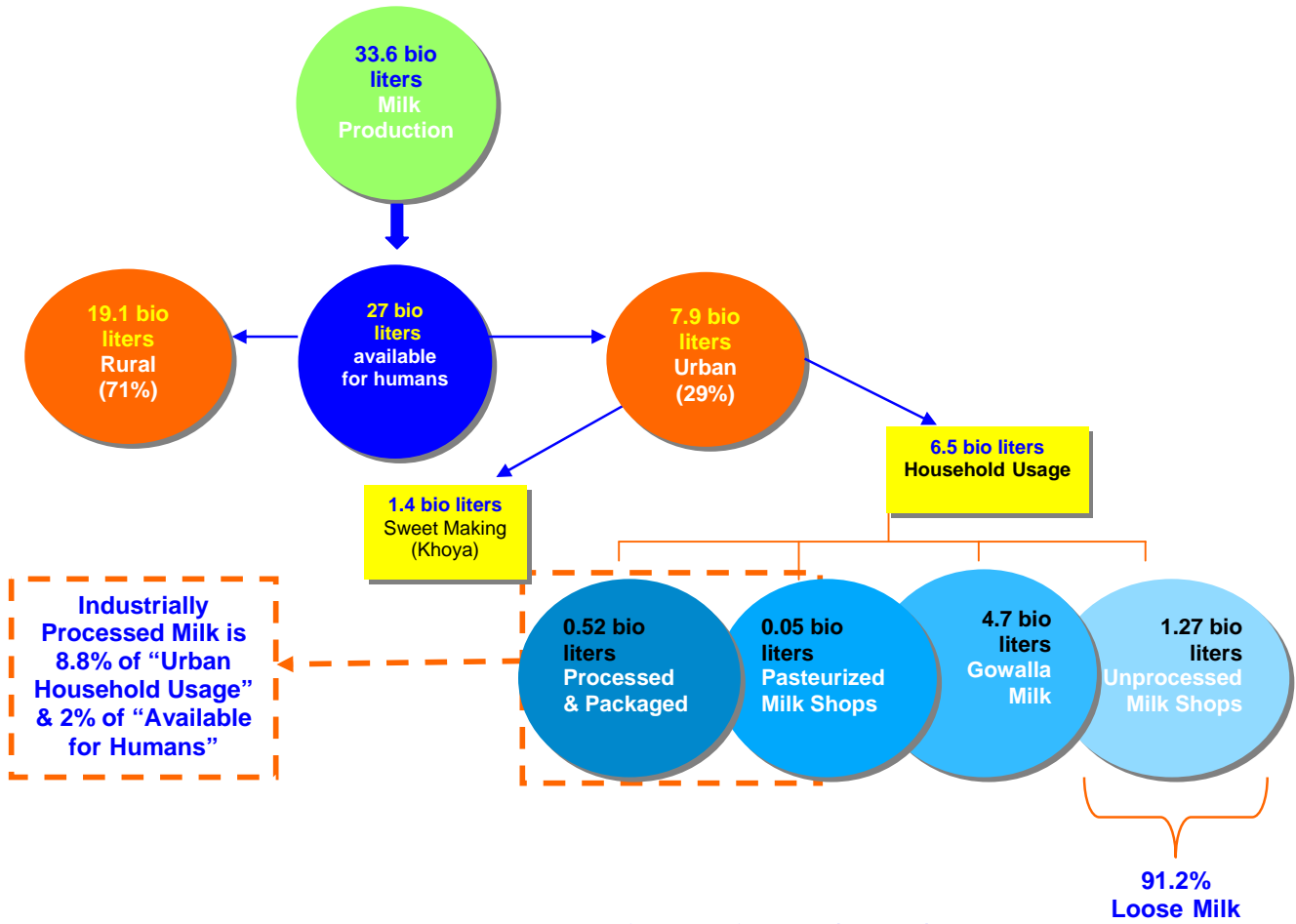
Various complex calculations have been made to estimate what would happen to world prices, and consequently to economic conditions in developing countries, if the grossly unfair agricultural subsidies were removed. The US Department of Agriculture reported in 2001 that full elimination of global trade-distorting agricultural subsidies would result in an annual world welfare gain of US\$56 billion. According to a World Bank study, full elimination of agricultural subsidies in rich countries would increase global trade in agriculture by 17%, and agriculture exports from low- and middle-income countries would rise by 24%. As a result, total annual rural incomes in these countries would increase by about \$ 60 billion, or roughly by 6%.

If Pakistan were to achieve similar gains from the post subsidy regime the time to prepare is now. If so Pakistan's White Revolution is very timely, coinciding with the window of opportunities in world trade and global economic growth that may occur through the Doha Round. While the US, Argentina, Chile and Uruguay will supply dairy to the American continent, the Indian sub-continent is expected to partially fill the vacuum created by some sunset sectors.

¹⁵ Figure 2-G Fonterra Report by Phillip Turner, 2005.

FIGURE 2-H

Pakistan – 4th Largest Milk Producing Country



Source: EDS, Tetra Pak researches 2004

CHAPTER-3

3.0 White Revolution (Dhoodh Darya) – to activate the resource potential of rural Pakistan and serve as a key engine of economic growth, thus radically changing the landscape of Pakistan’s agriculture economy through dairy development!

The White Revolution (Dhoodh Darya – river of milk) endeavors to be a key engine of economic growth for the country and undertakes the responsibility to make the most of the potential of rural Pakistan. To achieve this goal Dairy Pakistan intends to set out a roadmap for all dairy stakeholders. It promises to embrace the well being of all dairy farmers and their livestock. At the same time, it focuses on improving the business environment of processors and all other participants in the supply chain.

It seeks to improve the landscape of rural Pakistan through a progressive and proactive dairy infrastructure. Improving the economics of smallholding farms and increasing the number of mechanized farms is the prime objective of the White Revolution. The White Revolution promises to modernize the conventional dairy farming from a by-product of mixed farming into an efficient agri-enterprise. As a result, the White Revolution will influence the lives and livelihoods of millions of farmers and enhance lifestyles in urban Pakistan through quality and innovative product mix.

Targeted Dairy Development 2015

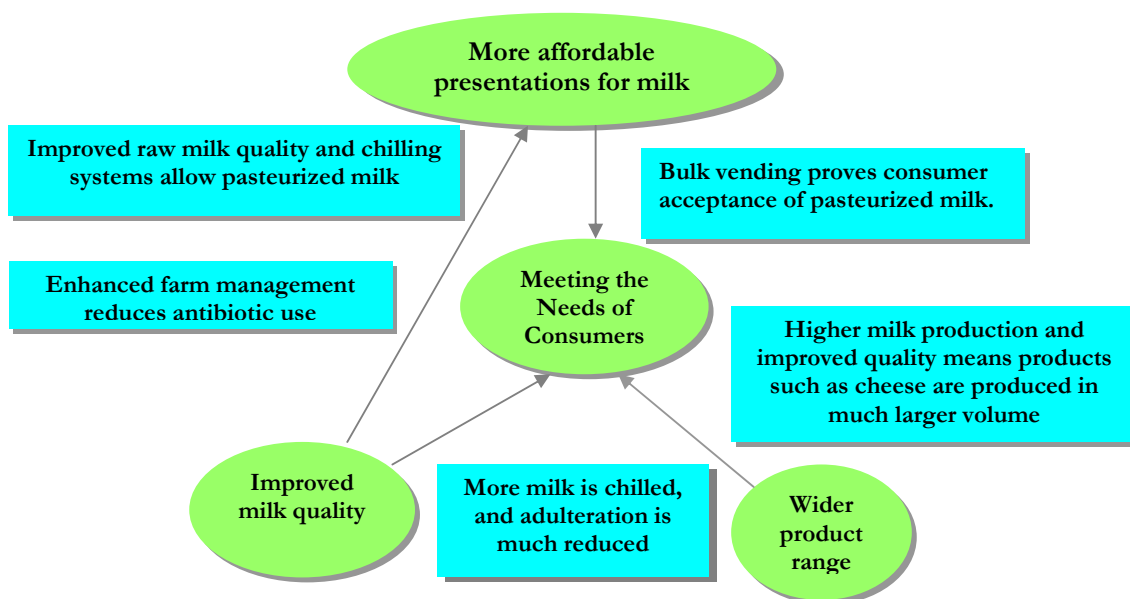
The vision of Dairy Pakistan is to build a “Modernized Dairy Sector”.

A “Modernized Dairy Industry” is defined as one, which meets the needs of major stake holding groups.

The key elements of our Vision, therefore, are that the dairy sector will be meeting the needs:

- Of consumers,
- Of farmers,
- Of processors,
- And of the Nation.

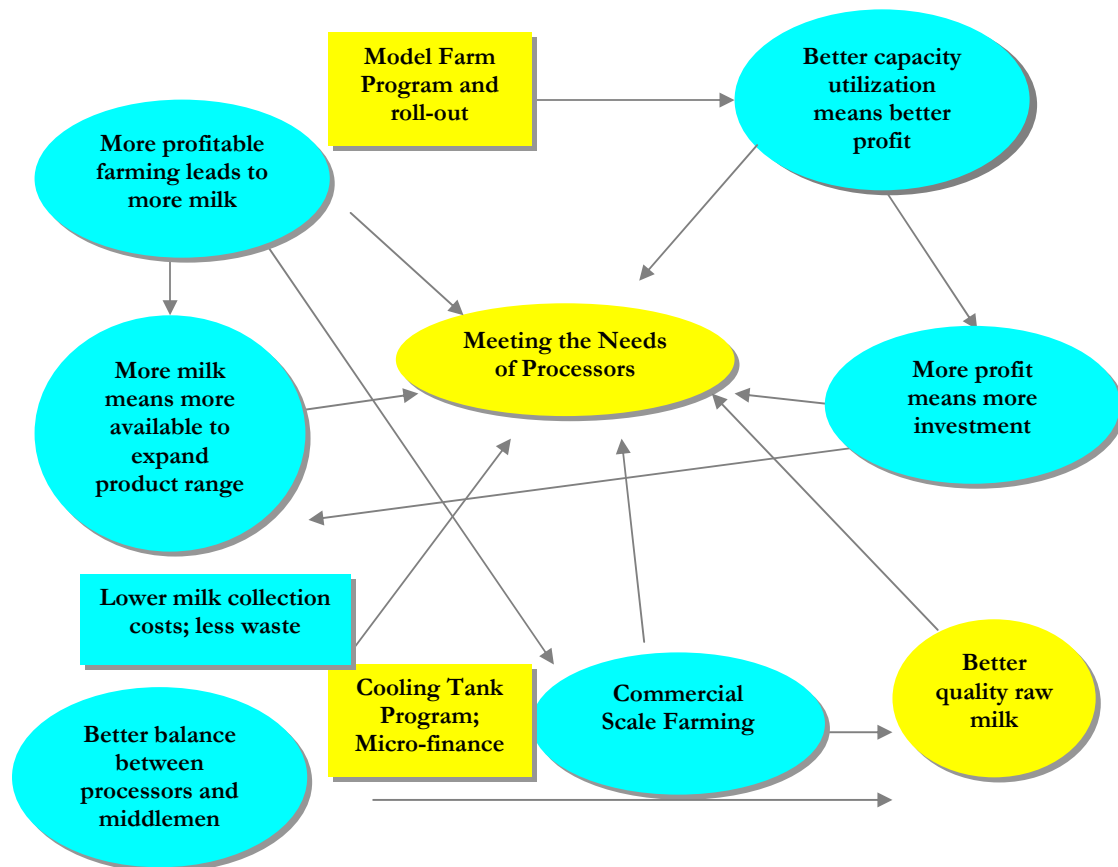
Meeting the Needs of Consumers



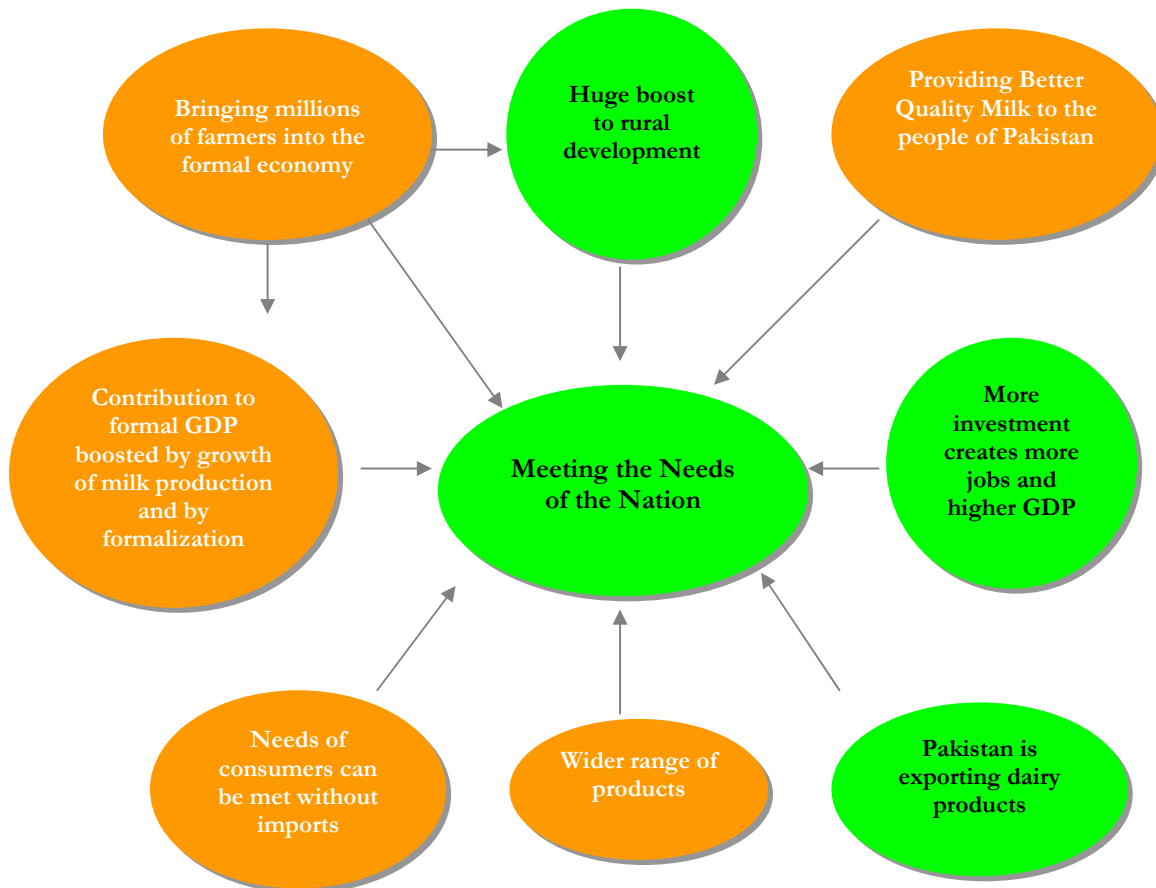
Meeting the Needs of Farmers



Meeting the Needs of Processors



Meeting the Needs of the Nation



We believe there is need for radical transformation of the informal dairy sector into a more formal and organized sector. For this transformation to really happen the sector requires a commercially driven dairy development program. The key stimuli of such an approach may include:

- Stimulating changes at a production level, encouraging technological and especially farm management advancement on smallholding farms, and an increase in the number of mechanized farms.
- Organizing the milk supply chain and legitimizing the role of milk traders/dhodhis

We feel that should the above-mentioned changes happen in the spirit in which they are being conceived, the outcome will be a dairy sector that will truly be the engine of economic growth of Pakistan. Currently without any policy interventions or any available support mechanism, the livestock sector as shown earlier has performed exceptionally. Once a collective industry-wide effort is made to change the sector for the better, a new dairy industry of Pakistan will be born. This newborn industry will be capable of delivering significant gain to the economy. It will:

- Expand an important source of cash flow to rural Pakistan.
- Contribute to foreign exchange through import substitution and some export.
- Substantially increase the contribution to the exchequer through an organized and documented dairy sector.

- Lead Pakistan's agriculture economy in the transition phase from a basic rural landscape into commercially orientated agri-enterprise.

3.1 Specific Targets of the White Revolution:

The White Revolution is targeted to achieve an annual production of **40 billion liters** of milk by 2015 (out of which at least 16 billion will be formal FA, we say in the goals for 2015, that formal is to be 40%), thus providing significant additional cash flow to dairy farmers. The proposed Dairy Development Models are designed to deliver specific development projects through investment in infrastructure and human capital:

- 2440 farms model farms will be set up to develop and demonstrate best practice farm management, with the goal of raising productivity levels by up to 30%.
- 6330 farm cooling tanks and 2100 mobile milk collection units will be provided to preserve highly perishable milk.
- A Farm Management and Dairying Research institute will be established, including a semen research centre.
- Through a program to assist the creation of rural entrepreneurs, businesses active in fields such as equipment and service contracting, equipment maintenance and feed/ration provision will be established or further developed.
- Vocational & Technical Training for adequate numbers of farmers and support service workers like AI technicians and Animal Health workers etc.
- Establishment of 700 farm input stores to provide good quality nutritional products at economical prices to 6000 villages.
- Standardized designs for Animal / livestock shelters for providing cost effective and efficient housing for livestock.
- Expansion of biogas production units in dairy concentrations.
- Protection and enhancement of indigenous breeds and identification / recording of best local breeds.
- Research for the profitability of buffalo milk production.
- Introduce pasteurized milk in formats, which make it better quality than "loose milk" while affordable to the bulk of the population.

3.2 Modus Operandi to Unlock the Potential – The Eight-point Strategic Agenda of the White Revolution.

We propose an Eight-point strategic agenda that will unleash the potential of the milk economy.

3.2.1 The most important point of the Strategic Agenda of the White Revolution will be the successful implementation of the Dairy Development Projects. The projects are designed to deliver specific development models. The models primarily concentrate on investment in dairying infrastructure and human capital. The setting up of model farms will introduce enhanced farm management techniques and will improve productivity levels. Similarly the boosting of the cold chain will improve the life of the perishable milk. The Dairy Institute with a Semen Research Unit will have significant impact. This will be supported by vocational training facilities for dairy technicians.

3.2.2 Creating Rural Entrepreneurs: Expensive items of farm machinery, which are required on an occasional basis, may be too costly for all but the largest farms. In other countries which focus on low cost farming and where government subsidies tend not to be available, over time a system has developed of local area regional service providers, who own these expensive items and contract their service to a reasonable numbers of farmers. In this manner, the cost of a large asset is spread over many farms, bringing mechanization to a larger number of farms than would otherwise be the case. In addition, often specialized skills can be developed more easily, owing to the smaller number people who will be engaged in the use of this equipment.

Thus in New Zealand and in Australia, local area entrepreneurs (generally known as “contractors”) own grass cutting and hay baling equipment, and bring these items to individual farms at agreed times and for agreed rates. The contractor does not rent the equipment, rather he provides the full service, including using the equipment on the farm.

It is proposed that Dairy Pakistan develop a program involving donor agencies to develop a business model along these lines. It is proposed that model businesses be established, whose functions can be transferred to other entrepreneurs upon proving successful under local conditions. Close supervision will be needed in the first instance, to ensure proper training in the use of specialized equipment, the entrepreneur learns how to market his services, matters such as insurance for any damage to fences, for example, are handled in a professional manner, and perhaps most importantly, a pattern of setting rates which are fair to all parties are set.

With respect to the important topic of maintenance of reasonably sophisticated equipment, it may be necessary to build upon the creation of regional entrepreneurs at the “contracting” level, with another hierarchy, that of entrepreneurs operating specialist maintenance centers – clearly, the latter level will service a number of contractors. The beginnings of a network of regional businesses can be identified.

3.2.3 Developing the Value Added Market – innovation in health, pleasure and presentation

Dairy products have evolved from mere commodities to life-style statements. Pakistan’s dairy revolution has been precipitated by the surge in consumer empowerment through greater health and quality consciousness. These value-added life-style enhancing dairy brands currently constitute about 40% of the dairy market, this profitable segment would cross the 65% mark in the next 8 years and will attract foreign investment and will reduce imports. One could imagine the contribution to the GDP and the economy with this rate of growth in the value added sector.

Today, the ability of the processors to boost added value product development is limited by the relative shortage of milk compared to the demand from their consumers. Processors struggle, especially over summer, to procure sufficient milk to meet demand for core products such as UHT milk, resulting in the opportunity to introduce more sophisticated products being much reduced. Thus, an important precursor to the development of a wider product range is the success of the Model Farm Program and other programs designed to link more farmers (and hence more milk) to the formal sector.

Given improved availability of better quality milk to the formal sector, development of a wider range of products will occur. A product group, which is expected to show strong growth in future, is cheese. Cheese is a highly nutritious product with significant consumer appeal. An improving economy will lead to increasing demand for cheese products. It is likely that the range of fermented products such as yogurt will increase also.

If milk production and quality is sufficient to enable exports, then the most likely products to be exported will be skim milk powder, anhydrous milk fat and casein. Development of added value products such as casein will be necessary if Pakistan is to capture a useful share of the world market.

Production of added value dairy products requires, in addition to the necessary raw milk, investment in plant and in human resources.

A useful standard, which the Pakistan dairy industry should set itself, is to match the range of products available in the consumer markets of the Gulf. This implies development of cheese and fermented products, improved presentations of butter and whole milk powder, and packed ghee. Further development of traditional sweets is desirable.

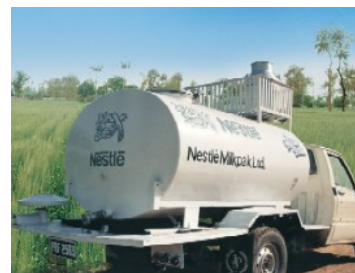
3.2.4 Organizing the informal sector into documented formal economy and to formalize the role of the middlemen: Only around 3% of the total dairy sector is organized and documented. The remaining 97% is handled by the informal sector.

3.2.5 Propagating quality and implementation of pasteurization laws: Some of the dhodhis or middlemen of the milk supply chain carry out a successive adulteration process; in the form of water addition, ice, vegetable oil, etc in order to increase their margins and preserve the milk. There is no practical punishment or incentive system in milk quality hence the dhodhi is mostly unaccountable. The regulatory structure currently in vogue in the milk sector is archaic and quite inadequate for modern times while the ability of government to implement these regulations is also limited. We recommend the implementation of Food Quality Safety Standards, and the implementation of pasteurization laws to ensure a White Revolution of quality milk.

3.2.6 Mapping Increased Supply Pockets with special incentives for NWFP and AJK: Pakistan has huge potential to increase its supply chain pockets. The existing location of supply pockets is Punjab and Sindh. NWFP and AJK regions are both well poised and in need of regional local supplies. Special incentives to be provided to licensing, quality productions, setting up of corporate dairy farms and a special *tax incentive to be given for setting up processing units and dairy farms in earthquake hit AJK and NWFP*, this will create livelihood opportunities in the regions and increase milk supply pockets. Milk pockets should also be assessed for the suitability of co-operative development.

3.2.7 Attracting foreign investments, joint ventures and encouraging existing processors to increase investment in the sector.

Clearly, foreign investors like Nestle etc change and improve the whole structure of the dairy sector. For example, Nestle employs 5000 permanent employees and buys milk from 135,000 farmers throughout the country. More investors like Nestle in the sector are likely to uplift not only the dairy farm structure but also rural Pakistan as a whole. While it is important to attract foreign investment it will remain crucially important to have the existing processors reinvest in the sector. As drivers of the industry their growth and investment remains of utmost importance in the short and the medium term.



3.2.8 Dairy Pakistan - creating a monitoring and implementation Mechanism for the White Revolution: this will be of utmost importance to enhance the capacity of the implementation process through Dairy Pakistan. The diagrammatic vision of "Empowering Rural Pakistan is given in the end of this chapter in figure 3-B.

3.3 "White Revolution (dhoodh darya) promises to empower rural Pakistan"

The White Revolution envisions converting the subsidiary occupation of dairy farming into an instrument of socio-economic development. It is intention of these programs to place the farmer at the centre of the substantial benefits arising from dairy development. Large-scale poverty reduction must be based primarily on harnessing the energy and creativity of poor people, and on allowing the private sector to achieve its full potential. Nestle is a good example of how businesses can improve the quality of living for the poor while at the same time making *conscientious profits*.



“It is an interesting example of how business, by taking a very long-term view of development and the interests of various stakeholders, can contribute to poverty reduction and improvement in nutrition on a very large scale, while at the same time creating significant business success”. (Please refer to Table 3-A below).

TABLE-, 3-A (Nestle Milk District Model)

Nestlé's Milk District Model

(Harvard Business School-November 2005)

“Nestlé, the world’s largest milk company, and the world’s largest provider of vitamin- and mineral fortified foods in the world, especially milk, cereals, bullion and culinary products had over the years, consistently built food systems around the world that contributed positively to the financial well-being of producers, the nutritional needs of consumers, and the economic development of many countries around the world. These food systems were developed in keeping with Nestlé’s long-term commercial strategy of being a wellness company—an important element of the success of the model; each initiative was a win-win for the partners involved, as well as for the local constituents. Nestlé’s successes were in no small measure due to being an engine of rural development through its milk district model, and the care the company took with their supply chain, increasingly valued by consumers in the wake of various food safety and security concerns, foot-and-mouth disease, the BSE outbreak and other recent food scares, and increasing public interest in health and nutrition. Most recently, Nestlé’s milk districts in Pakistan, Brazil, Mexico, Chile, India, and China, among others, reported substantial positive results”.

Table 3-A

Source: Harvard Business Review – Nov 05

The process of “business for development” involves leadership commitment, institutional innovation, learning, and external catalysts. The White Revolution follows this approach and undertakes to unveil the potential of rural Pakistan through:



- Encouraging and creating with technical assistance and other forms of support rural entrepreneurs.

- Developing rural infrastructure through better cold chains and improved transportation and communication channels.

- Introducing solutions for the farmers to reduce reliance on expensive middlemen systems.



- Mobilizing women workforce into livestock care
- Promoting rural ownership and communal sentiments through economic centers serving as the hub of socio-economic rural activity.
- Specific programs will be implemented to achieve the above-mentioned targets. Various programs like rural entrepreneur, dairy markaz, village dairy; small farm holders project etc will be



implemented through various donors, government and dairy sector funding. In addition a study on mapping poverty pockets will also be carried out.



- **Dairy Markaz¹⁷ will help unveil the strengths of the large rural marketplace.** With rising rural incomes, there is a need to discover the strengths of the large rural marketplace of

Pakistan. It is myth to believe that rural consumers are not brand and quality conscious. The share of branded goods fertilizers, beverages and other consumer goods shows the rural areas are also brand conscious. Multinationals like Coke and Pepsi have already ventured into the hinterland. Both Coke's and Pepsi's success stories in neighboring rural India show phenomenal growth and product diversification. In addition to multinationals, many local Indian companies are moving into rural areas including TATA, Reliance and Hindustan Lever Ltd. Hindustan Lever has a program that creates incoming-generation capabilities for underprivileged rural woman; improves rural quality of life by spreading awareness of best practices in health and hygiene; empowers the rural community by creating access to relevant information through community portals and it also works with NGOs to spread literacy. The company has created over 15,000 entrepreneurs, most of them women, in 61,400 villages across 12 states.

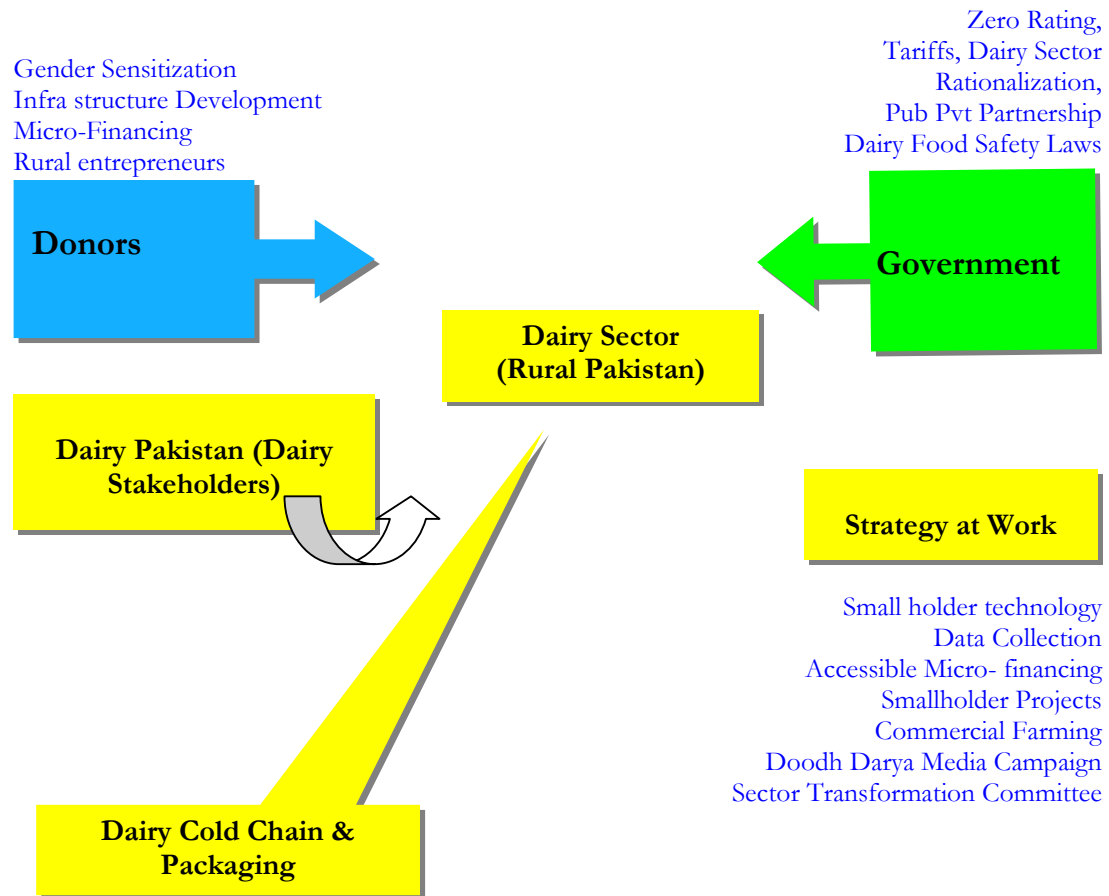
- **Revolutionizing Farmer Facilitation** – Dairy Markaz communicating farm needs through internet, local language call centers and B2B meetings. The White Revolution is determined to develop the rural economy of Pakistan through revolutionary changes. The concept of Dairy Markaz will encourage interaction between the urban and the rural as a frequent activity. The Markaz will facilitate business activities through internet, local language call centers or B2B meeting arrangements, resulting in placing the farmer directly in the market mechanism. Farmers have only an approximate idea of price trends and have to accept the price offered to them on the day that they bring their grain/milk to the mandi or the trader. Additionally, farm inputs, veterinary services, medicines etc are not all the time in close proximity to the farmer. As a result, traders and middlemen exploit both farmers and buyers through practices that sustain system-wide inefficiencies. A revolutionary model to introduce small holding farmers to technology driven solutions, for commercial transactions is envisioned called the Dairy Markaz (details of which are given in Annexure A). The Dairy Markaz will follow the e-Choupal model of India¹⁸ that has reached about 3.5 million farmers and is expanding to 30 villages per day, making it India's one of most *ambitious horizon-widening initiatives*. The Dairy Markaz model will be extended not only to facilitate the farmer through online support but also through call centers in Punjabi and Sindhi. The lesson is that no dream is unachievable no matter how fanciful. With a farm population vibrant though unskilled, a rich natural resource (milk) and the power of the Dairy sector as a labor-intensive activity to absorb jobs, the white revolution is surely going to transform the landscape of rural Pakistan

¹⁷ Details of which can be found in Chapter 6 below

¹⁸ In India the e-Choupal model has been a catalyst of rural transformation. It is helping to alleviate rural isolation, create more transparency for farmers, and improve their productivity and incomes

FIGURE 3-B

Empowering Rural Pakistan



CHAPTER-4

4.0 Strategy in Action – Strategic Initiatives by Dairy Pakistan

To put the all-inclusive 2015 White Revolution into action, Dairy Pakistan working with its stakeholders will build institutional capacity over time, and at the same time will drive the White Revolution.

It is recommended that ad-hoc groups of stakeholders be assembled by Dairy Pakistan whenever it is considered that the pace and effectiveness of the White Revolution can be improved by such a step.

4.1 Small Holder Dairy Project:

In the course of the next few years, consideration will need to be given as to how the results of the Model Farm Program can be spread more rapidly throughout the dairying areas of Pakistan. One model may perhaps be Kenya's Small Producers Project. This program, supported by the UK's Department for International Development (DFID) entails encouraging small holding farmers to improve farm management and farm economics through radio and TV solicitation. The solicitation is followed up by extension services.

4.2 Dairy Technology Program:

There is no national level breeding policy to support the breeding of higher yield cattle and to ameliorate inconsistent milk production. Technologies such as artificial insemination have been cited as solutions towards increasing the milk yield. Improved cattle feed and by-pass protein feed technology should also contribute towards improving the milk yield. Under the Dairy Development Projects - DDP, provision has been made to assign the proposed Farm Management and Dairying Research Institute as the key body to design the breeding policy for the country and to improve the research and analysis on technological changes and issues in breeding, thus taking care of herd book recording for registered cow and buffalo breeders and collaborating with AI and semen supplying companies. The Institute will also analyze results and develop recommendations for the industry and farmers for improvement. The institute will have shared data network with other research institutes at National and International level.

In the milk procurement system, current practices are based on pricing of milk on fat content. Electronic 'Milkotesters' for establishing fat, SNF content, bacterial count, heavy metals and pesticides residue etc. need to be introduced in the future. A lot of milk is wasted due to faulty supply chain practices, hence the need to provide technological tools on easy loan facility to farmers. Widespread usage of bulk coolers for chilling of milk at the village level will reduce supply chain losses and improve milk quality. The Institute will have a key focus on modification of farm management techniques in use elsewhere to make them suitable for Pakistani conditions and on implementation.

4.3 Diversified and Accessible Dairy Micro-financing:

The rural economy in Pakistan has generally not been tapped as a potential. However, there is a desperate need to fill in the gap for institutional financing in rural Pakistan. Lending for small farmer program is needed through micro-finance and SME financial institutions primarily Khushali Bank, Punjab Bank, SME Bank, KASB Bank and others. There is an overall increase in bank loans being provided for the Dairy Sector, although the demand continues to be stronger than supply.

Financial Institutions in Pakistan need to diversify their dairy loans portfolio. It remains pertinent for financial institutions to consider and make provision for loans in the following important components of dairy business:

Cattle and buffalo breeding and calf rearing

Frozen semen banks and A.I. centres

Small, medium and commercial dairy units

Salvage of dry pregnant buffaloes from city dairies

Production of perennial Lucerne as green fodder

Fodder production on common village grounds

Silvi-pastoral schemes for production of fodder grasses, fodder trees, timber/fuel trees.

Conservation and storage of dry fodder and fodder banks

Production of fodder seeds

Mini and major cattle feed plants

Urea-molasses brick manufacturing units

Mobile veterinary service

Setting up of private veterinary practice

Electronic milk testers for dairy cooperatives

Equipment and machinery for processing of liquid milk and milk products

Other dairy machinery like milking machines, milk tankers,

Construction of milk houses for collection of milk from producers.

Manufacturing, storage and marketing of value added indigenous milk products.

Banks should ensure that all backward and forward linkages are available and prepare schemes in a compact manner so that inputs and services including marketing of milk are available. The methods of appraisal, sanction and disbursements of dairy loans need to be introduced along with field monitoring of ongoing schemes. Banks should diversify and provide loans for all activities of dairy industry particularly for breeding of animals and processing and marketing of milk and milk products. Dairy Pakistan will regularly invite consortia banks to update them on the sectors needs. A biannual meeting between banks, State bank, relevant Government Ministries and private sector should be held for better coordination and implementation of Dairy Micro-finance and Dairy loan schemes.

4.4 Dairy Quality Standardization and Monitoring Mechanism

Pakistan does not enjoy a high level of food safety; it faces the challenge of continually improving food safety and reducing food-borne illness. Globally, food-borne illness is a growing public health problem because of changes in the way food is produced and manufactured, and changes in consumer requirements. The Government of Pakistan through the Ministry of Health and its relevant Ministries in the Provinces should approach the management of food safety in depth. Governments have agreed that food safety should be addressed throughout the food supply chain (i.e. from paddock-to-plate) to maximize food safety. This approach aims to maintain or improve public health and safety and ensure that consumers can have the highest confidence in the safety of the food they consume, without imposing undue costs on industry. The dairy industry across the world is a highly regulated sector and practices high levels of food safety management. At the moment, Pakistan's food safety management falls under Food Rules 1965. This needs to be updated.

4.5 Dairy Media Campaign – “Dhoodh Darya”:

The Vision 2015 sets to benefit the consumer and the farmer in all aspects of rural development. While the farmer is educated on hygienic milk production and collection the consumer will need to be educated on the ills of loose milk.

4.6 Dairy Business Advocacy Program:

The importance of business advocacy need not be emphasized. Business advocacy or public relation and lobbying for the development of dairy sector would mean educating the Government on the endogenous and exogenous business and commercial needs of the sector. Dairy Pakistan will work closely with companies and institutions like J E Austin and Dairy SWOG to establish an advocacy and lobbying function. Goals include advocacy on tax and tariff rationalization in the sector, for an effective import and export regime for the country in wake of regional integration, preferential agreements and changes in the multilateral trading system.

4.7 Dairy Cold Chain and Innovative Protective Materials:

The future of the packaging industry is promising with high growth potential due to high acceptability of packaged milk amongst consumers. Milk in Tetra Pak cartons represents more than 90% of the processed and packaged milk today, which is growing at a growth rate close to 25% on average for the past 5 years (since 2001). Packaged milk is widely accepted by the consumers for different usages, and we expect that to increase in the next 10 years. The use of packaged milk (in Tetra Pak cartons) is growing in the drinking segments, whilst we foresee the tea whitening segment will continue to lead the category. The industry, led by Dairy Pakistan, needs to consider how packaging solutions can be introduced, such that packaged milk of higher quality can be presented in an economical manner to a broader proportion of the population.



CHAPTER-5

5.0 “The tax, the tariff and the trade”- Policy Needs Analysis for the Dairy Sector – A Case for Business advocacy

A rational tax and tariff policy can either develop a sector or alternatively assist its destruction. There is a need to change the tax and tariff regime of Pakistan for an efficient and investor friendly dairy sector. Clearly an unfair tax regime that discriminates between the organized and un-organized sector is a huge obstacle to re-investment by major companies. Also in light of the industry restructuring that is taking place and the changes happening due to the multilateral and regional trading system, a complete tariff rationalization of existing policies is needed. In lieu of the above the following tax and tariff changes are recommended in budget 2006-2007 to encourage technology up-gradation and investment in value chain infrastructure of the dairy sector.¹⁹.

1. Zero Rating Of Sales Tax On Dairy Products
2. Zero Rating Of Customs Duty On Raw Materials For Packaging Supplies To
3. Dairy Industry
4. Processing Equipment, Plant and Machinery
5. Dairy Farming Extension services
6. Income Tax exemption on new investment in commercial dairy farms
7. Corporate Tax reduction for small Niche Dairy players
8. Zero duty for Import of Semen
9. Zero duty for Import of Veterinary Vaccines
10. Tariff Rationalization

5.1 Zero Rating of Sales Tax on Dairy Products:

Dairy Pakistan seeks intervention of Central Board of Revenue against sales tax inconsistency and requests that “**Zero Rated**” status be granted to the “**Dairy Industry of Pakistan**”.

The impact of zero rating will make processed dairy products competitive and increase revenue to GoP in the form of direct taxes. It is also likely that new players both local and foreign may enter the dairy industry on rectification of sales tax inconsistency.

For example, the elimination of incoming call charges and massive reduction in activation charges in lieu of Customs Duty resulted in phenomenal increase in mobile phone use etc, which in consequence increased tax revenue in following forms:

- Withholding income tax collections
- Sales tax on call charges and
- Income tax on network operations

Another example is the zero rating of raw materials and parts used in the manufacturing of tractors increased the annual production of tractors from 25,435 units in 2003-04 to 31,663 units in 2004-05. (*Source: Economic Survey of Pakistan, 2004-05*).

The economic benefits of zero rating cannot be underemphasized. A zero tax structure is likely to attract capital to the industry, increase pace of innovation to meet diversified consumer needs, widen the industrial base of support services, rural development and of course contribute to the wider poverty alleviation cause especially in rural areas.

Productive investment in the dairy industry will boost industrial income, and bring small entrepreneurs into the tax net – resulting in enhanced Government revenues including import substitution of Rs.1 billion of powder milk and cheese in the long run. The contribution of the zero rating to the wider job economy of the country is presented in Figure 5-A below:

¹⁹ Zero Rating and Zero Duty attached in Annexure C & D have been submitted to the GoP on ----

FIGURE 5-A
Job creation from Informal to Formal through encouraging productive investment in the sector

Value Chain	Current formal sector jobs	Jobs formalized from Informal to formal by 2015
Dairy Farming	500,000	3,050,000
Model Procurement	20,000	56,500
Dairy Processing	15,000	30,000
Transportation	1500	12,600*
Sales & Distribution	9,500	80,000*
Allied Industries	2,400	16,000
Total Employment	548,900	3,245,100

Source: Bench mark from the estimated employees of the industry and projected on the basis of potential.

** includes village level entrepreneurs*

5.2 Zero Rating of Customs Duty on Raw Materials for Packaging Supplies To Dairy Industry

Processed milk in Pakistan or elsewhere has to be transported from the processor to the consumer. Due to the distances in between the markets and the producers and the processors and the consumers the transportation of the perishable milk is a tedious job. Only packaged milk in Tetra Pak packs is able to sustain a very long life and serve as the alternative solution to very expensive cold chains. In lieu of the importance and advantages of packaging a 5% concession is sought to ensure packaging is readily available at a cost effective price.

In Pakistan two mediums are generally used for packaging milk:

a) Ultra Heat Treatment (UHT)

UHT process involves flash sterilization, cooling and packing milk in sterile packaging called aseptic packaging. Aseptic packaging provides UHT milk with longer shelf (up to 9 months), which enables its distribution across the country. Aseptic packaging therefore is considered the preferred method in dairy industry to market liquid dairy products.

b) Spray Drying of Milk

Liquid milk is concentrated, spray dried and converted into powder form. Powder milk is then packed in aluminum based packaging material. This allows milk to be stored for extended periods (up to two years) and as such can be exported also.

The Suggested Amendments With HS Codes And Customs Duty For Items Used For The Manufacture Of Liquid Food Packaging Material For Local Dairy Industry are provided in Figure 5-B below:

FIGURE 5-B (Packaging recommended for tax exemption)

S. No.	H.S. Code	Description of Commodity	Existing Custom Duty	Proposed Custom Duty
1	4819.2000	Folding cartons	15%	0%
2	7607.1100	Aluminum Foil	20%	0%
3	3901.1000	Low density Polyethylene	5%	0%
4	3901.2000	Low density Polyethylene	5%	0%
5	3901.9000	Adhesive Polymers	5%	0%
6	4804.3900	Bleached Kraft Paper	20%	0%
7	4804.4900	Duplex Kraft Board	20%	0%
8	4804.5900	Duplex Kraft Board	20%	0%
9	4810.9900	Clay Coated Duplex Kraft Board	25%	0%

Rationale for seeking zero custom duty is firstly of course customs duty escalates the cost of production of formal sector of processed milk and dairy products. It renders the formal sector uncompetitive against informal sector and except for paper and board; all the items are not manufactured locally. A detailed proposal as submitted to Government is attached as Annexure D.

5.3 Processing Equipment, Plant and Machinery

GoP has already provided concessions to dairy industry vide SRO 575(1)/2005 by eliminating custom duty and sales tax from dairy and agro based industries. However, there are still some equipment, plant and machinery used by the dairy industry that needs to be covered. This equipment, plant and machinery are not dairy specific, but are essential for dairy industry. We therefore request that custom duty and sales tax on import of the items listed below in Table 5-C, by the dairy industry should also be zero-rated.

TABLE 5-C (Tax exemption/ reduction in processing)

<i>Description</i>	HS Code	Existing Structure		Proposed Structure	
		Custom Duty (%)	Sale Tax (%)	Custom Duty (%)	Sales Tax (%)
Conveyors	8428.3900	5	0	0	0
Cream separators	8421.1100	5	0	0	0
Deaerator	8421.3990	5	0	0	0
Labeling machine	8422.3000	5	0	0	0
Milk Evaporator	8419.3900	5	0	0	0
Air conditioning unit	8415.8200	5	0	0	0
Air Handling Units	8415.8300	5	0	0	0
Air Heater	8419.1900	5	0	0	0
Cooling Tower	8418.6900	5	0	0	0
Homogenizer	8434.2000	5	0	0	0
Laboratory ovens	8516.5000	25	15	5	0
Milko Scans	9027.3000	5	0	0	0
Prefabricated buildings	9406.0000	25	15	5	0
Racking System	7310.2900	25	15	5	0
Tote bins	7310.2900	25	15	5	0
Tubular Heat Exchanger	8419.5000	5	0	5	0
Laboratory glassware	7017.0000	10 to 15	15	0	0
Boilers	8402.0000	5 to 20	0	5	0
Generators	8502.0000	5 to 20	0	0	0

5.4 Dairy Farming and Extension Services

In addition to above, we have also identified essential materials that are required to improve the quality of dairy farming and extension services. In this respect GoP has again provided certain exemptions vide SRO 575(1)/2005. However, these exemptions cannot be availed by individual farmers. Therefore, it is requested that the following items in Figure 5-D used for dairy farming and extension services should also be zero-rated to the benefit individual farmer.

FIGURE 5-D (Farming and extension services)

Description	HS Code	Existing Structure		Proposed Structure	
		Custom Duty (%)	Sale Tax (%)	Custom Duty (%)	Sales Tax (%)
Pure Breeding Animals: Bull	0102.1020	5	0	0	0
Pure Breeding Animals: Oxen	0102.1040	5	0	0	0
Bovine semen	0511.1000	5	15	0	0
Containing corticosteroid hormones, their derivatives and structural analogues	3004.3200	10	15	0	0
Cod liver oil	3004.5010	5	15	0	0
Unani ayurvedic and other oriental type medicine	3004.9010	10	15	0	0
Homeopathic medicines	3004.9020	10	15	0	0
Dextrose and saline infusion solution, with infusion set	3004.9030	20	15	0	0
Dextrose and saline infusion solution, without saline infusion set	3004.9040	20	15	0	0
Ultrasonic scanning apparatus	9018.1200	5	15	0	0
With needles	9018.3110	20	15	0	0
Without needles	9018.3120	20	15	0	0
Tubular metal needles and needles for sutures	9018.3200	20	15	0	0
Dextrose and saline infusion giving sets imported along with empty non-toxic bags for infusion solution	9018.3910	20	0	0	0
Dextrose and saline infusion giving sets	9018.3920	20	0	0	0
Cannula	9018.3940	20	15	0	0
Surgical needles	9018.3950	5	15	0	0
Endo tracheal tube	9018.3960	5	15	0	0
Balloons	9018.3970	5	15	0	0
Anesthesia apparatus	9018.9010	5	15	0	0
Stethoscopes	9018.9020	5	15	0	0
Surgical scissors	9018.9030	5	15	0	0
Surgical knives	9018.9040	5	15	0	0
Sphygmomano-meter	9018.9050	5	15	0	0
Other	9018.9090	5	15	0	0

5.5 Import of Semen: Pakistan suffers from poor breeding issues. Presently the import duty on Semen is 5%; a zero rate is requested to make the use of AI affordable for smallholder farmers.

5.6 Import of Vaccines: Animal care surely remains at the heart of all dairy activity. Vaccines are an important tool of care and protection for the herd. Easily available imported vaccines will support the farmer by ensuring healthy animals and hence improved productivity. It is important to note that Indian vaccines are the most suitable vaccines for the local herd. Hence, cost effective good quality Indian vaccines allowed to be imported at 0%.

5.7 Tariff Rationalization for the dairy sector: With the “growing spaghetti bowl” of trade relations within Asia and globally, there is an imperative need for the dairy sector of Pakistan to identify threats and opportunities at the import and export level, by understanding the multilateral, regional and bilateral rules of origins that create or negate competition for dairy products and dairy machinery. In Pakistan’s context there are a host of regional agreements within Asia-Pacific that need to be reviewed. The core policy questions that need to be addressed include lists of products that deserve zero-tariff duty in order to support healthy growth of the dairy sector, primarily packaging and livestock. Additionally, the tariff structure affecting the dairy sector especially under SAFTA and Pakistan’s preferential agreements may need a revised rationalization methodology. A Dairy Tariff Rationalization study will be undertaken to identify the ratio and balance in raw and value added goods, including import duties on dairy manufacturing equipment.

The tariff rationalization study will also propose a revised duty structure in the wake of export opportunities under preferential and regional trade agreements.



CHAPTER-6

Dairy Development Projects

6.0 Creating Dairy Entrepreneurs, Empowering Small Holding Farmers and Developing Dairy Infra-structure

6.1 Project Proposal 1 (Milk Collection Tank)

Installation of Additional Milk Cooling Tanks.

Milk collection systems often place the quality of milk at risk. The non-availability of cooling tanks at the local level is a big handicap as unhygienic practices are used instead of proper refrigeration. Such practices may include adding ice or often unsafe preservatives. This reduces profitability to the original farmers, ruins the milk quality and overall is a health hazard to consumers. In order to overcome the handicap, a programme of promoting cooling tanks and or “chillers” or (Cooling Tanks) to industry participants is planned. This will assist in maintaining quality and enhancing profit.



Project Brief

The project proposes to install a large number of Cooling Tanks (6330) Most of the tanks will be provided through processors for collection centres, with a smaller number going to middlemen and a very small number going to large farmers. This will enable them to conserve the quality of fresh milk produced in the rural environment of Pakistan and sell it for a better price, as milk is a highly perishable commodity with few hours of quality life (unless chilled). The project aims to provide a 30% grant and 70% soft loan component to selected program participants. This process will be a key development factor for the overall dairy sector of Pakistan.

Project Objectives

The main objectives of the program are to promote the use and adoption of farm cooling tanks for the following reasons,

- Allow better quality chilled milk to be marketed from the farm to industry/ consumers.
- Create both morning and evening milk market awareness in remote areas, away from big cities/ customers.
- Minimize transport cost of milk by transporting milk only one time rather than morning and evening.
- Improved opportunities in terms of quality milk stowage and selling.
- Reduction of milk wastage as being a highly perishable item.
- Significantly increase the volume of milk available for marketing through less wastage and the opportunity to recover evening milk, where this is not be collected at present.

Project Implementation

Dairy Pakistan will identify industry participants who wish to participate in this program through a rigorous application and selection process. There will be project management team under a Project Manager working out of a Project management Unit (PMU) directly under the management structure of Dairy Pakistan. The process will provide a subsidy based approach (30% grant and 70% loan facility) for motivating industry participants for installing chillers with easy credit mechanism (soft loans). The processors will provide a platform for selection and endorsement by Dairy Pakistan of eligible farmers.

The industry will promote and give incentives for the chilled milk supply practice for quality milk. This will work closely with the proposed Progressive Dairy Entrepreneur. The key activities will include promoting the use of chillers amongst farmers and facilitating farmers/ dhodies (i.e. village level milk suppliers) for obtaining chillers on easy terms (either on loan or self financed).

Outputs: (Quantitative)

1. 6330 new chillers of different capacity enhancing the collection, stowage and sales of quality milk.

Impacts

A total of 2 Billion liters of milk will be additionally chilled and sold at a better price of at least Rs1 above the normal milk and with better quality standards hence creating an additional revenue of Rs2 Billion or \$US33 million per annum or \$US100 million over three years. It is further considered that perhaps 10% of the milk collected in these cooling tanks would otherwise be wasted, so this is an additional benefit of Rs2.7 billion per year.

Proposed Budget- Farm milk cooling tank / Rural Entrepreneurs development project (3 years duration)

Description	Costs in PKR (millions)	Costs in US\$ Millions
Funds requested from Donor agency which ones	1540	25.7
Soft loans equity by farmers	3202	53.4
TOTAL	4742 (PKR Million)	79 (US \$ Million)

**Project management costs are included in the grant amount requested from the donors.*

6.2 PROJECT PROPOSAL 2 (Model Dairy Farms)

Introducing Modern Farm Management through Model Farms.

The project will upgrade dairy farms (total 2440 dairy farms) for the progressive farmers. It is mentioned that Pakistan under careful estimates is the 4th largest fresh milk producing country in the world with annual milk production of 33 Billion liters.

The process will provide awareness and technical support to farmers for adopting best farm practices and build necessary infrastructure for improved animal care, improved breeding and overall improved yield of milk. Additionally the introduction of model farms will develop entrepreneurial skills in them for commercial dairy farming.

Main Objectives:

The main objectives are:

- Promote dairy farming under a range of circumstances, from smallholding to commercial
- Improve dairy farm efficiency by implementing best farm practices.
- Develop/ construct model dairy farms to serve as demonstration farms for awareness and dissemination of best practices to local farmers.
- Drive awareness of profitability.
- Provide the opportunity to fine tune farming practices for local conditions, following which farmer training can take place with a high degree of confidence.

Outputs and deliverables

A total of 2440 model farms will be developed, enhancing milk production by perhaps 30%, or in simple terms a single cow will produce 4 liters of additional milk on a daily basis.

Key activities

- a) Improving existing farms into model farms with full management support.
- b) Developing the capacity of dairy farmers for getting financial credit from banks etc for their farm needs.
- c) Demonstration of model dairy farms as best practice models and gearing up more farmers towards modernization.
- d) To provide a grant amount of 30% with a soft loan of 70% to progressive farmers for dairy farm development.
- e) Each farm will be equipped with the necessary assets to support modern farm management techniques:
 - a) Better quality Animals.
 - b) Mechanization.
 - c) Building and shed design.
 - d) Training.

General Impacts.

- a) Poverty Alleviation (more opportunities in the rural areas)
- b) Improved quality of dairy farm practices in Pakistan.
- c) Improved awareness and participation of farmers.
- d) Linkages between Dairy Industry and Farmers.
- e) Model farms available for replication and improvement.
- g) Additional employment opportunities in Dairy Industry and supporting rural services.
- h) A more profitable industry overall, from farmer to processor, and therefore direct and indirect benefits through rural Pakistan and to the Government through higher taxes on profit.

Economic Impact:

Total impact after the first 3 years will be an increase in production of perhaps 166 million liters, valued at Rs2.5 billion to the farmers.

These model farms will serve as platforms where new investors or neighbor farmers can visit and gain some experience on commercial dairy farming.

Further impacts will be readily generated as farmers adopt new ideas and practices well from fellow ‘leader’ farmers.

Beneficiaries.

Small and medium farmers.

Potential investors in the rural areas with good land holdings.

Rural population in general.

Industry and Milk market.

Implementation (Dairy farm Project)

There will be a process of selection of existing dairy farms (for upgrading) and also for establishing new dairy farms for progressive farmers. These will be short listed on the basis of set criteria under the supervision of a dairy processor of the region and Dairy Pakistan. A project management unit will be established under the governance of Dairy Pakistan. The PMU and/or the processor will provide technical support to the selected farms for their improvement. The other model will be to bring in new farmers who have lands and are interested in dairy farming. These farmers will be provided with technical support for developing new model farms. The Model Farm Program will be based on assisting existing farms, and far fewer Greenfield developments will receive assistance from Dairy Pakistan. The Model Farm Program (i.e. other than Greenfield) will use an equity based mechanism where 30-50% grant will be provided to farmers with 50% to 70% soft loans arranged through a financial institution.

The 50% grant and 50% soft loan component will be utilized on a smaller number of farms in the initial stages of the project. Once improved performance is proven, these farms will serve the neighboring farmers as best practice models and will also promote improved economic factors and greater profitability. The project PMU will have a number of technical teams with sufficient resources to undertake this task. Furthermore the dairy industry will also support the process in tangible terms.

Proposed Budget - Model Dairy Farm project: (3 years duration)

Description	Costs in PKR Millions	Costs in US\$ Millions
Donor agency Grant	2883	48
Loan financing/ soft loans	5214	86.9
TOTAL	8097 (PKR million)	135 (US\$ million)

* Project management costs are included in the grant amount.

Extending the Model Farm Program

The goal of the Model Farm Program is to provide models whereby existing farmers can see pathways to growth. Given that the vast majority of existing farmers are very small scale, this requires Dairy Pakistan to identify means through which appropriate farm management techniques can be introduced to these smallholders. As modern farm management techniques require physical assets, e.g. fences such that animals can have free access to water, and sheds to provide relief from high temperatures, a significant issue is how these assets can be provided to smallholders and especially landless farmers.

One possibility is to organize groups of smallholders into co-operatives, such that the provision of assets becomes economically feasible. In this concept, farmers would need to gather their animals onto a single farm. Animals would need to be identified separately, as already planned under the Model Farm Program. Milk production from each animal would also need to be quantified. It would be most efficient if farmers were to supply labour on a roster basis, although the difficulty of having different milkers for buffaloes is acknowledged.

A major issue would be land for a co-operative farm.

It is recommended that Dairy Pakistan lead a study into the economics of such a proposal, and if such an approach is likely to be profitable, then pilot schemes should be undertaken.

It should be noted that a potential partner, who will supply seed finance for a pilot co-operative farm has been identified, and this partner requires that the pilot consider the way the initiative can be used to demonstrate development for females.

6.3 PROJECT PROPOSAL 3 (Farmer Technical Training Program)

Investment in technical training for Smallholding Dairy Farmers and Technicians

Dairy Pakistan, together with stakeholders, will develop training systems for enhancing the knowledge of farm management techniques throughout the Pakistan dairy industry. It is important, however, that this builds upon both the success of and the knowledge gained from the Model Farm Program. Therefore, design of this Training Program has been undertaken but will formally be launched once the Model Farm Program has been underway for say 2-3 years, and the benefits are proven.

In the meantime, training program, which operate at the level of quite basic farm management and animal health, will be initiated in parallel to the model farm program. A detailed program is underway in planning stage for developing a proper curriculum on animal health care and also on best farm practices, which will first train master trainers on a long term, vision and then a formal training process will be launched.

Meanwhile it is estimated that in order to improve the enabling environment for the development of the dairy sector and rural economy in Pakistan, the project focused on the “basics” proposes to train a sizeable number of approximately 10,000 semi-skilled persons, particularly Artificial Insemination (AI) workers and Animal Health workers (AHW). Additionally more than 200,000 farmers are required to be addressed through information and dissemination processes on basic farm practices. This will improve the overall enabling environment of the dairy sector situation in Pakistan at the basic level in approximately three years time frame. This “basic” training is modeled on the present activities of the Rural Development Foundation.

Development Objective:

Improved socio-economic conditions for the average dairy farmer in the rural context of Pakistan, improved skills in terms of human resources associated with dairy sector (domestic and village entrepreneurs), improved yield of better quality milk available for sale and consumption, sustainability for dairy farmers through better animal health and good quality animal breeding, development of village level entrepreneurs, women development for direct participation in dairy farming activities, improved health of animals (livestock) in the dairy sector and larger volume of dairy farmers connected to the market mechanism.

Proposed budget to initiate a basic vocational training program.

Description	Costs in PKR Millions	Costs in US\$ Millions
Funds requested from Donor agency	733	12.2
Equity/ Loan financing/ other sources	529	8.8
TOTAL	1262 (million PKR)	21 (million) US\$)

*Project management cost is inclusive in the grant amount requested from the donor

6.4 PROJECT PROPOSAL- 4

Farm Management and Dairying Research Institute

Despite being the 4th largest milk producing country, with 50 Million animals, 8 million associated farming households and over 33 Billion liters of annual milk production, Pakistan is still not self-sufficient in milk and milk products and there is no organized way or technical support available to provide scientific inputs to this sector.

It is proposed that working with stakeholders, Dairy Pakistan review the gaps in the scientific support available to support dairy industry development, and the benefits that could accrue to the industry through closing those gaps. It is intended that this review be undertaken with donor agencies, and should be complete say by 30 June 2007.

Depending on this the outcome of this review, Dairy Pakistan will then develop an action plan to establish a Farm Management and Dairying Research Institute.

Activities, which the review may determine would prove cost-beneficial to the industry, include the following:

1. Breeding.
2. Feeding.
3. Milk production economics.
4. Local applied dairy farm mechanization.
5. Semen research and production unit.
6. A training component needs to be built into the establishment of such a facility.

It is critical that any institute, which is agreed to be established by the stakeholders and by funding providers, be applied rather than theoretical in nature, and focuses on the dissemination of information of practical use to the majority of the participants in the Pakistan dairy industry.

Proposed budget for Phase-I of the Institute (Planning and initial establishment)

Description	Costs in PKR (Million)	Costs in US\$ (Million)
Donor agency grant	474	7.9
Funds self generation	144	2.4
Industry & Government support	210	3.5
TOTAL	828 (PKR million)	13.8 (US\$ million)

Project implementation cost is inclusive in the grant

6.5 PROJECT PROPOSAL -5 (Mobile Milk Collection Units program)

Project Brief:

The project proposes to develop over 2100 new entrepreneurs employed in milk concentration areas, by. By enabling them to own a vehicle with chilled infrastructure (Mobile Chiller tank), which will help them to conserve quality of milk collected from far flung areas and provide it to consumers at a premium price.

The project aims to provide 70% soft loan and 30% grant component to the rural entrepreneurs for purchasing the vehicles and improve their economic condition by becoming a self employed entrepreneur.

Dairy Pakistan and leading stake holders from the private dairy sector will manage the process.

Objectives:

The overall objective of the program is to achieve better market prices and lower spoilage losses for the farmers. The specific objectives include:

- To ensure better quality milk to the consumers by providing better chilling facilities
- To create rural entrepreneurs who can work in a self-sufficient manner.
- To reduce milk spoilage caused by high bacteria load due to high temperature
- To improve the price of the milk earned by the farmer through better quality milk and better linkage to the market.

It is critical that these mobile milk collectors do not abuse their position at the expense of farmers, and continuing monitoring of their activities will be required.

Activities:

- a) Selection of potential rural entrepreneurs with the support of industry and rural institutions.
- b) Encourage existing doddies who are currently in the trade to use these vehicles and provide vehicles to them.
- c) Finalize vehicle designs and vendors.
- d) A grant cum soft loan process scheme will be introduced to enable the entrepreneurs to purchase the vehicle.
- e) Connecting the entrepreneurs to the market mechanism

Target Output:

- Over 2100 new entrepreneurs employed in milk concentration areas.
- Procurement of 500,000 litres of improved quality chilled milk through these vehicles

Impact (Projected revenue Based): A total of an additional 180 million litres will be chilled and sold at a better price of at least Rs.1 above the normal milk, with better quality standards. In addition 1% quantity loss will be avoided by timely chilling. This will create an additional annual revenue of Rs.210 million or US\$ 3.5 million or US\$ 10.5million in three years and enhancing the annual revenue of 2125 entrepreneurs by Rs.296,000 each. Most importantly, through the funding mechanism, a degree of control over margins taken by these mini-middlemen may be able to be asserted, giving a fairer and more transparent return to the farmer.

Duration: 3 Years

Location of the Project: Areas with milk production concentration which is too dispersed to allow for other more formal methods of milk collection.

Proposed budget:

Description	Cost in PKR Millions	Cost in USD millions
Funds requested from Donor agency	285	4.76
Equity/Loan Financing	485	8.1
TOTAL	771	12.857

Total includes US\$ 1.29 Mln as service charges by Dairy Pakistan

Brief Introduction and Rationale: Much of Pakistan's dairy herd is held by farmers having an average of 2-3 dairy animals/ household scattered in wide areas. Most of the milk is collected by dodhies who go door to door to collected small quantities and then take them to market. During this whole process from milking to reaching the consumer can take up to 8 hours, during which milk is not chilled. The quality of milk deteriorates exponentially when it is held at elevated temperatures. Availability of mobile collection units with chilling facility to farmers/milk collectors can result in improvement of milk quality and consequently help farmers fetch a better price for milk.

Project Implementation:

Project Management Unit will identify rural entrepreneurs with the help of dairy processors in milk potential areas.

These entrepreneurs will be provided with vehicles fitted with milk tanks. The tanks will be insulated and also will have a chilling unit attached which can be operated by plugging in with electricity. The vehicles will get chilled at any plug-in facility before leaving for collection in the area and keep the milk chilled up to 6 hours before it reaches the consumers or collection facility of any dairy company. The collected milk will be deposited at the collection center where a milk chiller will be installed to maintain milk temperature. Following vehicle types will be used:

1. Motor bike
2. Qing Qi
3. Pickup / Hilux

Vehicle Type	No. of vehicles	Chilling capacity (lit/vehicle)	Total Chilling Capacity (lit)
Motor Bike	500	100	50,000
Qing Qi	1500	200	300,000
Pickup/ Hilux	125	1200	150,000
Total	2,125		500,000

Sustainability of the project: The project will be self-sufficient in the long run through better price earned by the farmers/collectors.

6.6 PROJECT PROPOSAL-6 Review of Support Services Technical (Animal Health Care) Training

There are a number of institutes providing technical training for dairy industry human resources. It is essential that the efforts of these training institutes (which are taken to include professional education as well as more vocational training) are co-ordinated and where desirable reviewed for effectiveness. In keeping with the decision of GoP to establish Dairy Pakistan, dairy industry training may need some leadership from the private sector in order to provide assurance that the needs of the industry are achieved. Under such a model, a voice needs to be identified to represent the smallholders. It is possible that owing to its contact with good numbers of farmers arising through the Model Farm Program, that Dairy Pakistan may be able to fulfill this role to some extent, at least on the vocational training level applicable to smallholders.

As noted earlier, it is intended by Dairy Pakistan that the Model Farm Program be used to prove appropriate farm management techniques. It is essential that the body of training providers be in a sound position to disseminate the lessons of the Model Farm Program as these start to flow. The Training Sub-Group of the Dairy SWOG no doubt has an important role to play in the integration of effort of training providers.

The large numbers of veterinarians in Pakistan represents a huge base of knowledge. It is considered desirable that a review of the training of these veterinarians is undertaken, in order that the benefit they bring to the dairy industry is maximized. Such a review can be useful only with a commitment from concerned parties that this is desirable, and that any recommendations will be implemented without bias and concern relating to past practices and their efficacy.

The proposed project is planned on a two phase strategy,

- a) To develop a consolidated plan, curriculum and dissemination process to develop professional veterinarians and animal health workers with an improved understanding of Pakistan's dairy sector environment, breeds and the right way to handle the matters related to long term animal health care benefits.
- b) In the second phase, a concept of mobile veterinary clinics be introduced for reaching far flung areas and provide accessibility to poor farmers for getting professional veterinary advice for their animals.

The proposed budget for initiating the programme is as under,

Description	Cost in PKR Millions	Cost in USD millions
Funds requested from Donor agency as Grant	960	16
Equity/Loan Financing	411	6.86
TOTAL	1,371	22.86

** Includes service charges of US\$ 2.5 million for PDDC from the grant amount*

6.7 PROJECT PROPOSAL -7 Farm Input Stores for farmer Small Holding Farmer Facilitation

Project Brief: The project proposes to develop over 690 farm input stores, which will provide quality animal nutritional products to farmers in approximately 6,000 villages at economical prices.

The project aims to provide 50% grant and 50% soft loan component to implementing organizations, to cover for operating cost and initial investment cost. This process can be instrumental in development of dairy sector in Pakistan.

Brief Introduction and Rationale:

Balanced feeding plays a major role in increasing milk yields per animal. The animals need a balanced diet containing green fodder, protein concentrates and other edibles considering animal's body weight, lactation status and milk production potential. However, no proper management is done by farmers in Pakistan because of limited knowledge and scarce resource availability.

Green fodder availability is the most basic feeding need of the dairy animals, however hardly 10% of the required quantity of fodder is grown in Pakistan. A large number of cattle are grazed on marginal lands, canal banks and roadsides. Stall-feeding includes large amounts of wheat straw which has no nutritional value. Concentrate use is also very limited.

Objectives:

The overall objective of the program will be to improve farmer economics by improving milk yields through balanced nutrition.

The specific objectives include:

- To train the farmers about the benefits of balanced nutrition
- To improve the availability of quality animal nutrition inputs to the farmers
- To help farmers reduce cost of production by improving milk yields

Key Activities:

Selection of entrepreneurs interested in running the bulk units

- Identification of sources of input purchases
- Awareness creation about balanced and high quality animal nutrition in the farmers
- Technical services in collaboration with dairy companies and NGOs

Target Output:

- Setting up of 115 bulk farm input stores & 575 farm input stores resulting in:
- Availability of balanced nutrition of 115,000 animals
- Yield Improvement of 1 lit/animal resulting in additional production of 115,000 lit/day or 34.5 mil lit/year of milk

Impact (Projected revenue Based):

Additional milk production to result in annual increased farmer income of PKR 552 million or US\$9.2 million amounting to US\$ 27.6 million in three years. This will result in additional income of PKR 28,800 for 57500 farmers.

Project Implementation:

One module of farm input store will consist of a bulk store and 5 retail stores. Local entrepreneurs will be encouraged to establish these modules. The module will be headed by a store manager, who will sit at the bulk store and do inventory planning, stock management etc. Each farm input store will cover 10 villages.

The locations of farm input stores will be decided in consultation with agri-services departments of dairy companies. The stores will start with supply of nutritional inputs; however the scope can be expanded to medicines and farm equipment as well. Demand generation for the products will be done by the field staff of the concerned dairy companies. The financing requirements include the purchase of land, vehicle for material movement, working capital requirement and miscellaneous other items.

Sustainability of the project:

The project will be self-sufficient in the long run as the sales volumes for the bulk stores will grow gradually. It will be important to use funding provision to monitor margins charged by these stores, and the quality of goods supplied.

Timing

It will be necessary to use the Model Farm Program to determine the most appropriate items for such stores to stock, including seasonal and regional differences. Therefore, the Farm Input Store program will be phased until after the Model Farm program has been running for say two to three years.

Proposed budget:

Description	Cost in PKR Millions	Cost in USD millions
Funds requested from Donor agency as Grant	428	7.14
Equity/Loan Financing	429	7.145
TOTAL	857	14.285

* Includes US\$ 1.43 mln as service charges for PDDC from the grant amount

6.8 Project Proposal 8 – Livestock Housing

The environmental conditions in Pakistan necessitate the provision of shelter and appropriate facilities for housing livestock. Shelter ranges from very simple structures, such as trees, through to the comprehensive, e.g. modern sheds with cooling systems.

While livestock productivity is integrally related to providing relief from the elements, the profitability of farming systems may be compromised by over-capitalization in livestock housing. The balance between optimizing productivity and maximizing profit must be determined as it pertains to the design and construction of animal sheds.

There is an apparent lack of research, expertise, and resources on this subject within Pakistan. As livestock housing is one of the largest capital costs involved in establishing dairy farms, this subject requires urgent investigation.

The development of standard designs, and importantly the knowledge and understanding which would underpin design is needed, to enable the provision of sound recommendations to farmers. Specifically the shelter needs of indigenous versus exotic cattle, and of buffaloes versus cows, must be proven on a profitability and animal welfare basis. In addition the relative economics of installing different water dousing and fan cooling systems should be investigated.

It is further noted that construction methodology must also be “localized”, meaning that design must taken into account the cost effectiveness of materials available locally, in order that the most efficient use of capital occurs.

From these investigations, appropriate guidelines and construction blueprints should be developed and circulated/made available to relevant institutions/organizations, the construction industry, and farmers.

6.9 Project Proposal 9 – Biogas

Intensive dairying, as practiced in some locations, for example the milk colony of Karachi, produced large volumes of dung. On occasion this is used as manure or dried for fuel purposes, but in some locations, with the Karachi milk colony being a good example again, large volumes of animal waste are disposed of into drains, from where it may travel to water systems such as rivers or the sea.

It is proposed that Dairy Pakistan work with interested parties to determine the economics of producing biogas at locations where large volumes of dung are concentrated. It is possible that even large farms may have sufficient volume of dung to make biogas production viable.

6.10 Project Proposal 10 – Indigenous Breeds

Indigenous breeds have evolved over thousands of years to withstand the local conditions found in Pakistan. Traits such as resistance to heat and pests have significant value. It is important that pure indigenous breeds are not lost to the gene pool. Already, much inter-breeding occurs.

Dairy Pakistan will seek support from relevant agencies to develop a project under which pure native breeds are firstly maintained and secondly milk production within these indigenous breeds is developed at the genetic level.

There are a number of indigenous cattle breeds used for milk production in Pakistan. The most common are Sahiwal and Red Sindhi, dual-purpose meat and milk breeds such as Tharparkar, Cholistani, and Kankrej, and multiple crosses in between commonly referred to as 'desi' breeds.

These indigenous animals have evolved over 5-6,000 years under Pakistani environmental and managerial conditions. They can be characterized by high levels of heat tolerance, disease resistance, and milk fat content. They manage to survive and produce milk on rudimentary, low quality diets, often without water of adequate quality and/or quantity, and in the absence of appropriate husbandry.

Although cast aside in importance due to their typically low milk yields by international standards, they are well adapted and valuable breeds for milk production in Pakistan.

The key principle of any livestock breeding system is to maintain and enhance those traits of economic importance. Current breeding practices on many Pakistani dairy farms are focused on crossbreeding indigenous *Bos indicus* breeds with *Bos taurus* breeds from overseas, principally Holstein Friesian. This produces crossbred progeny with a combination of higher milk yields and environmental adaptations. When the progeny of such breeding practices have trait performance higher than the average of both parents, it is termed heterosis, or hybrid vigor. Generations of these first crosses are commonly referred to as F1, with successive crossing of progeny to the same sire breed leading to F2, F3 generations, and so forth. With each successive generation the hybrid vigor expected from crossing diminishes, eventually declining to an insignificant level, i.e. there is very little genetic diversity remaining between sire and dam. Indiscriminate crossbreeding, both towards Holstein Friesian and between desi breeds, risks the loss of desirable genetic traits, particularly from the indigenous cattle population.

To maximize heterosis in successive generations of animals under cross breeding programs, the use of 2 or 3 breed rotational crossing is required. This is often referred to as 'criss-cross' breeding. In simplest terms it involves the alternate use of different sire breeds between each generation. This technique is a well-proven and widely internationally used method for maintaining hybrid vigor in crossbreeding programs. For this system to be successful, purebred sires from the relevant breeds must be used. In Pakistan this requires the maintenance of purebred herds of indigenous cattle specifically for the purpose of generating sires for crossbreeding and maintaining a genetic resource of desirable traits.

Steps must be taken to ensure that indigenous breeds of cattle are preserved in Pakistan to maintain purity for crossbreeding and to ensure that thousands of years of genetic evolution in particular traits are not lost in a few short decades.

There are several existing facilities in Pakistan that are maintaining purebred herds of indigenous cattle for the purpose of semen production, e.g. Red Sindhi at Tando Jam, Sindh, and Sahiwal at Bahadarnagar, Punjab. A review of these facilities and other facilities is urgently required to determine efficiency and ensure practices are aligned to the objectives of the dairy industry. Co-ordination and collaboration between these facilities, and with other relevant institutions, departments, organizations, and farmers must be achieved. A needs analysis relative to achieving industry goals should be undertaken to determine any resources required.

6.11 Project Proposal 11 – The Value of Buffalo Milk

Published research suggests that buffalo milk is less profitable than cow's milk to the farmer. Indeed, it is possible that the difference in profitability is quite marked. If the contention is true, and the difference in profitability quite significant, then it may be a significant drain on profitability for the entire industry. It is therefore important to undertake research to determine the facts of the situation. This is no suggestion in this project that buffaloes should be phased out, but it is important that the facts are known, so that any marketing issue, which arises from the situation, is addressed. It is suggested that selected model farms are used for research into this matter.

6.12 Project Proposal 12 – Boosting Herd Numbers and Genetic Diversity through Imports and Establishment of a Commercial Breeding Farm

Based on the difficulty processors have had with securing milk supplies to meet the demands of their consumers, it is reasonable to consider that along with the other management issues discussed in this paper, quite probably there are insufficient animal numbers in Pakistan to provide the necessary milk volumes. In addition, there is a tendency for the best animals to be lost to the gene pool of Pakistan. These dual needs suggest a case for the import of reasonable numbers of animals.

The most efficient way to do this would be to import by ship load (approximately 1,400 cows) – this is beyond the means of all apart from perhaps a very few farmers. It is considered therefore that Dairy Pakistan review demand for the import of cows, and consolidates purchases from a number of farmers, in order that efficiency of scale and thus cost reductions are achieved.

With respect to a commercial breeding farm, this would focus on breeding animals for sale to dairy farmers. Unlike some other breeding establishments in Pakistan, it would focus on supplying reasonably large numbers of above average animals, rather than pure breeds or high potential animals. The breeding programme would focus on traits desirable in a low cost dairying environment and hence support the broader goals of Dairy Pakistan.

6.13 Project Proposal 13 - Developing Milk Pockets

It is considered that there may be milk pockets through Pakistan that are distant from formal processors but accessible to underserved regional markets.

It is proposed to undertake a series of projects to evaluate the feasibility of developing such pockets. The projects may include the following:

- How to develop co-operatives, which may be responsible for local milk collection, cooling tank centre operation and marketing.
- Identify the smallest scale pasteurization equipment available, and operating costs for such processing plant.
- Determine whether bulk vending of pasteurized milk from such pockets would meet consumer expectations.
- Determine the economics of milk pocket development, in a manner that provides a template against which identified or potential pockets can be evaluated for suitability for development.

Such a program, if economic, will expand areas of milk production and collection, and connect the farmer to the market, in more isolated areas of Pakistan, thus spreading the fruits of dairy development to a broader area and larger numbers of farmers.

It should be noted that this program may well identify areas where the development of co-operatives could well assist overall dairy development, along with the simultaneous enhancement of dairy farm households. It is likely that a model approach be taken, i.e. close study of a potential milk pocket should be undertaken to expand knowledge of such pockets.

Project Phasing

Some of the projects described above are dependent on lessons gained in the course of other program, notably the model farm project. In addition, Dairy Pakistan needs to build institutional capability in order to successfully lead these programs. Therefore, phasing of projects will be required. The initial period covered by this phasing is three years, as this is the extent of funding presently committed to Dairy Pakistan. The view of Dairy Pakistan on phasing is as follows:

TABLE 6-A (Project Phasing)

	2H06	1H07	2H07	1H08	2H08	1H09
Model Farm Program	Implementation					
Cooling Tank Program	Implementation					
Farmer Technical Training Program				Review how to disseminate best practice farm management lessons from Model Farm Program	Implementation	
Farm Management and Dairying Research Institute		Review of gaps and cost benefit analysis	If CBA supports establishment , achieve support from necessary stakeholders and funders	Construction begins	Staffing	Commencement of activities
Mobile Milk Collection Units		Detailed program design, working with funders	Secure funding	Implementation		
Review of Support Services Technical Training	Seek consensus for need for review	Undertake review and propose any recommendations	Work with technical assistance providers to implement			
Farm Input Stores				Review lessons from Model Farm Program, earlier if possible/desirable	Design detailed program, working with potential funders	Implement if funding is available
Livestock Housing	Work with technical assistance providers	Project Complete				
Biogas		Identify possible technical assistance providers	Cost Benefit Analysis	Design program if CBA is favorable	Secure funding	Implement
Indigenous Breed Program	Design Program, especially determining which institution should undertake this role		Secure funding	Implement		
The Value of Buffalo Milk				Research on Selected Model Farms		
Animal Imports	Review demand	Implement				
Milk Pockets	Research economics	Secure funding	Implement			

CHAPTER 7

7.0 Business Model Program

7.1 Creation of Rural Entrepreneurs

Expensive items of farm machinery which are required on an occasional basis may be too costly for all but the largest farms. In other countries which focus on low cost farming and where government subsidies tend not to be available, over time a system has developed of local area regional service providers, who own these expensive items and contract their service to a reasonable numbers of farmers. In this manner, the cost of a large asset is spread over many farms, bringing mechanization to a larger number of farms than would otherwise be the case. In addition, often specialized skills can be developed more easily, owing to the smaller number people who will be engaged in the use of this equipment. Thus in New Zealand and Australia, local area entrepreneurs (generally known as “contractors”) own grass cutting and hay baling equipment, and bring these items to individual farms at agreed times and for agreed rates. The contractor does not rent the equipment, rather he provides the full service, including using the equipment on the farm.

It is proposed that Dairy Pakistan develop a program involving donor agencies to develop a business model along these lines. It is proposed that model businesses be established, whose functions can be transferred to other entrepreneurs upon proving successful under local conditions. Close supervision will be needed in the first instance, to ensure proper training in the use of specialized equipment, the entrepreneur learns how to market his services, matters such as insurance for any damage to fences, for example, are handled in a professional manner, and perhaps most importantly, a pattern of setting rates which are fair to all parties are set.

With respect to the important topic of maintenance of reasonably sophisticated equipment, it may be necessary to build upon the creation of regional entrepreneurs at the “contracting” level, with another hierarchy, that of entrepreneurs operating specialist maintenance centres – clearly, the latter level will service a number of contractors. The beginnings of a network of regional businesses can be identified.

7.2 Finance and the Middleman

Analysis of the operation of milk collection centres demonstrates that even if (a) a milk collection centre operated by a processor pays more for milk than a middleman and (b) the farm is reasonably close to a collection centre, then the farmer will not necessarily sell his milk to the collection centre. There may be several reasons for this:

- Farmers have a lengthy relationship with middlemen, and perhaps they are perceived as being more reliable than other participants in the industry (or at least other program that have tried to convince them to supply to alternatives to their middleman).
- If the perception that most adulteration occurs by some middlemen is not 100% accurate, and some farmers are doing this also, then such farmers will tend to supply middlemen as the risks of detection are likely to be considerably lower.
- Middlemen also provide credit to the farmers.

It is considered that the third of these possibilities is the most likely reason that farmers continue to supply middlemen. It is a logical progression, therefore, that while program such as the establishment of more collection centres through the Cooling Tank program is a necessary condition to allow more milk to be handled through the formal sector and in more hygienic ways, this is not by itself sufficient to change present supply patterns in a major way. These collection centres need to be linked to the provision of alternative finance sources if they are to become a more real choice for farmers.

Dairy Pakistan will work with sources of finance to develop a business model under which alternative finance can be made available to farmers supplying milk to collection centres.

It noted that it is incumbent upon all processors, without exception, to treat suppliers fairly and ensure payment is made to them on time. If this is not achieved, then the link between middlemen and farmer will remain as strong.



CHAPTER 8

8.0 Cold Chain vs. Warm Chain

The prevalence of often very poor quality loose milk sold to consumers is of major concern.

Loose milk may be a health hazard, and it would be fair to say that typically more loose milk than packaged milk would suffer from adulteration. Many factors contribute to this prevalence of un-pasteurized milk:

- The strength of the dhodhis in milk collection (clearly, if processors collected all the milk, then there would be none available for loose milk sales).
- Traditional links between gawallas and consuming households.
- The absence of a cold-chain.
 - This at least in part reflects the difficulty of making investments in pasteurizing plants and cold chain profitable, when the competition is loose milk.
- The unfair advantages in terms of tax and adulteration enjoyed by the informal sector over the formal sector.
- A lack of awareness among consumers of the health risks of loose milk, offset by the practice of boiling milk prior to consumption.
 - This could be extended to include the observation that in general consumers probably are not aware of the extent to which adulteration is practiced, and that what is perceived as “the way milk should be” may be far from what good quality milk is when respected through the supply chain.
- The desire for cream line milk, in order that cream can be skimmed for separate household use.
- The cost of packaging used in present warm chain presentations, which tends to reduce the available consumer pool which can afford better quality packaged milk.

8.1 Pasteurization Law and Other Approaches

Several approaches may be capable of influencing the present situation:

- Media campaigns highlighting the risks of loose milk.
- Efforts described elsewhere to provide alternatives to farmers to selling milk to middlemen.
- Regulatory controls, such as a Pasteurization Law, requiring all milk sold to consumers in Pakistan to be pasteurized.
- Introduction of low cost packaging.
 - This implies offering pasteurized milk rather than UHT, which in turn requires the establishment of cold chain distribution.
 - Very significant investment in pasteurization equipment would be required.

Achieving progress in this complex matter is not easy. A discussion on suggested methodologies follows,

a) Firstly, it is noted that the entire processing capacity of the formal dairy sector is less than the milk sold in Lahore each day, without taking the rest of the nation into account. Very large investment would be required before pasteurized milk could be supplied to a large proportion of the population of Pakistan. The main investment budget would include setting up pasteurization plants and cold chains distribution. A breakdown of likely costs for such a project would be as follows:

	Plant & Needs	Rs. Million
	Plant producing 25000 litres	
1.	Installation Costs	1.5
2.	Chilling	0.5
3.	Generator	0.4
4.	Electricity Installation	0.2
5.	Storage Tank	1.2
6.	Pasteurization and Packaging Machinery	13.0
7.	Boiler	0.5
8.	Chemical System	0.2
9.	Milk Collection Tank	0.6
10.	Milk Refrigerator Van	0.7
12.	Miscellaneous Land/building costs	4.0
13.	Pre-Operating Costs	0.25
Total Costs		23.05

The total cost for a minimum 50 basic pasteurization plants is estimated at Rs1.153 billion. With an average consumption rate of 250 grams, it is estimated that one plant capable of processing 25,000 litres per day will meet the needs of about 100,000 consumers. Assuming if an average sales territory for the pasteurized milk plant has 100 shops, it would mean that for every plant the projected cost of shop refrigerators would be Rs.3 million. In other words the total cost per plant along with the cold chain will amount to Rs. 26.05 million. Assuming that pasteurization law was to be implemented in ten mid-level cities of Pakistan, we estimate a minimum number of 50 pasteurization plants. The total cost for a minimum 50 plants plus related in-store refrigeration is estimated at Rs. 1.303 billion (approximately).

b) Secondly, industry participants who have studied the matter consider that pasteurized milk tends to be around Rs5/litre more expensive than loose milk. This is sufficient to affect consumer demand.

c) Thirdly, media campaigns are expensive and would take a long time to influence consumer behaviour to any marked extent.

d) Fourthly, reliance upon regulatory measures may not be as effective as hoped. Even the most optimistic commentator would agree that not all laws and regulations are observed to the extent that the promulgating authority hoped.

Given the latter point, it is concluded that if superior quality milk is to be provided to a good proportion of consumers, then an approach based solely on regulation (namely a Minimum Pasteurization Law) is unlikely to be effective. A mixture of market and product development, in conjunction with regulation is likely to be needed.

8.2 Integrated approach

Rather than sole reliance on a regulatory approach, we return to our theme of integration – the key is to integrate as many actions as possible if progress is to be made in the supply of pasteurized milk to a good proportion of the Pakistan population. It is considered that the guiding principles of a program to build a market for pasteurized milk should include the following:

- Identification of appropriate technology and logistical solutions, which can provide pasteurized milk at a price close to that loose milk.

- Recognition that if consumers do not wish to pay additional for better quality milk, this is a marketing issue, and that attempting to reduce consumer choice by trying to regulate loose milk out of existence may not be successful.
- Supporting regulation.

This chapter proceeds to review a more market and product development approach, while the regulatory approach is discussed in more detail in Chapter 10.

It is recommended that Dairy Pakistan review with stakeholders how pasteurized milk can be successfully introduced. Some logistical solutions, based on a concept used for many years in India, warrant study. Perhaps trials based on specific localities will be required.



In India, most notably in Delhi, pasteurized milk is sold in bulk, through outlets operated mainly by Mother Dairy. This scheme has been operational for many years, and was launched with the support of India's National Dairy Development Board. Milk is pasteurized at dairy factories, then chilled and pumped into tankers for transport to the bulk vending outlets. At the outlet, the milk is pumped into tanks from which consumers draw milk. Consumers bring their own vessels for carrying the milk back to their homes. From the consumer perspective, this system delivers good quality pasteurized milk at an affordable price.

Tanker for transport of chilled, pasteurized milk to bulk vending outlets (Delhi).



Chilled, pasteurized milk being pumped into a tank at the outlet.



A token-operated bulk vending filling system.

A variant of the outlet based approach comes with the use of motorcycle or bicycle based salespeople, who sell pasteurized milk from smaller, mobile tanks.



Bicycle mounted tank for distribution of pasteurized milk, Delhi.

The favorable price of bulk vended milk is largely achieved owing to the lack of expensive packaging material. Dairy Pakistan will lead a study of the economics and marketing aspects of such a concept in the Pakistani context.

One matter, which needs to be considered, is how to control adulteration post the pasteurization of the bulk milk and the departure of the tanker from the dairy factory. The bulk nature of the product means that physically adulterants could be added, and therefore management systems need to be in place to deter this.

The integration of a pasteurized milk program with other Dairy Pakistan program should be noted:

- (a) Pasteurization of milk can only be done by the formal sector; hence the Cooling Tank and Mobile Milk Collector Program boost the opportunity for the development of a pasteurized milk sector. In turn, these programs depend on the microfinance initiative to achieve maximum success.
- (b) The Milk Pocket Development Program should provide an opportunity to market pasteurized milk.
- (c) Raw milk of improved quality will be needed if the less rigorous heat treatment of pasteurization (compared with UHT) is to provide a satisfactory product. The Model Farm, Cooling Tank, Milk Pocket Development and Mobile Milk Collection program all assist the goal of improved milk quality.

The large capital investment associated with the introduction of pasteurized milk should be noted. It should also be recognized that a reasonable quality pasteurized milk will only be achieved if the quality of the raw milk supplied to the plant is satisfactory, i.e. much better than what is supplied to processing plants today.

CHAPTER 9

Animal Numbers

9.0 Increasing the National Herd Size and Genetic Potential Through Animal Imports and a Dedicated Breeding Farm

Imports of cows may be desirable for a number of reasons:

1. Pre-feasibility studies conducted by Dairy Pakistan suggest that imported cows may prove to be the most profitable animals for dairy farming. This theoretical analysis needs to be tested under local conditions of disease prevalence and heat stress.
2. Boosting the national herd with higher yielding animal will assist the drive to increase milk production.
3. Importing animals can improve the genetic pool available to the industry.
4. Importing animals can provide a useful means to kick start milk production undertaken as a result of new investment in the industry.

The role that Dairy Pakistan could play in animal imports is not yet clear. Nevertheless, it is apparent that importing in larger (sea freight) numbers will be more economical than if they are imported in smaller (air freight) numbers. At the very least, a co-ordination role is needed in order to gain the scale associated with sea freight.

The import of a reasonably large (1,400) number of cows at one time results in the need for a staging/quarantine area, where cows can be cared for very well until adapted to local conditions. Such a staging area may well provide an opportunity for training in the care of more sensitive animals.

One of the features of the present situation in Pakistan, driven perhaps by an overall shortage of milk relative to demand, is that the best animals are sought by farmers in the milk colony of Karachi. Aided by a higher price for milk than found in other locations, such farmers are able to out-bid others for the better animals. Ultimately, these superior animals and their offspring are used for meat, after their highest yielding seasons are behind them. Hence these superior genetics tend to be lost to the national herd at a greater rate than the less desirable genetics of animals not purchased for the milk colony. Imports of animals may negate this trend to some extent. The longer term solution to this matter is of course greater overall milk production and in particular the establishment of a co-coordinated approach to breeding policies.

One role for Dairy Pakistan in this program would be to identify the most economic source of animal imports (most economic meaning not only cost of animal purchase but also performance under local conditions and the envisaged low cost dairying model), and to co-ordinate with suppliers from the selected origins.

Assistance will be sought from donor countries, especially those supplying animals under commercial conditions, on the establishment of staging areas and the use of such an area for training purposes.

A dual track strategy should be followed with respect to establishing commercial breeding farms. Somewhat differently from the case of most breeding initiatives, this would focus more on achieving the supply of a reasonable number of animals with above average traits (most breeders focus on a smaller number of very high quality animals). The traits selected for at this commercial farm should be those, which support low cost dairying under Pakistani conditions.

CHAPTER 10

10.0 Adulteration and Hygiene Issues for Milk and Proposal for Pasteurization Law

10.1 Summary:

A Dairy Food Safety Standards & Pasteurization Law is recommended to be introduced as amendments to 1965 Pure Food Rules Pakistan; the new amendments will give confidence to the players of the supply chain in the benefits of getting registered, receiving requisite license for dairy facilitation activities and complying with a mandatory Milk Source Tracking Label. The proposed amendment will promote a premium-driven quality route.

10.2 Adulteration and Hygiene Issues

High rates of adulteration and severely unhygienic practices need to be regulated, premium for quality needs to be addressed: Adulteration of milk is one of the most serious issues that the dairy sector of Pakistan is today facing, causing not only major economic losses for the processing industry, but also major health risks for the consumers. Due to the spread of small holding farmers and consequent supply chain complexities, milk handling processes in the traditional system are extremely unhygienic and there is no enforcement of standards. This results in poor quality products. In order to keep milk temporarily fresh, middlemen commonly add ice to the milk, which results in dilution of milk solids by up to 30% and often microbiological contamination from poor quality water being used in the manufacture of ice. Compounding the problem, middlemen attempt to counter the dilution by adding vegetable oil, whey powder and other ingredients to extend the solid content of the milk. Antibiotics and peroxide are also often used as preservatives.

Regulation can assist the control of adulteration but the root cause of such adulteration is lack of developed milk collection system and the processing industry. Only a small percentage of the milk is properly collected.

10.3 Strict compliance for quality and implementation of pasteurization laws: The dhodhis or the middlemen of the milk supply chain carry out a successive adulteration process; in the form of water addition, ice, vegetable oil, air exposure etc in order to increase their margins and preserve the milk. There is no punishment or incentive system in milk quality hence the dhodhi is mostly unaccountable. The regulatory structure currently in place in the milk sector is archaic and quite inadequate for modern times while the ability of government to implement these regulations is also limited. We recommend the implementation of Dairy Food Safety Standards, and the implementation of pasteurization laws to ensure a White Revolution of quality milk, details of which are provided below.

10.4 Dairy Quality Standardization and Monitoring Mechanism

Pakistan does not enjoy a high level of food safety; it faces the challenge of continually improving food safety and reducing food-borne illness. Globally, food-borne illness is a growing public health problem because of changes in the way food is produced and manufactured, changes in consumer requirements. The Government of Pakistan through the Ministry of Health and its relevant Ministries in the Provinces should approach the management of food safety seriously. Governments have agreed that food safety should be addressed throughout the food supply chain (i.e. from paddock-to-plate). This approach aims to maintain or improve public health and safety and ensure that consumers continue to have the highest confidence in the safety of the food they consume, without imposing undue costs on industry. The dairy industry across the world is a highly regulated sector and practices high levels of food safety management. At the moment, Pakistan does not have food safety management systems or rules under Food Rules 1965. The Food Rules 1965 need to be revised under the light of newly proposed pasteurization law and Dairy Food safety standards.

10.5 Dairy Food Safety Standards and Pasteurization Laws:

Dairy Food Safety Standards & Pasteurization Laws will be introduced as amendments to 1965 Food Laws of Pakistan (Provincial) or through PSQCA (Pakistan Standards and Quality Control Authority) at a federal level. The new amendments in 1965 food rules or adoption by PSQCA, will give confidence to the players of the supply chain in the benefits of getting registered, receiving requisite license for dairy facilitation activities and complying with a mandatory *Milk Source Tracking Label*. The proposed amendment will promote a premium-driven quality route.

Dairy products are a rich and convenient source of nutrients for people. The purpose of a Food Safety Standard is to provide guidance to ensure the safety and suitability of milk and milk products. All foods have the potential to cause food borne illness, and milk and milk products are no exception; indeed owing to the liquid nature of milk and its suitability as food for microbes as well as humans, the risks to the degradation of milk are even greater than for many products. Moreover, the milking procedure, subsequent pooling and the storage of milk carry the risks of further contamination from man or the environment or growth of inherent pathogens. Potential also exists for the contamination of milk with residues of veterinary drugs, pesticides and other chemical contaminants.

In light of the prevalent conditions of low quality and adulteration, there is imminent need for a regulation on dairy food safety and a law discouraging loose un-pasteurized milk.

A proposed draft of Food Safety Laws is contained in Annexure A.

CHAPTER 11

Conclusion

11.0 The White Revolution (Dhoodh-Darya) will deliver real benefits:

This paper has identified a number of programs, which will drive the development of the dairy industry of Pakistan; no doubt, as development proceeds, more will be added to the list. Key programs discussed through this paper are as follows:

Program	Nature of the Program	Impacts
Cooling Tank Program	Install a large number of cooling tanks through dairying areas.	Make cooling tanks more available, such that more farmers can access them and milk quality is preserved.
Model Farm Program	Introduce improved farm management techniques to a number of farms across Pakistan, supported by the necessary equipment (provided by soft loans and grants).	More profitable milk production, leading to more investment and greater production. Prove the new management techniques. Use model farms to demonstrate to a wider audience the improved systems.
Farmer Technical Training	Disseminate the lessons of the model farms.	Improved systems across a large number of farms.
Farm Management and Dairying Research Institute	Establish a research institute focused on practical issues facing farmers across Pakistan.	Improved genetics, improved fodder production, localized solutions.
Mobile Milk Collection Units	Provide assistance to establish a large number of milk collectors able to access farms not presently linked to the formal sector, and get milk to cooling centres quicker.	Better quality milk, improved contact with the market for more remote farmers, and establishment of a useful number of rural entrepreneurs.
Support Services Technical (AHW) Training	Review present education for support services	Broader educated support services, able to assist farmers across a wider range of issues.
Farm Input Stores	Establishment of farm input stores	Better quality inputs available at more reasonable costs
Livestock Housing	Shed design	Sheds designed for Pakistan conditions, using the most effective materials available locally.
Biogas	Review the economics of producing biogas from animal dung	Utilization of a material which presently can be a significant source of pollution, while improving the availability of energy
Indigenous Breeds	Protect the genetics of indigenous breeds	Ensure the qualities of indigenous breeds are retained for the future, and for enhancement by selection techniques
Value of Buffalo Milk	Understand the economics of buffalo milk production versus cows.	Ensure production and marketing decisions are made on the basis of fact.
Animal Imports	Improve herd numbers and genetic potential of the national herd	Superior milk production, chiefly for commercial farms.
Milk Pockets	Research the economics of developing milk pockets, including cooling and pasteurization in remote areas	Linkage to the market for farmers not connected with the formal sector, co-operative development where useful, improved milk supply to undersupplied regional markets.
Business Model Programmes	Drive the creation of rural entrepreneurs for contracting	More efficient use of capital, new jobs in rural areas.
Bulk Vending of Pasteurized Milk	Provide good quality milk at a reasonable price to the mass of the population	Meet the Needs of "the 95%"

The paper has also highlighted the role that finance may play in the relationship between farmers and middlemen, and it is important that alignment between the formal sector and micro-finance provides is achieved, such that the formal sector can match the service provide by informal market participants.

The Government of Pakistan, along with international providers of finance and development aid, recognize that Pakistan's dairy sector is capable of making an important contribution to national and especially rural development. The industry has many important backers willing to assist the growth and improvement of an industry, which can play a vital role for Pakistan. Dairy Pakistan and its members remain its strongest supporters.

This paper identifies that a successful dairy sector requires numerous contributing elements to be in place. It must be appreciated that boosting one or two of these elements without enhancing others is unlikely to be effective. For example, increasing animal numbers but not providing farmers with the management tools to maintain animal health and feed provision will not provide anything other than temporary benefit. The support of the Government of Pakistan in the establishment of Dairy Pakistan indicates that the Government is aware of both the need for and benefits arising from development of a dairy industry of better overall effectiveness and quality. With so much support and desire from a range of institutions to drive development, it is perhaps useful to consider which of the many areas needing improvement should be the responsibility of which institution. It is also useful to note that the Government has established Dairy Pakistan as a public-private partnership, in recognition that the public sector can do some things best, while the private sector may do other things better. Clearly, only Government can provide the necessary infrastructure to rural Pakistan. It is considered, therefore, that the priority for direct Government action should be the provision of infrastructure such as reliable electricity, and adequate roads and water supply. Similarly, only Government can provide the necessary regulations pertaining to food standards and hygiene. Therefore, another priority is for Government, working with industry, to upgrade food standards to reflect modern practices. Again, only Government can set educational standards and be the chief financial supporter of educational facilities. It is considered that aspects of education pertaining to dairying could be reviewed and perhaps modernized.

Government provides key support for many other initiatives: at some stage it may be useful for Government and other participants to determine how this support is delivered to ensure the maximum benefit. It is considered that the public-private model of Dairy Pakistan may prove to be an important conduit for successful implementation of development support to the dairy industry.

The importance of this discussion lies in the need to develop a number of elements at similar times: there is no point in supplying cooling tanks to farmers without reliable electricity supplies; there is no point in donating animals to farmers who cannot or do not know how to feed them appropriately; there is reduced benefit in developing a cluster of efficient and profitable dairy farms in an area with roads which are impassable during the rainy season. The list of combinations such as these could go on considerably, but the point is clear – an integrated approach requiring development across numerous fronts is essential. Some of the important fronts have been highlighted in this paper; it is clear that any successful and profitable dairy industry requires a myriad of contributing elements. A non-exhaustive list of these may be as follows:

- Secure land tenure.
 - Availability of appropriate feed and water.
 - A rural road network so that milk can be collected from sometimes remote locations.
 - A reliable electricity supply.
 - Farm management techniques appropriate to local conditions, dispersed through the farming community.
 - A holistic approach to animal health.
 - A means of achieving genetic gain.
 - Credit formation.
-
-

- The ability to grow animal numbers.
- A good quality and efficient processing sector.
- Efficient logistics/distribution, including a cold chain from farm to consumer, or from farm to processor in the case of UHT products.
- An education system which delivers a stream of willing and capable human resources, learned in farm management and veterinary science.
- Efficient markets.
- Appropriate quality standards, which are adhered to because all participants want this, and understand the importance of quality to the long-term health of the industry.

It is generally accepted that Pakistan demonstrates insufficient of these requirements. Despite this, Pakistan has the world's 4th largest milk production, estimated to reach 33 million tones of milk per year. This is a great achievement under difficult conditions. Much effort and determination will be required to achieve the integration of well-meant programs, which are otherwise doomed to deliver less than their potential.

It is also important to note that development of the dairy industry is a journey of many small steps. Cognizance must be given to the present state of the industry and the consumer habits. It is not possible to leap to developed world dairying – the basics must be focused on first, and then a logical progression followed.

The White Revolution is an opportunity to deliver change and modernization to the dairy industry, and therefore unlock the potential of the dairy industry of Pakistan. This White Paper is intended to illustrate how the combination of many programs can drive development of the dairy industry. Successful development will benefit the many millions of farmers, and the even more millions of milk consumers.



ANNEXURE- A

Proposed Pasteurization Law and its background

Background:

At the heart of the debate between consumption of raw milk and pasteurization laws are the two divergent view points, those who want to shift to a predominantly cold-chain, pasteurized milk system and those who seek to improve the current 'warm-chain' raw-milk system that accounts for 91.2% of all marketed milk. The questions surrounding the two main approaches have implications for geographically and economically marginal producers, the large processors of pasteurized milk, informal marketing agents, unlicensed milk retailers and mobile milkmen, the relative rewards for smallholder producers, processors and informal distributors and lastly the price and availability of 'quality' milk to consumers.

Those who favor a cold-chain (*to keep the milk at 4 to 6c during whole supply chain*) industry with pasteurized milk, characterize the current situation of raw milk production as chaotic distribution; with stagnant production and demand; leading to poor returns to producers and continued use of raw milk that carries considerable health risks for consumers through poor handling and adulteration.

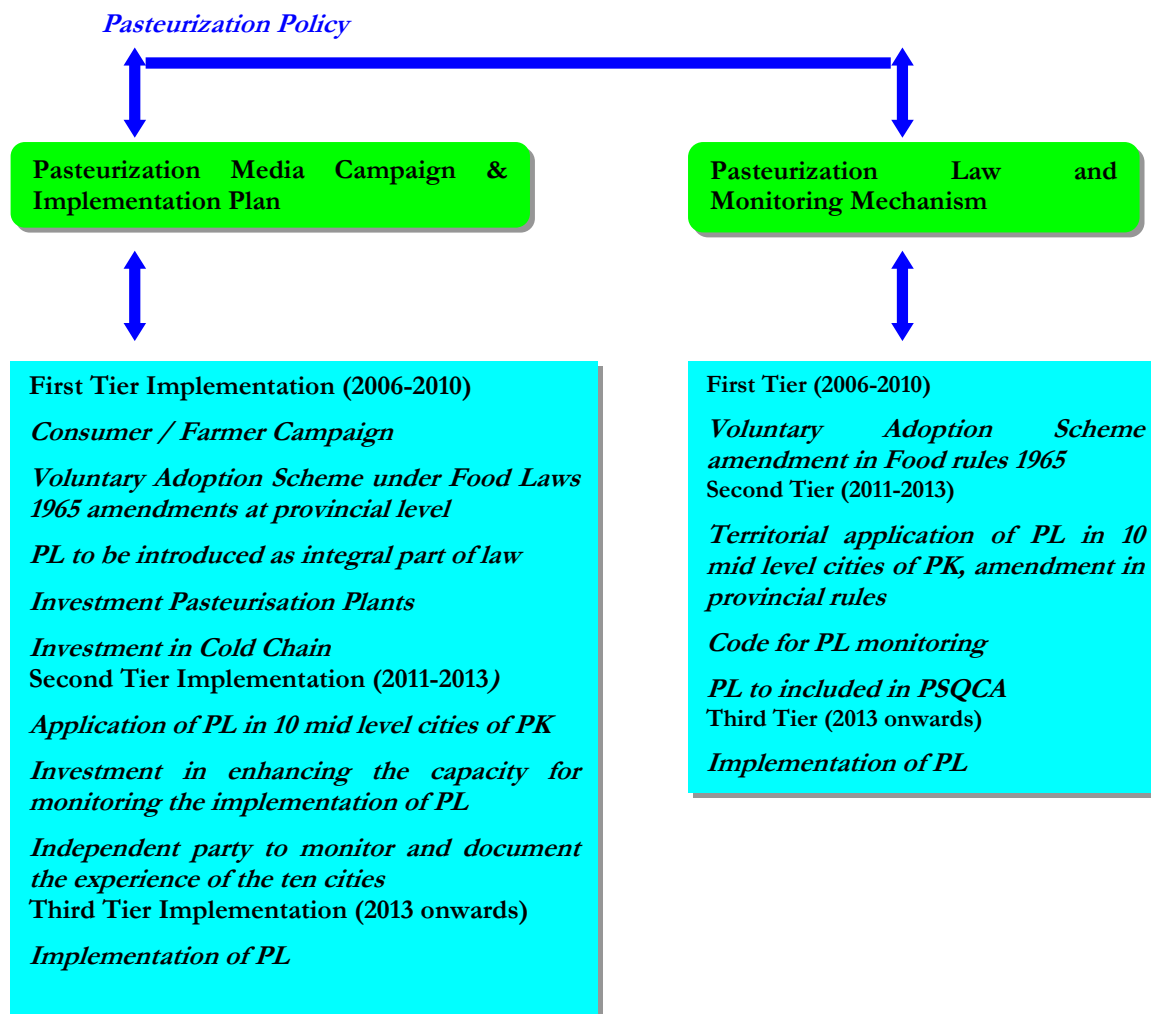
However, those who support improvements to the informal warm-chain system as opposed to pasteurization cold chain system maintain that the investment needed for a cold chain in a country like Pakistan is enormous and the poor level of monitoring mechanism carried out through very limited resource pool of food inspectors does not allow the implementation of pasteurization laws. The supporters of the warm chain claim that the efficient, quick and relatively low cost system of getting milk from producer to consumer should not be dismantled. Dairy marketing policies in developing countries have often relied on standards derived from industrialized countries where large-scale production systems, cold chain pathways, and milk pasteurization are key features. However, some of these standards may be inappropriate in developing countries, owing to climate, poor infrastructure, taste factors and large distances. In Pakistan, as in most developing countries, consumers prefer unpasteurized milk and are often not willing to pay the extra costs associated with packaging and processing. The almost universal practice of boiling milk destroys harmful disease pathogens and largely eliminates public health risks.

In order to propose a minimum pasteurization legal regime in Pakistan it is important to consider the historical perspective of such laws internationally. In the US activities in the area of milk sanitation began in 1924 with studies on the role of milk in the spread of disease. A model regulation known as the Standard Milk Ordinance for voluntary adoption by State and Local Milk Control Agencies was promulgated. An accompanying Code was published in 1927, which provided detailed monitoring mechanism and administrative details as to satisfactory compliance. This model milk regulation has been formalized gradually since 1924 and has recently in 2003 finalized as the Grade "A" Pasteurized Milk Ordinance. Similarly, in New Zealand work started in 1911 vide Health Act 1911, followed by various food safety laws; Food Act 1981, Dairy industry Act 1992, Health (food hygiene) Regulations 1993, Dairy industry Act 1994, Food production (Dairy Food safety scheme) Regulations 1999, Food production (safety) Act 2000 & Food production (safety) Regulations 2002 (SFQ) and Food Act 2003. In India various food law Acts contain provisions on pasteurization.

It may be noted that at an average it took about 30-40 years for each country to introduce formal pasteurization provisions in their Food Laws. As such there are no separate pasteurization laws in legal regimes except for New Zealand that has a complete law on Grade A milk with a local monitoring system for each State. In India pasteurization has worked well in some areas but it is a result of government injecting billions of rupees into the industry. In China, there is no minimum pasteurization

law for raw milk at farm or middleman level. Milk is brought to the industry and pasteurized/processed/UHT. In short while in most countries sale of loose raw milk is prohibited, however, there is no pasteurization law as such.

In the context of Pakistan a pasteurization law should be applied in stages. We propose the following three-pronged methodology for the application of such standards in the milk supply chain of the country:



Along with the Media Campaign a study will be commissioned to design a detailed implementation plan for pasteurization laws in Pakistan. The detailed study should be carried out within the timeframe and parameters given in the table below:

Pasteurisation Law Implementation Plan

2006: A detailed study on Pasteurisation Implementation Plan should be commissioned as the first step forward. While the study is still being carried out provisions on pasteurisation laws should be proposed in the West Pakistan Pure Food Rules, 1965, provincial amendments. This should be proposed initially based on the pattern of Voluntary Adoption, in the second stage ten mid level cities of Lahore to be included and lastly the law to be applied to the whole of country. Another study should be commissioned on the investment required for Pasteurisation plants all over the country along with the ancillary cold chain. By end 2006 the proposed Dhoodh Darya Media Campaign on consumer and farmer education should be launched. The recommendations of the two studies commissioned should be reviewed.

2007-2010: Based on the recommendations provided by the two above-mentioned studies, a coordinated effort by the Federal Government, the Provincial government and the private sector should be made to initiate the investment process both in setting up pasteurization plants with interested entrepreneurs and in providing the requisite cold chain concentrating on the ten mid level cities of Pakistan namely: Sialkot, Kasur, Okara, Pakpattan, Chiniot, Jaranwala, Hyderabad, Sukkhar and --

2011-2013: By amending the West Pakistan Pure Food Rules, 1965, to include pasteurisation provisions, the law will become a good pilot project to test the implementation of such a law. Union and District level government will be engaged for the smooth implementation of the law both for pasteurised milk producers and the consumers. In addition to the PL a Code on Monitoring Mechanism for such a law will be designed and implemented in the ten cities. An independent monitors team will be appointed to document and monitor the implementation of pasteurisation law in the ten cities. A report on the outcome of the experience will be submitted in December 2013.

2014: Under the guidance of the report submitted in December 2013 on the experience of the implementation of pasteurisation law will be reviewed. Based on the outcome and the experience an independent and complete pasteurisation law bill will be designed for implementation.

2015: Implementation of Pasteurization Law 2015

However, as noted previously, huge investment is required for the implementation of the pasteurization laws in Pakistan. The main investment budget would include setting up pasteurization plants and cold chains including developing the capacity of the Government for monitoring.

Pasteurization law

A brief outline of a pasteurization law follows:

Pasteurization: The terms Pasteurization, 'Pasteurized' and their grammatical variations shall be taken to refer to the Process of heating every particle of milk or milk products to at least 63°C and holding it at such temperature continuously for at least 30 minutes (Batch pasteurization) or heating it to at least 72 °C and holding it at such temperatures for at least 15 seconds (for continuous flow pasteurization) or any other approved temperature-time combination equivalent thereto, that will serve to give a negative phosphates test, followed immediately by cooling to a temperature of not more than 4°C.

Territorial application: For the initial five years the implementation of the law will be restricted to the following ten cities:

Punjab

Sialkot (a prosperous business hub, with many foreign visitors), Kasur (contiguity to Lahore)

Okara, Pakpattan, Chiniot,

Sindh

Sukkhur, Hyderabad

License:

Every milk collector, milk distributor, bulk milk hauler / sampler, milk tank truck, milk transportation company and each milk plant, receiving station, transfer station milk tank truck cleaning facility operator shall hold a valid license. The license for a milk tank truck(s) may be issued to the milk transportation company. It shall be unlawful for any person who does not possess a license from the Regulatory Authority to manufacture bring into, send into, or receive into for sale, or offer for sale therein or to have in storage any milk or milk products defined in this Act. Licenses shall not be transferable with respect to persons and/or locations.

Duration of License:

A licensee shall unless sooner suspended or cancelled will be enforce for such period as the Government may prescribe; provided that if an application for a fresh license is made before the expiry of the period of validity of the license, the license shall continue to be in force until orders are passed on the application.

Renewal of License:

The Regulatory Authority will make the renewal of the License after the lapse of the period of the License on application by the License holder for the period required by the License holder but not exceeding 2 years on the payment prescribed by the Regulatory Authority.

Suspension of License:

The Regulatory Authority shall suspend such license, whenever it has reason to believe that a public health hazard exists; or whenever the license holder has violated any of the requirements of this *Act*; or the licensee has ceased to carry on business of the nature specified in the license, or whenever the applicant or licensee as the case may be has been convicted of an offence in relation to the requirement specified by the Act, or whenever the license holder has interfered with the Regulatory Authority in the performance of its duties. Provided, that the Regulatory Authority shall, in all cases, except where the milk or milk product involved creates, or appears to create, an imminent hazard to the public health; or in any case of a willful refusal to license authorized inspection/audit, serve upon the holder a written notice of intent to suspend license.

Reinstatement of Licenses:

Any license holder whose license has been suspended may make written application for the reinstatement of his license.

- i. If the suspension is due to a violation of any of **bacterial, chemical contaminant/adulteration or deviation in cooling temperature** standards the concerned Body, within one week after the **receipt** of notification for reinstatement of license, shall issue a temporary license after inspecting the conditions responsible for the violation have been corrected.

Milk tracing label: Labeling of packed pasteurized milk would be mandatory; highlighting **producers' name, address, packing date and expiry date.**

Shelf life:

Must be max 4 days from the date of packing

Monitoring:

- i. An inspector shall at all reasonable hours, have access to all public or private sales room, warehouses, factories, stores, where milk is offered for sale or deposited for the purpose of sale and seize or procure samples.
- ii. Seize or procure samples of milk at the place of delivery or other place during transit, or upon the premises of elsewhere in the possession of any person for the purpose of carriage.
- iii. The inspector shall inspect frequently, as may be prescribed by the Food Authority or the Regulatory Authority, all establishment licensed for the manufacture, storage, or sale of an article of milk within the area assigned to him.
- iv. To satisfy himself that the conditions of the licenses are being observed.
- v. To maintain a record of inspection made and action taken by him in performance of his duties.
- vi. To make such inquiries and inspections as may be necessary to detect the manufacture, storage or sale of milk in contravention of the law.

Appointment of inspectors:

Government may appoint inspectors in respect of milk and milk products, and an inspector so appointed shall have jurisdiction in such area as Government may direct, provided that health officer of local authority and such officers in service of the Government, as Government may by notification in the Official Gazette specify shall be ex-officio inspectors in respect of all food within the area under their respective jurisdiction. The existing food inspector appointed under Pure Food Ordinance 1960, shall continue to exercise the power to file a complaint for contravention or breach of any of the provision of this Act. Section 36 of the Pure Food Rules 1965, regarding the duty of the Food Authority to employ one inspector for every 10,000 of population or a part thereof should be amended to the effect that there should be one food inspector for every 3000 population for effective implementation of pasteurization laws.

Eligibility of Inspector:

No person shall be appointed to be an inspector unless he:

- (i) In case inspector holds a suitable qualification in food science or related fields.
- (ii) Nothing in this Act shall affect the appointment of inspectors made before coming into force of this Act.

Special Conditions for the Manufacture of Pasteurised Milk:

- (i) **The milk has been retained at a temperature not less than 72c for 15 seconds (for continuous flow pasteurization) or at 63c for 30 minutes (batch pasteurization) and has been cooled to a temperature of not more than 4c in a plant approved for the purpose.**
- (ii) **The milk has been retained at 4 to 6c temperature until delivery to the consumer.**
- (iii) The milk shows efficient pasteurization as evidenced by satisfactory negative phosphates test.
- (iv) That the milk does not show a coliform count exceeding 10 per milliliter, at any time after pasteurization and before delivery to the consumer.

Special Provision for Milk and Dairy Produce:

No person shall offer or keep in possession for sale or deliver for sale or supply to any person:

- i. Impure or unwholesome milk drawn from animals affected with any disease of livestock whether contagious, infections or otherwise capable of causing the milk to become unwholesome.
- ii. Milk drawn from animals within 30 days before or 10 days after parturition.

Restrictions on the employment of persons suffering from infectious or contagious diseases:

- i. No person shall allow any person suffering from infectious or contagious disease.
- ii. To milk animals
- iii. Handle any vessel used for the reception of milk intended for sale.
- iv. To take part or assist in the business of dairyman, cow or buffalo keeper, or vendor of milk, or
- v. To be employed in dairy

Regulatory Authority:

There should be a body i.e. Regulatory Authority etc. who manages the matters in relation to issue or renewal of the Application for licenses. Monitor strictly the pasteurization laws.

Establishment of a Dairy Regulatory and Monitoring Authority DRA

An autonomous Body called the Dairy Regulatory Authority will be established. The Functions of the Authority would be to advise, guide and device policies for registration, certification, pasteurization law and food safety standards. In order to implement the Organized Milk Collection model and its ancillary registration and certification objectives a registration process of middlemen and dairy entrepreneurs is proposed. The Dairy regulatory and Monitoring Authority will carry out the registration process under a registration and certification law. The Kenyan Model given in below table is good way to approach the issue.

The Dairy registration and monitoring law will incentivize registration of the informal sector primarily middlemen. We recommend a voluntary registration for a period of three years, after which registration for all milk traders will be mandatory. The working rules of the dairy authority will inter alia include provisions for a Registrar, who will perform all duties designated to him by the authority. Key responsibilities of the registrar will be management of funds, property and business of the authority, administration, organization and control of staff of the authority; keep and maintain a register of.

- (i) Milk producers;
- (ii) Milk processors;
- (iii) Milk or milk products importer or exporter;
- (iv) Marketing agent;
- (v) Dairy inputs suppliers, manufacturers and importers
- (vi) Retailers.

TABLE

As the Kenyan dairy industry was liberalized and expanded rapidly over the past decade, strong pressure was exerted on the government to insist that all milk sold be pasteurised to ensure the safety of the nation's milk supply. That's where research made the difference for the poor. Data obtained over the years by the Smallholder Dairy Project disclosed that almost all milk in Kenya is boiled by households before being consumed, indicating that raw milk represents no substantial public health hazard. This reliable information helped establish small dairy producers and milk traders as successful and credible agents in the eye's of the country's dairy policymakers and regulators, who are now, in the words of the permanent secretary in the ministry of livestock, 'mainstreaming the raw milk market'. The new policies will, for example, allow Kenya's informal dairy workers to be licensed, and thus brought into the formal economy for the first time. That's good news for the country's estimated 1.8 million informal milk producers and sellers.

Note the huge opportunity for corruption inherent in this structure, and how similar regulations in India severely impeded the development of the dairy industry there. This aspect needs to be addressed with special focus during implementation and in continuity

The registrar will also publish periodically a register of persons, who would be provided incentives and issue certificate of registration in accordance with the provisions of the

Registration and Certification law. The regular registration and certification of the middlemen will be meticulously monitored and analyzed for future action by Dairy Pakistan.

Financing

Financing of the Dairy Regulatory and Monitoring Authority will be managed by money allotted by the Government for the purpose of the proposed law; all fees and other charges payable under this proposed law; such donations, grants and bequeaths as the authority may from time to time receive from stockholders or organizations; income derived from investments; proceeds derived from sale of assets; and contribution from fees collected on importation of milk and milk products; any other source of income identified by the authority and legally acquired.

Note:

“Dairy food safety standards” are attached as Annexure B

ANNEXURE-B
Dairy Safety Standards For Milks and Milk Products

Table of Contents

Sr #	Contents	Page #
1	Introduction	01
2	Objectives	01
3	Scope	01
4	Terms & Definitions	01
5	Relative roles of producers, manufacturers, distributors, retailers, transporters, consumers and Govt. authorities	04
6	Principals applying to the production, processing & handling of all milk & milk products	05
7	Hygiene at farm level	06
8	Handling, storage & transport of milk	08
9	Documentation & record keeping	11
10	Milk reception at factory	11
11	Sampling of milk	11
12	Control of food hazards	12
13	Establishment, design & facilities	13
14	Distribution of finished products	13
15	Establishment of shelf life	14
16	Microbiological & other specifications	14
17	Incoming of milk	14
18	Water	15
19	Incoming materials (other than milk) requirements	15
20	Establishment, maintenance & sanitation	15
21	Labeling of dairy products	16
22	Awareness about hygiene	16

DAIRY FOOD SAFETY STANDARDS (For Milk & Milk Products)

1. Introduction

Dairy products are a rich and convenient source of nutrients for customer / *consumers*. The purpose of this Food Safety Standard is to provide guidance to ensure the safety and suitability of milk and milk products to protect consumers' health and to facilitate trade. All foods have the potential to cause food borne illness, and milk and milk products are no exception as dairy animals may carry human pathogens. Such pathogens present in milk may increase the risk of causing food borne illness. Moreover, the milking procedure, subsequent pooling and the storage of milk carry the risks of further contamination from man or the environment or growth of inherent pathogens. Furthermore, the composition of many milk products makes them good media for the outgrowth of pathogenic microorganisms. Potential also exists for the contamination of milk with residues of veterinary drugs, pesticides and other chemical contaminants.

The purpose of this standard is to:

A General Dairy Food Safety Standards

Provide guidance in implementing the proper hygienic control of milk and milk products throughout the food chain for its suitability & safety to ensure public health when consumed.

B Analytical Techniques

Provide analytical techniques to be employed for milk and its products analysis.

2. Objective

The objective of this Standard is to apply the recommendations to the particular case of milk and milk products. It also provides guidance towards meeting the requirements contained in the Dairy Food Safety Standards.

3. Scope

This Standard applies to milk and its products for Production, storage, transportation, analysis, processing and handling of milk and milk products by farmers, dhodhies, middlemen, milk processors, distributors and retailers where applicable.

4. Terms & definitions

4.1 Raw Milk

This is the secretion from the mammary gland derived from milking of healthy Halal milch animals. It shall be free from colostrums.

4.2 Cow's MILK:

It shall be the milk obtained from one or more cows. It shall not contain less than 3.5% of milk fat, and not less than 8.5% of milk solids other than milk fat.

4.3 Buffalo's MILK

It shall be the milk obtained by one or more buffaloes. It shall contain not less than 5.0% of milk fat and not less than 9.0% of milk solids other than milk fat.

4.4 Goat's MILK

It shall be the milk obtained from one or more goats. It shall contain not less than 3.5% of milk fat and not less than 8.0% of milk solids other than milk fat.

4.5 Sheep's MILK

It shall be the milk obtained by one or more sheep. It shall contain not less than 6.0% of milk fat and not less than 9.0% of milk solids other than milk fat.

4.6 Camel's MILK

It shall be the milk obtained by one or more camels. It shall not contain less than 3.0% of milk fat naturally homogenized and not less than 10.0% of milk solids other than milk fat.

4.7 Standardized MILK

It means milk, standardized to contain not less than 12.4% of milk solids, including *not less than* 3.5% of milk fat provided that the term standardized refers to standardization of fat contents.

4.8 Homogenised MILK

Milk which is subjected to such temperature and pressure which will ensure breakup of the fat globules into much smaller particles & to such an extent that, after forty eight hours (to be stored at 4c) or for 6 hours at 20c of quiescent storage no visible cream separation occurs on milk.

4.9 Pasteurization

The terms Pasteurization, "Pasteurized" and their grammatical variations shall be taken to refer to the Process of heating every particle of milk or milk products to at least 63°C and holding it at such temperature continuously for at least 30 minutes or heating it to at least 72°C and holding it at such temperatures for at least 15 seconds or any other approved temperature time combination equivalent there to, that will serve to give a negative phosphatase test and cooled immediately to a temperature of not more than 20°C.

4.10 Sterilization

The term "Sterilization", "Sterilized" and their grammatical variations, shall be taken to the process of heating continuously every particle of milk to at least 100°C for *such* length of time sufficient to kill organisms present and contained for delivery in hermetically *sealed* containers. It also means heating milk "continuously" to a temperature of 115°C for 15 minutes or 145°C for 3 seconds, or equivalent approved temperature time combination to ensure preservation at room temperature, for a period of not less than 1.5 days from the date of manufacture, Sterilized milk shall show absence of albumin negative *by Turbidity test*.

4.11 UHT MILK

UHT stands for "Ultra Heat Treatment" also called long life milk. UHT treatment is normally in the range of 135 to 150 °C in combination with the appropriate holding times necessary to achieve commercial sterility.

4.12 Recombined/ Reconstituted MILK

Homogenized product prepared from milk fat, non-fat milk solids and water. It shall be pasteurized and shall conform

- | | |
|-----------------------------|----------------------------|
| b) Milk fat | not less than 3.5% |
| b) Milk solids | not fat not less than 8.9% |
| c) Phosphates activity test | negative |
| d) Turbidity | negative |
| e) Methylene Blue | negative |
| f) Colony Count/ ml | not more than 300, 000 |
| g) Coliform | < 10 |

4.13 Skimmed MILK / Low fat milk

Milk which after the extraction of milk fat by mechanical or other process contains such fat in quantity less than 3%. It shall contain not less than 9.0 percent of milk solids other than milk fat.

4.14 Condensed MILK

The fluid product resulting from the removal of a considerable portion of water from full cream milk, with or without sugar and include the articles commonly known as dried milk or milk powder. It shall conform to the following

- | | |
|------------------------------|---------------------|
| a) Milk fat | not less than 9.0% |
| b) Milk solids including fat | not less than 31.0% |

4.15 Condensed MILK (Sweetened)

The product obtained from halal milch animals or from standardized milk by the partial removal of water & after addition of sugar. The fat and / or protein content of the milk may have been adjusted only to comply with compositional requirements by the addition and / or withdrawal of milk constituents in such a way as not to alter the whey protein to casein ratio of the milk being adjusted. It shall conform to the following

- | | |
|-----------------|---------------------|
| a) Milk fat | not less than 9.0% |
| b) Total solids | not less than 31.0% |
-
-

- | | |
|------------------------|--------------------|
| c) Milk protein in SNF | not less than 34.0 |
| d) Titratable acidity | not more than 0.3% |
| e) Bacterial count/ gm | not more than 500 |
| f) Coliform | negative |

4.16 Condensed Skimmed MILK

A fluid product resulting from the removal of a considerable portion of the water from skimmed milk, with or without sugar. It shall conform to the following

- | | |
|----------------|--|
| a) Milk solids | not less than 26.0% in case of sweetened variety |
| b) Milk solids | not less than 20.0% in case of unsweetened variety |

4.17 Dried MILK / MILK Powder

Milk concentrated to the form of powder or solid by the removal of water. It shall conform to the following with allowed food additives

- | | |
|-------------------------|--|
| a) Milk fat | not less than 26.0% |
| b) Moisture | not more than 4.0% |
| c) Ash | not more than 7.0% |
| d) Titratable acidity | not more than 1.0% |
| e) Milk solids | not less than 95.0% |
| f) Solubility index | not less than 85.0% in case of roller dried milk |
| g) Solubility index | not less than 98.0% in case of spray dried milk |
| h) Bacterial count / gm | not more than 50,000 |
| i) Salmonella | Absent in 25 gms |

4.18 Milk Powder Vegetable Fat Based

- | | |
|-----------------------|---------------------|
| a) Vegetable fat | not less than 26.0% |
| b) Moisture | not more than 4.0% |
| c) Ash | not more than 7.0% |
| d) Titratable acidity | not more than 1.0% |
-
-

- | | |
|--------------------------------|---|
| e) <i>Milk solids</i> | <i>not less than 68.0%</i> |
| f) <i>Solubility index</i> | <i>not less than 85.0% in case of roller dried milk</i> |
| g) <i>Solubility index</i> | <i>not less than 98.0% in case of spray dried milk</i> |
| h) <i>Bacterial count / gm</i> | <i>not more than 50,000</i> |
| i) <i>Salmonella</i> | <i>Absent in 25 gms</i> |

4.19 Dried skimmed MILK / Non- fat dry MILK

It is separated milk concentrated to the form of powder or solid by the removal of water. It shall conform to the following with allowed food additives:

- | | |
|--------------------------------|---|
| a) <i>Fat</i> | <i>Less than 3%</i> |
| b) <i>Moisture</i> | <i>not more than 4.0%</i> |
| c) <i>Asb</i> | <i>not more than 9.0%</i> |
| d) <i>Titraable acidity</i> | <i>not more than 1.0%</i> |
| e) <i>Milk solids</i> | <i>not less than 96.0%</i> |
| f) <i>Solubility index</i> | <i>not less than 85.0% in case of roller dried</i>
<i>not less than 98.0% in case of spray dried</i> |
| g) <i>Bacterial Count / gm</i> | <i>not more than 50,000</i> |
| h) <i>Salmonella</i> | <i>Absence in 25 gms</i> |

4.20 "Liquid Tea Whitener"

Means with Min 6.5% milk fat or vegetable fat, Min 3% Milk solids (SNF), and other permitted additives.

4.21 "Powder Tea Whitener"

Means with Min 15% milk fat or vegetable fat, Min 30% Milk solids (SNF), and other permitted additives.

4.22 Fermented MILK

A product manufactured by the fermentation of milk, with or without compositional modification by the suitable microorganisms and resulting in reduction of pH with or without coagulation. Starter microorganism shall be viable, active and abundant in the product to the date of minimum durability.

4.23 Flavored MILK

A product obtained by the addition of syrup or flavor made from wholesome ingredients, by whatever name called, may contain nuts (whole, fragmented or ground) chocolate, coffee or any other permitted flavor, permitted color, with or without other permitted food additives and sugar. It shall be boiled, pasteurized or sterilized / UHT. The flavored milk shall have the same min. % of milk fat and milk solids not fat as the milk from which it is prepared. The type of milk shall be clearly and conspicuously indicated on the label in a prominent position.

There shall be written in the label on a package containing flavored milk, the word “Flavored milk” or the name of the flavor conjoined with the words “flavored milk”. These words shall form the 1st line of the label and no other words shall appear in the same line.

4.24 Cream / Balai

It shall contain not less than 40% of milk fat with or without permitted food additives.

4.25 Flavored Cream

It shall contain not less than 10% of milk fat with or without permitted food additives

4.26 Butter

It is a fatty product derived exclusively from milk and / or products obtained from milk, principally in the form of an emulsion of the type water-in-oil with or without permitted additives. It should conform to the following

- | | |
|---------------------------------------|-----------------|
| a) <i>Milk fat</i> | <i>min. 80%</i> |
| b) <i>Moisture</i> | <i>max. 16%</i> |
| c) <i>Milk solids-not-fat content</i> | <i>max 2.0%</i> |

4.27 DESI GHEE

The clarified fat derived from milk or curd and free from added coloring matter or preservative, with permitted anti-oxidants. It shall have a characteristics pleasant natural color & flavor; it shall conform to the following

- | | |
|-------------------------------|---|
| a) <i>Milk fat</i> | <i>Min 99.6%</i> |
| b) <i>Moisture</i> | <i>not more than 0.5%</i> |
| c) <i>FFA (as oleic acid)</i> | <i>not more than 2.0% without anti-oxidant and 0.4 % with anti-oxidant)</i> |
| d) <i>BR value at 40°C</i> | <i>40.0 to 43.5</i> |
| e) <i>Polenske value</i> | <i>not more than 2.8</i> |
| f) <i>Richert value</i> | <i>not less than 26 (not defined in codex)</i> |
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-

g) *Baudouins test* *negative*

4.28 Cheese

A substance known as cheese and made exclusively from milk or cream or both, with or without addition of salt or of innocuous preservative or of innocuous coloring matter,

a) *Milk fat* *not less than 40.0% (by weight of dried cheese)*

4.29 Cottage cheese

A soft /granular cheese prepared from the curd obtained by adding coagulating agent under the influence of the harmless bacterial culture to pasteurized skim milk. It shall contain not more than 80% moisture.

4.30 DAHI or CURD

A product obtained by the lactic acid fermentation of at least pasteurized milk.

a) *Milk fat* *not less than 3.5%*

b) *Milk solids* *not less than 9.0%*

4.31 Yogurt (To be defined as PSQCA)

4.32 Skimmed Milk Dahi /Curd

A product obtained by the lactic acid fermentation and contains fat in quantity less than 3%. It shall contain not less than 9.0 % of milk solids other than milk fat

4.33 Ice Cream, Fruit Ice Cream, Malai-ki-barfi, Khoya-ki-Barfi, Malai ki Kulki, KHOYA-KI-KULFI, KULFA, CONE ICE CREAM

The pure clean frozen product made from a combination of milk or cream or other milk products, with or without eggs, but with water, sugar and harmless flavoring and harmless coloring, and with or without added stabilizer, and with or without fruit, fruit juices, nuts, cocoa, coffee or chocolate, syrup, cake of confections, ice cream by whatever name it is called, shall contain not less than 10%, by weight of milk fat, not less than 36% of total solids and not more than 0.5% of stabilizer & fulfill the following:

a) Provided that when the ice cream contains fruits or nuts or both, the contents of milk fat may be reduced proportionately but not less than 8.0% of milk fat,

b) Provided further that ice cream shall not weigh less than 4.5 lbs / gallon.

4.34 Khoya

A product derived from halal milch animals by evaporation of a part of the water from the milk by a process of indirect continuous stirred heating and it shall conform the following

- | | |
|--------------------|----------------------------|
| a) <i>Milk fat</i> | <i>not less than 20.0%</i> |
| b) <i>Moisture</i> | <i>not more than 33.0%</i> |

4.35 Barfi, Pera, Kalakand

A sweet prepared from khoya and sugar with or without other ingredients except starch. It shall conform the following

- | | |
|--------------------|----------------------------|
| a) <i>Milk fat</i> | <i>not less than 10.0%</i> |
| b) <i>Moisture</i> | <i>not more than 18.0%</i> |

4.36 Frozen desserts

5. RELATIVE ROLES OF MILK PRODUCERS, MANUFACTURERS, DISTRIBUTORS,

RETAILERS, TRANSPORTERS, CONSUMERS, AND GOVT. AUTHORITIES

Although the responsibility lies with the manufacturer for ensuring that the foods manufactured are safe and suitable, there is a continuum of effective efforts or controls needed by other parties, including milk producers, to assure the safety and suitability of milk products.

The interrelationship and impact of one segment of the food chain on another segment is important to ensure that potential gaps in the continuum are dealt with thorough communication and interaction between the milk producer, the manufacturer, the distributor and the retailer. While it is principally the responsibility of the manufacturer to conduct the hazard analysis within the context of developing, implementing and maintaining a control system based on HACCP.

5.1 Responsibilities:

To achieve an effective continuum, the various parties should pay attention, in particular, to the following responsibilities.

5.1.1 Milk Farmers should ensure that good agricultural, hygienic and animal husbandry practices are employed at the farm level. These practices should be adopted, as appropriate, to any specific safety-related needs specified and communicated by the manufacturer.

5.1.2 Manufacturers should utilize good manufacturing and good hygienic practices to control hazards during primary production. Manufacturer should clearly and effectively communicate handling instructions to transporter, distributor and retailer. System for traceability of products must be established and maintained in order to have control over products. Records must be maintained as appropriate.

5.1.3 Distributors, transporters and retailers should assure that milk and milk products under their control are handled and stored properly in accordance with *GMP,s*.

5.1.4 Consumers should accept the responsibility of ensuring that milk and milk products in their possession are handled and stored properly in a way that it is safe in use till its consumption and is / are handled according to the *GMP,s* / *GSP,s*.

6. PRINCIPLES APPLYING TO THE PRODUCTION, PROCESSING AND HANDLING OF ALL MILK AND MILK PRODUCTS

The following overarching principles apply to the production, processing and handling of milk and milk products starting as mentioned below;

6.1 From raw material production to the point of consumption, dairy products should be subjected to a combination of adequate control measures, and these control measures should be shown to achieve the appropriate level of public health protection.

6.2 Good hygienic practices should be applied throughout the food chain so that milk and milk products are safe and suitable for their intended use.

6.3 Hygienic practices for milk and milk products should be implemented within the context of HACCP.

6.4 Control measures should be verified and validated as effective.

7. HYGIENE AT FARM LEVEL

7.1 Primary Production

7.1.1 Principles Applying to the Primary Production of Milk;

Milk should not contain any contaminant / *adulterant* at a level that jeopardizes the level of public health protection, when presented to / used by to the consumer.

Contamination of milk from animal and environmental sources during primary production should be minimized.

The microbial load of milk should be as low as achievable, using good milk production practices, taking into account the technological requirements for subsequent processing.

7.2 Environmental Hygiene

7.2.1 Water and other environmental factors should be managed in a way that minimizes the potential for the transmission of any type of hazards (e.g. physical, chemical or microbiological) directly or indirectly into the milk.

7.2.2 When water is used for the cleaning of the udder and equipments for milking and storage of milk, it should be of such quality that it does not adversely affect the safety and suitability of the milk.

7.2.3 Precautions should be adopted to ensure that milking animals do not consume or have access to contaminated water or other environmental contaminants likely to cause diseases transmissible to humans or contaminate milk.

7.2.4 Milking operations should minimize the introduction of food-borne pathogens and foreign matter from the skin of animal or milkman (in case of manual milking) and general milking environment as well as chemical residues from cleaning and disinfection routines.

7.3 Areas and Premises for Milk Production

The design, layout and provision of holding areas should not adversely affect the health of animals. Holding areas should be kept clean and maintained in a manner that minimizes the risk of animal infection or contamination of the milk.

Milking areas should be kept free of undesirable animals such as, poultry and other animals whose presence may result in contamination of milk.

Premises where milking is performed should be easy to clean, especially in areas subject to soiling or infection, e.g. they should have:

7.3.1 Flooring constructed to facilitate draining of liquids and adequate means of disposing of waste

7.3.2 Adequate ventilation and lighting

7.3.3 An appropriate and adequate supply of water of a suitable quality for use when milking and in cleaning the udder of the animals and equipments/utensils used for milking

7.3.4 Effective separation from all sources of contamination such as lavatories (if used) and manure heaps

7.3.5 Effective protection against vermin

7.4 Animal health

The health *status* of milking animals and herds should be managed in such a manner that addresses the hazards of concern for human health. *Milk should come from healthy animals so that it does not adversely affect the safety and suitability of the end product.* Milk should be drawn from halal milch animals that;

1. Are identifiable to facilitate effective herd management practices
2. Do not show visible impairment of the general state of health
3. Do not show any evidence of infectious diseases transferable to humans through milk.

7.4.1 Adequate measures should be implemented in order to prevent udder infections, through;

1. The correct use of milking utensils (e.g. daily cleaning after use, disinfection).
 2. The hygiene of milking (e.g. udder cleaning or disinfection procedures).
 3. The management of the animal holding areas (e.g. cleaning procedures, design and size of areas).
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7.4.2 Unsaleable Milk

Milk having any of the following / s shall not be sold or supplied to the public or a dairy company;

1. Milk from an animal with a confirmed clinical disease (if unsure of the health status of an animal check with your veterinarian) such as;
 - a) Brucellosis
 - b) Salmonellosis
 - c) Tuberculosis
 - d) Listeriosis
 - e) Yersiniosis
 - f) Leptospirosis
2. Milk with unusual color, smelling or compositional change
3. Milk, which contains foreign matter like dead vermin or droppings etc.
4. Milk which contains any inhibitory substance or chemical contaminants, e.g. pesticide residue
5. Milk from an animal within 4 days of giving birth
6. Milk containing more immunoglobulin than is normally found in milk from a healthy milking animal 4 or more days after giving birth
7. Milk which has/had added to it any water, cream, skimmed or partly skimmed milk, or had any of these components removed.
8. Reselling of milk already failed to meet the acceptance criteria on quality basis and has potential to cause safety hazard.

7.5 General Hygienic Practice

1. With consideration given to the end use of the milk, forage and feed for lactating animals should not introduce, directly or indirectly, contaminants into milk in amounts that present health risk to the consumer or adversely affect the suitability of milk or milk products.
2. Pests should be controlled, and in a way that does not result in unacceptable levels of residues, such as pesticides, in the milk. Site plan may be used as to demonstrate the control over pest control activities.
3. Animals should only be treated with veterinary drugs authorized by the Govt. authority for the specific use and in a manner that will not adversely impact on the safety and suitability of the milk, including adherence to the withdrawal period specified.
4. Residues of veterinary drugs in milk should not exceed levels that would present an unacceptable risk to the consumer.
5. Good animal husbandry procedures should be used to reduce the likelihood of animal disease and thus reduce the use of veterinary drugs.
6. Only those medicinal products and medicinal premixes should be used that have been authorized by Govt. authority for inclusion in animal feed.
7. Milk from animals that have been treated with veterinary drugs that can be transferred to milk should be discarded until the withdrawal period specified for the particular veterinary drug has been achieved.

7.6 Hygienic Milking

In order to minimize contamination during milking, effective hygienic practices to be applied in respect to skin of the animal, the milking utensils, the handler and the general environment e.g. faecal sources of contamination. Milking should be carried out under hygienic conditions, including;

1. Good personal hygiene of the milking personnel
2. Clean udders, teats, groins, flanks and abdomens of the animal
3. Clean and disinfected milking utensils, vessels/equipments
4. Avoidance of any damage to the tissues of the teat/udder.

In particular, during any milking, consideration should be given to minimizing and / or preventing contamination from the milk production environment and maintaining personal hygiene.

7.7 Milk Cooling

Farm dairy occupiers must ensure that, directly after milking, raw milk is filtered and

1. Immediately cooled
2. Cooled down to 4 °C or below after completion of milking
3. Kept at or below 8 °C until collected, or until the next milking.

8. HANDLING, STORAGE AND TRANSPORT OF MILK

With consideration given to the end use of the milk, handling, storage and transport of milk should be conducted in a manner that will avoid contamination and minimize any increase in the microbiological load of milk.

8.1 Milking Utensils, Vessels, Equipment Design

Milking utensils, vessels, equipments and storage tanks should be designed, constructed and maintained in such a way that they can be adequately cleaned and do not constitute a significant source of contamination of milk.

8.2 Storage of Milk

1. Milk storage tanks and cans should be designed, constructed, maintained and used in a manner that will avoid the introduction of contaminants into milk and minimize the growth of microorganisms in milk.
 2. Milk storage tanks and cans should be so designed & constructed to ensure complete drainage in order to avoid contamination of the milk when it is stored. Time and temperature control is important during storage and transport of milk and depends highly on the type and effectiveness of the control measures applied during and after processing. Therefore, the needs for time/temperature control at farm level should be clearly communicated by the manufacturer of the milk products.
 3. Surfaces of milk storage tanks, cans and associated equipment intended to come into contact with milk should be easy to clean and disinfect, corrosion resistant and not capable of transferring substances to milk in quantities that will present a health risk to the consumer.
 4. Milk tanks and cans should not be used to store any harmful substance that may subsequently contaminate milk. If milk storage tanks and cans are used to store foods other than milk, precautions should be taken to prevent any subsequent milk contamination.
 5. Storage tanks and cans should be cleaned and disinfected regularly with sufficient frequency to minimize or prevent contamination of milk.
 6. Storage tanks or portions of storage tanks that are outdoors should be adequately protected or designed such that they prevent access of insects, rodents and dust in order to prevent contamination of milk.
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7. There should be a periodic verification process to ensure that milk storage equipment is properly maintained and in good working condition.
8. Reuse of any utensil, vessel, equipment must be avoided which has already been used for any material / chemical, injurious to human health and is potential source to milk contamination.

8.3 Premises for Storage of Milk and Milking-Related Equipment.

The premises should have;

1. Suitable milk refrigeration equipments *as* appropriate.
2. Proper lighting facility but
 - a) *lights shall be placed so that they will shine into a lidded bulk milk tank.*
 - b) electric lights in the milk storage room or area shall not be located over a milk tank, unless they are effectively screened and shatter proof, to prevent broken glass from entering milk.
 - c) lights over the milk tank shall be designed so that dust does not accumulate on the upper surface of the lights. (*New Zealand dairy industry, NZCP 1- Farm Dairy Code of Practice, Third Edition*)
3. Sufficient supply of water of suitable quality for use in milking and in cleaning of equipment and instruments
4. Protection against vermin.
5. Easily cleanable floors with proper slope to avoid stagnant water, if applicable.
6. Adequate separation between milking areas and any premises where animals are housed in order to prevent contamination of milk by animals. Where separation is not possible, adequate measures should be taken to ensure that the milk is not contaminated.
7. In situations where the milk cannot be chilled on the farm, collection and delivery of the milk to a collection center or processing facility within certain time limits may be required.

8.3.1 Minimum Approved Distances

All livestock and poultry shall be housed, fed and controlled at specified distances from the farm dairy *and* its water supply. These areas shall be cleaned and well maintained.

Livestock and poultry shall be housed, fed and controlled no closer than the following distances from the milking area, milk receiving area and milk storage room/area, tanker access loop and water supply; Effluent ponds and ofal holes 45 meters

▪ Silage	45 meters
▪ Dead animals	45 meters
▪ Poultry	20 meters
▪ Livestock housing	20 meters
▪ Loafing barns and other buildings	20 meters
▪ Hay barns and hay	20 meters
▪ Feed pad	20 meters

8.4 Collection, Transport and Delivery Procedures

1. Milk should be collected, transported and delivered without undue delay, and in a manner that avoids an introduction of contaminants into milk and minimizes the growth of microorganisms in the milk.
2. Milk should be transported in intact stainless steel or aluminum containers.

3. Personnel and vehicular access to the place of collection should be adequate for the suitable hygienic handling of milk. In particular, access to the place of collection should be clear of manure, silage, etc.
4. Prior to collection, the milk transporter or collection / chilling center operator should check the individual producer's milk to ensure that the milk does not present obvious indications of spoilage and deterioration. If the milk shows indications of spoilage and deterioration, it should not be collected.
5. Collection and chilling centers, if employed, should be designed and operated in such a manner that minimizes or prevents the contamination / deterioration of milk.
6. Milk should be collected under hygienic conditions to avoid contamination of milk. In particular, the milk transporter or collection center operator should, where appropriate, take samples in such a way to avoid contamination of the milk and should ensure that the milk has the adequate storage/in-take temperature prior to reception.

8.5 Procedure of the Milk Transporter (Milk Hauler)

1. The milk transporter should receive adequate training in the hygienic handling of raw milk.
2. Milk transporters should wear clean clothing.
3. Persons at risk of transferring pathogens to milk should not perform milk-hauling operations.
4. Appropriate medical follow-up should be done in the case of an infected worker.
5. Milk transporters should perform their duties in a hygienic manner so that their activities will not result in contamination of milk.
6. The driver should not enter the stables or other places where animals are kept or places where there is manure.
7. If the driver clothing and footwear are contaminated with manure, the soiled clothes and footwear should be changed or cleaned before work is continued.
8. The tanker driver should not enter the processing areas of the dairy plant. Conditions should be arranged to allow necessary communication with the staff of the dairy, delivery of milk samples, dressing, rest breaks, etc. without direct contact taking place with the dairy processing areas or with staff members involved with processing milk and milk products.

8.6 Transport Time and Temperature

1. Transport temperature and time should be such that milk is transported to the dairy or to the collection/chilling center in a manner that minimizes any detrimental effect on the safety and suitability of milk. The temperature at storage and transportation should be maintained between 4-8°C.
2. The time and temperature conditions for the collection and transport of milk from the farm should be established taking into account the effectiveness of the control system in place during and after processing, the hygienic condition of the milk and the intended duration of storage.

9. DOCUMENTATION AND RECORD KEEPING

Records should be kept, as necessary, to enhance the ability to verify the effectiveness of the control systems. With respect to food safety, records should be kept where necessary on;

1. Prevention and control of animal diseases with an impact on public health
2. Identification and movement of animals
3. Regular control of udder health
4. Use of veterinary drugs and pest control chemicals
5. Nature and source of feed
6. Milk storage temperatures
7. Use of agricultural chemicals
8. Equipment cleaning

10. MILK RECEPTION AT FACTORY

Reception operator or inspectors or the person who is responsible for the inspection of milk and milk transport should check the following;

10.1 Transport

1. Physical condition of truck / transport to ensure its integrity and cleanliness.
2. Tyres have been washed enough to the extent that these are free from mud or soil.
3. Top lids and discharge valves are sealed properly.
4. Message should be clearly printed at three side of the transport "Milk for processing only".
5. System must be in place with clear responsibility to record deviation and take necessary corrective and preventive action as appropriate.

11. SAMPLING OF THE MILK

11.1 When milk is received at factory, the sampling should be done as per following procedure.

1. Sterile all sampling tools, for example spoons, plunger, bottles, test tubes etc.
2. Hands should be washed, dry and properly disinfectant to avoid any contamination risk.
3. Sampling person should follow all GMP's while taking sample, clean uniform, wearing cap etc.
4. Mix the milk thoroughly with the help of sterile plunger.
5. Collection of sample from tanker or any utensil with sterile spoon etc.
6. Closing of lid/cap of the sampling bottle/test tube.
7. Cleaning of sampling bottle and writing of the following description on it;
8. Sampling Time
9. Sampling Date
10. Tanker number or location
11. Sampling person name.
12. Storage of collected sample in refrigerator set at 4°C+1 or Icebox for further delivery. The milk samples should not be kept for longer period in refrigerator or icebox.

11.2 Milk Reception Norms

11.2.1 When milk is received at factory or processing plant, the inspector or receiver should check the followings parameters;

- | | |
|--------------------|--------------------------------|
| ▪ Organoleptic | clean, no off odor / off taste |
| ▪ Temperature | Max 8°C |
| ▪ PH | 6.65-6.90 |
| ▪ Clots on Boiling | negative |
| ▪ Sodium | less than 580mg / 100g SNF |
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3. Further, any additional hazards that can be introduced into the milk product during and after processing (e.g. environmental contamination, human contamination) should also be considered. During such considerations, the effectiveness of preventive measures taking place in the manufacturing environment (e.g., environmental and equipment sanitation programs, employee practices, pest control programs, etc.) should be evaluated to determine the likelihood of occurrence of potential hazards.

13. ESTABLISHMENT, DESIGN AND FACILITIES

1. Equipment should be designed and installed such that as far as possible dead ends or dead spots in milk cans / utensils & milk pipelines do not occur.
2. From milk production through to finished products, products should be stored at appropriate temperatures and for appropriate times such that the growth or development of a food safety hazard will be minimized and the product's suitability will not be adversely affected.
3. Incoming milk when arriving at the dairy plant, and provided that further processing does not allow otherwise, the milk should be cooled and maintained at such temperatures as necessary to minimize any increase of the microbial load of the milk.
4. The principle of "first arrived, first processed" should apply.
5. Intermediate products that are stored prior to further processing should, unless further processing does not allow it, be kept under such conditions that limit/prevent microbial growth or be further processed within a short time period.
6. There should be adequate stock rotation, based on the principle of "first in, first out".

14. DISTRIBUTION OF FINISHED PRODUCTS

1. It is essential that milk and milk products be kept at an appropriate temperature in order to maintain their safety and suitability from the time it is packaged until it is consumed or prepared for consumption.
 2. It is the responsibility of the manufacturer to determine the shelf life of the product and the conditions for storage.
 3. The storage temperature should be sufficient to maintain product safety and suitability throughout the intended shelf life.
 4. Regular and effective monitoring of temperatures of storage areas, transport vehicles and store display cases should be carried out where:
 - a. The product is stored, and
 - b. The product is being transported, within the product load, which could be done by using temperature indicating and recording systems;
 - c. The product is being presented for retail sale.
 5. Particular attention should be paid throughout storage and distribution to:
 6. Periods of defrosting of refrigeration units;
 7. Temperature abuse; and
 8. Overloading the cold storage facility.
 9. Products that can be stored at ambient temperatures, should be protected against external agents and contamination, e.g., direct sun radiation, excessive heating, moisture, external contaminants, etc. from rapid temperature changes which could adversely affect the integrity of the product container or the safety and suitability of the product.
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15. ESTABLISHMENT OF SHELF LIFE

15.1 Product shelf life is influenced by a number of factors, such as:

1. Applied microbiological control measures, including storage temperatures;
2. Cooling methods applied to product;
3. Type of packaging (e.g. hermetically sealed or not, Modified Atmosphere Packaging);
4. Likelihood of post-process contamination and type of potential contamination.

15.2 The shelf life of milk products may be limited by microbial changes (e.g. deterioration by pathogenic and spoilage microorganisms to unacceptable levels).

1. When establishing product shelf life, it is the responsibility of the manufacturer to assure and, as necessary, to demonstrate, that the safety and suitability of the milk product can be retained throughout the maximum period specified, taking into consideration the potential for reasonably anticipated temperature abuse during manufacture, storage, distribution, sale and handling by the consumer.
2. These temperature abuses may allow the growth of pathogenic microorganisms, if present, unless appropriate intrinsic factors are applied to prevent such growth.

16. MICROBIOLOGICAL AND OTHER SPECIFICATIONS

1. The milk used for the manufacture of products covered by this Standard should be evaluated based on sampling of milk from individual farms or milk collection centers. Upon receiving, the milk should be subject to visual inspection to detect unacceptable conditions.
2. Any-non-compliance with the above mentioned criteria, and in particular with regards to pathogens, should result in immediate corrective actions at the farm level and in the manufacturing establishment, for example: rejection of the milk for the processing of raw milk products; corrective actions on the milking procedure (cleaning and sanitation procedures of the milking equipment, cleaning or sanitation procedures of the udder, etc.); quality of feed; the hygienic quality of the water supply; practices in animal holding areas; individual check of animals to find the animal(s) that may be the carrier; isolation of that animal from the herd as necessary. Corrective actions should be identified and implemented, and specific assistance to the dairy farm may need to be provided.

17. INCOMING MILK

17.1 Manufacturer should;

Establish incoming milk criteria that take into account the end use of the milk and the conditions under which the milk was produced.

1. Corrective action taken for non-compliance with incoming milk criteria should be commensurate with the potential risks presented by the non-compliance.

17.2 Microbiological criteria

Microbiological criteria may be necessary to be established at different points in the process for carrying out the design of control measure combinations and for the verification that the control system has been implemented correctly

17.3 Microbiological cross contamination

1. The flow of the product and of the ingredients within equipment and through the processing facility should maintain a forward progression from raw material receipt to finished product packaging so as to avoid cross contamination.
2. There should be adequate separation of areas with different levels of contamination risk.

17.4 Physical and Chemical Contamination

Preventive measures should be implemented to minimize risks of contaminating milk and milk products with physical and chemical hazards and foreign substances.

18. WATER

1. Dairy processing establishments should have potable water available, which prior to its first use, should meet the criteria specified by the Govt. authorities having jurisdiction and shall be regularly monitored. Reference of PSQCA drinking water standard no .
2. Reused / recycled water shall be treated and maintained in such a condition that no risk to the safety and suitability of food results from its use.
3. Reused / recycled water shall not be used / mixed in products.

19. INCOMING MATERIAL (Other than milk) REQUIREMENTS

1. Ingredients used for the processing of milk products should be purchased according to specifications, and their compliance with these specifications should be verified.
2. Raw materials should, where appropriate, be inspected and sorted before processing. Any claims that raw materials meet safety and suitability specifications should be verified periodically.

20. ESTABLISHMENT, MAINTENANCE AND SANITATION

20.1 All food product contact surfaces in piping and equipment, including areas that are difficult to clean such as by-pass valves, sampling valves, and overflow siphons in fillers shall be adequately cleaned.

20.2 Cleaning Programs

All equipment and utensils used in processing should, as necessary, be cleaned and disinfected, rinsed with water, which is safe and suitable for its intended purpose. Follow the CIP for the plant. A routine program to verify the adequacy of cleaning should be in place

20.3 Use and Maintenance

In the case of refrigerated products, the vehicle product compartment should be cooled prior to loading and the product compartment should be kept at an appropriate temperature at all times, including during unloading.

21. Labeling of dairy products

The registered number or name and address are that of final manufacturing dairy factory, and no other number is used. Where the product is processed by more than one manufacturer, the registered number or name and address of the final manufacturer is used on the final packaging

21.1 Information to enable trace ability

Information to enable trace ability is either

- Lot identification, such as a bag number, box number or quality unit number; or
- The date of *expiry*

21.2 The net contents by weight or volume

Net wt

Average weight principle will be applicable.

22. AWARENESS ABOUT HYGIENE

22.1 Training programs Govt. with the assistance of different organizations/stake holders shall initiate the preliminary awareness program for milk producers and personnel involved in the collection and transport and retail of milk to train them as necessary and have appropriate skills in the areas listed below:

1. Health of animals and use of veterinary drugs;
2. Manufacturing and use of feeds (more specifically fermented feeds);
3. Herd management;
4. Hygienic milking;
5. Storage, handling, collection and transport of milk (cleaning of storage tanks, temperature requirements, sampling procedures, etc.);
6. Milk selling at shops and Processing in Dairy Plant.
7. Microbiological, chemical and physical hazards and their control measures.

Reference cited:

1. W. P. Pure Food Rules 1965
2. NZCP 1. Farm Dairy Code of Practice (Third Edition)
ISBN 0-908946-00-7, New Zealand Dairy Board, Wellington, New Zealand, November 1998
3. FAO/WHO Codex alimentarius commission (food safety provisions) and OIE
4. World Organization for animal Health (Animal Health provisions)

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