A Feasibility Analysis of Dairy Ventures in India

A thesis presented in partial fulfilment of the requirements

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This thesis is dedicated to the memory of my grandfather (late) M.M.G Apparao, the Zamindar of Telaprolu

ABSTRACT

India is the largest producer and consumer of milk and milk products in the world. With rapid economic growth, the demand for milk is expected to increase at a faster pace than supply and the resulting supply-demand gap could reach 40 million tonnes by 2022. This presents a good opportunity for multinational dairy companies to venture into the Indian dairy market. As imports of dairy products into India are strictly regulated by means of tariffs and non-tariff barriers multinational dairy companies would have to meet their milk supply from domestic sources, possibly through alternate milk supply models. But starting and operating a successful dairy business in India is not an easy task. It is challenging because the complicated business environment, subsistence type of farming system, lack of quality feeds, large un-organised sector, fragmented structure of the industry, poor rural infrastructure, huge socio-cultural diversity and drastic climatic variations, make the process of milk production and procurement extremely complex. It is therefore vital for a new entrant (multinational dairy company) to perform a thorough analysis, before starting a dairy venture in India. One structured method for performing such an analysis is the feasibility study.

To date there has been limited research in the area of feasibility analysis of dairy ventures in India. In order to address this research gap, this study has been focused on developing a comprehensive framework of feasibility analysis for dairy ventures in India. The framework that was developed was then tested on a case study – a possible large scale dairy farm based milk supply model that Fonterra was considering implementing in the Nellore region of India. Through this process it was demonstrated that by using this framework it is possible to achieve a robust, disciplined and scientific method of evaluating the feasibility of large scale dairy ventures in India.

Key words: Feasibility studies, Dairy, India

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TABLE OF CONTENTS

CHAPTER 1

INTRODUCTION

1.0 INTRODUCTION

1.1 Background

Over the last three decades, the livestock sector in general and dairy sector in particular has witnessed rapid global expansion in both production and consumption. The main driver of this livestock revolution has been population and income growth, coupled with increased urbanization and change in consumer preferences to livestock products. Dairy has been an integral part of this revolution and world milk production has increased considerably over the last three decades. In 2009, world milk production stood at 699 million tonnes (MT) with the largest producers being EU-27 (150 MT), India (110 MT), and USA (86 MT) (International Dairy Federation, 2009).

But, dairy is a very sensitive industry in many countries (both developed and developing) and is therefore protected by various policies and regulations. Moreover since milk is a bulky and perishable commodity, local demand is usually met by local supply. As a result (excluding intra EU trade) only 7% of world milk production is traded internationally (International Dairy Federation, 2010).

In recent years the demand for dairy products has remained stagnant in developed nations. Consequently, dairy companies operating in big and mature markets such as Europe and USA face limited market growth opportunities in terms of volumes per capita and growth can only occur by increasing market shares or switching to higher value-added products. In contrast the demand for dairy products has been quite robust in the developing countries and multi-national dairy companies are increasingly looking towards these markets for ensuring growth in sales and revenue. However, entry into these markets can be quite difficult. One such emerging market which presents both a challenge and opportunity for dairy companies is India.

Agricultural is the principle occupation for most Indians and dairy constitutes a major part of Indian agriculture. India is the largest milk producer in the world with an annual production in excess of 110 million tonnes in 2009 (International Dairy Federation, 2009). India is also the largest consumer of dairy in the world and the value of the Indian dairy market was estimated to be about 42.5 Billion US$ in 2007 (Dairy India, 2007).

The dairy industry in India is integrally linked to the overall economic well-being of the country because it serves as a vital source of employment and provides livelihood opportunities to millions of small farmers in rural India. The average herd size of a dairy farmer in India is about 3 animals and farming systems are essentially of a low input/subsistence type. As a result the productivity of these dairy animals (1000kg ECM /year) is extremely low and quality of milk is poor. For most of these farmers, dairying is a secondary occupation- with off farm employment or crop farming being the main source of income. Moreover, the primary purpose of rearing dairy animals for these farmers is to produce milk for self-consumption and satisfy a nutritional need; and selling milk (marketable surplus) for profit is a secondary objective.

Apart from low productivity, another significant drawback is that the dairy industry is underdeveloped and fragmented. It's estimated that only 25 per cent of the marketable surplus is delivered to the organized dairy sector which comprises of cooperatives and privately owned milk processing companies. The remaining 75 per cent of milk is marketed through the un-organized or informal sector which comprises primarily of milk vendors. The milk vendors generally source milk directly from farmers (in rural/peri-urban areas) and sell fresh (unprocessed) milk directly to their customers/consumers (in urban areas).

Although India is the largest consumer of dairy products in the world (consuming nearly 100% of its production), the per-capita milk consumption (91 kg/year) is lower than the world average (103 kg/year). With rapid economic development and increases in family incomes, it is expected that per capita milk consumption as well as demand for improved quality dairy products will increase considerably in India. It's estimated that India's demand for dairy products could reach 200 million tonnes by 2022 (NDDB, 2011). Since dairy imports into India are strongly regulated using tariffs and tariff rate quotas, much of India's demand has to be met by the domestic dairy industry. Based on past trends it is projected that India's domestic industry will only be able to supply 160 million tonnes – resulting in a shortfall of 40 million tonnes. This growing demand for dairy products and likely supply-demand gap presents an excellent opportunity for multinational dairy companies to venture into the Indian dairy market with alternate milk supply models.

Since it is highly unlikely for the current subsistence type farming system to meet rising demand and consumer expectations, India requires more modern, efficient and productive dairy farming systems. Such dairy farming systems will need to be much larger in size in order to benefit from scale related efficiencies. Currently there are no large scale dairy ventures (3000 plus animals) in India. Moreover a typical large dairy farm in India has around 30 to 50 animals, and these large farms account for less than 5% of milk produced. Given the ground realities and context, starting and operating a large scale dairy venture in India would therefore require a through feasibility study.

1.2 Problem Statement

Starting and operating a successful large scale dairy business in India is not an easy task, especially for a multinational company with little or no experience of India. The complicated business environment, subsistence type of farming system, lack of quality feeds, large un-organised sector and fragmented structure of the industry, poor rural infrastructure, huge socio-economic/cultural diversity and extreme climatic variations make the process of milk production, procurement, processing and marketing very complex. These inherent issues and supply chain complexities make it vital for a new entrant (multinational dairy company) to perform a thorough analysis, before starting a dairy venture in India. One structured method for performing such an analysis is the feasibility study.

The primary purpose of a feasibility study is to determine if a business venture is possible, practical and viable (Hoagland and Williamson, 2000). More specifically a business feasibility study can be defined as a controlled process for identifying problems and opportunities, determining objectives, describing situations, defining successful outcomes and addressing the range of costs and benefits associated with several alternatives for solving a problem (Thomson, 2005). A significant component of the findings of traditional feasibility studies tend to focus on - likelihood of success, projected return on investment and how any identified risks should be mitigated. Identifying a non-viable project at a very early stage of project life ensures that valuable resources are not unnecessarily wasted.

The feasibility study is a vital part of the pre-investment phase and is employed during the very early stages of a projects life. This makes it quite difficult and complicated to perform because it includes several risk and uncertainty parameters. Furthermore, it is quite likely that the scope and complexity of an apparently feasible project can change after the initial problems and opportunities are fully analyzed or after the model has been designed. A project that is feasible at one point in time may become unfeasible at a later point in time. The lack of robust feasibility studies could result in misallocation of resources, long gestation periods, investment cost over-runs and project mortality. A well-designed methodology and approach can be extremely useful in reducing such errors and increasing the accuracy of the feasibility study.

Despite the diversity in industrial activities and projects, the components of feasibility studies tend to be conceptually similar. However there may be considerable differences in orientation and emphasis depending on factors such as the nature of the industry, the magnitude and complexity of the production unit contemplated, and the investment and other costs involved. Sometimes methods and estimates based on experience gained in an industrialized country are used to conduct a feasibility study in a developing country. These bear little relation to the conditions within which a project has to operate in a developing country. As these studies are unrelated or un-adapted to local factors, they can be misleading and result in misapplication of resources. A feasibility study must therefore be related to available production factors, local market and production conditions, local/regional legislature, and local socio-cultural practices/norms. In developing countries with usually inadequate planning, the need for such well-designed studies that focus on these important factors is even greater (UNIDO, 1978).

Although several types and methods of conducting feasibility studies have been described, no research study has looked at identifying approaches for conducting feasibility studies for dairy ventures in India. Moreover, the standard and depth of pre-investment feasibility studies in India in general and dairy ventures in specific are not of a sufficiently high level to ensure well informed decision making at successive stages of the pre-investment process.

Based on the context/scope of this study and also the research gap that exists- the research problems that this project tried to solve were:

1. What is the best suited, comprehensive and holistic framework of feasibility analysis that can be applied when assessing the feasibility of a large scale dairy venture in India?

2. Is this framework of feasibility analysis robust enough to determine the feasibility of a **Case Study** dairy venture in India (a proposed large scale dairy farming venture in Nellore region of India)?

1.3 Research Objectives

The primary objective of our study was to develop a framework for conducting feasibility studies of large scale dairy ventures in India. The secondary objective was to test this framework by applying it to a possible large scale dairy farming venture in the Nellore region of India and assess its feasibility. In the process of meeting these objectives, the following steps were followed:

1. Review existing feasibility study methodology and approaches.
2. Construct a framework for feasibility analysis that can be applied to assess feasibility of large scale dairy ventures in India.
3. Test the framework of feasibility analysis on a specific **case study** – a proposed large scale dairy farming based venture by Fonterra in the Nellore region of India.
4. Use learning's from the research to identify alternate milk supply models in the event that the case study proposal is not feasible.

1.4 Relevance of Research

Increasing globalisation, opening up of the economy in mid-1990's, rapid economic growth, and specifically de-regulation and liberalization of dairy markets has resulted in an increase in entrants into India's dairy sector. Yet no research has focused on the broad area of assessing feasibility of dairy ventures in India. This research aids in overcoming this deficit by developing a tool (framework of feasibility analysis) that can be used by dairy companies (both multinational and domestic) to assess the viability of their dairy venture in India.

Moreover no research has taken into account "contextual factors" and put them in perspective while assessing viability of dairy projects in India. These in-depth insights would be valuable for both dairy and agriculture based companies that either have or plan to have operations in India.

Finally, this study will also contribute to the research areas/ knowledge domains of both feasibility studies in agribusiness; and multinational dairy investments/projects in developing countries.

1.5 Limitations of Research

As this study was supported by Fonterra, it has focused almost entirely on assessing the feasibility of a proposed large scale dairy farming venture in the Nellore region. This is because Fonterra is considering establishing a large scale dairy farming venture to meet its milk supply needs in India; and at the start of this study Nellore region was identified as a possible project site. Hence the results of this study may not be entirely generalizable to other regions or alternate milk supply models. However, the insights produced by our study could be very valuable to Fonterra and other dairy companies that plan to enter the Indian dairy market with alternative milk supply models. Moreover the framework of analysis can be used to assess alternate models that might be used.

This study was largely descriptive and most of the data/information that formed the basis of this study was gathered from secondary sources – mainly published material. Furthermore, the subjective analysis of data/ information and its interpretation was performed by the researcher. These result in information/data access limitations and introduces bias which could affect the reliability and applicability of the study.

1.6 Thesis Outline

The first chapter describes the background and context of the selected area of study and introduces the problem that will be studied. An in depth literature review is performed in the second chapter. The literature review covers 2 areas of interest: 1) Feasibility studies in general, and 2) Four specific approaches for conducting a feasibility study. A review of feasibility studies was performed to get understanding of what they are (i.e. the mechanics, structure, functioning and utility) and how they can be used to address the problem being studied. Following which four approaches for conducting feasibility studies was described in detail.

In Chapter 3, the methodology used in this research is presented. It comprises of the research method and research design. The Framework of Feasibility Analysis that was developed is presented in Chapter 4. Additionally, a description of case study – the company (Fonterra) and project proposal (Nellore Dairy Project Report) is also provided in Chapter 4. The Framework of Feasibility Analysis is applied to a large scale dairy farming venture in Nellore region of India and its results are discussed in Chapter 5. Lastly, in Chapter 6 the outcomes of this research are summarised, conclusions drawn and recommendations are provided.

CHAPTER 2

LITERATURE REVIEW

Section I – Feasibility Studies

2.0 LITERATURE REVIEW

2.1 FEASIBILITY STUDIES

2.1.0 Introduction

A feasibility study can be defined as a controlled process for identifying problems and opportunities, determining objectives, describing situations, defining successful outcomes and addressing the range of costs and benefits associated with several alternatives for solving a problem (Thomson, 2005). More specifically it is an analytical tool that consolidates an argument and includes recommendations and limitations based on factual evidence, which are utilized to assist the decision makers when determining if the business concept is viable (Drucker, 1985; Hoagland & Williamson, 2000; Thomson 2003). It is often used to support the decision making process based on a cost benefit analysis of the actual business project viability (Thomson, 2005). The feasibility study is also an integral part of the strategic planning process of a business corporation because it can assist in selecting the best alternative and the orientation of the project (Alkass *et al.*, 2006).

The feasibility study is usually conducted during the deliberation phase of the business development cycle prior to the commencement of a formal business plan. Since the feasibility study is employed during the very early stages of a projects life; it becomes quite difficult and complicated to perform because it includes several risk and uncertainty parameters (Alkass *et al.*, 2006). It is nevertheless, one of the most important stages and mistakes at this stage can permanently handicap the projects performance.

Sometimes the feasibility analysis identifies that the project is not feasible for several reasons (Poos, 2004). For example, the project might make money and meet all feasibility requirements, but the Return on Investment (ROI) could be low so that the company would not want to advance the project. In this case the project is feasible to execute but not economically attractive or financeable (Poos, 2004). Banks are often more interested in the cash flow during the loan payback period and not the overall project economics. Thus a project may be feasible to a company but may not be structured or scheduled optimally for bank financing (Poos, 2004).

A “No” Feasibility answer is still a positive result as it saves the entrepreneur from wasting financial resources and valuable time on an un-viable venture. It is estimated that only one in fifty business ideas are actually commercially viable, therefore a feasibility study is an effective way to limit further wastage of investments and resources (Gofton, 1997; Bickerdyke *et al.*,. 2000; Thomson, 2005).

Additionally, the costs and time associated with the business planning stage will be considerably reduced because the information uncovered during the feasibility analysis can be used to support the business plan. The business feasibility study outline and business plan outline are very similar in nature and are normally designed to dovetail in pursuit of efficiencies of development, evidentiary alignment and consistency of reporting.

The business feasibility study will usually be assessed by potential investors and stakeholders based on the credibility and depth of argument. It should provide the stake holders with varying degrees of evidence/recommendations that a business concept will in fact be viable or not (Hoagland & Williamson 2000; Thomson, 2003; Wickham, 2004). The recommendations should be a mix of numerical data and qualitative, experienced-based documentation (Thomson, 2005). A significant component of the findings should be related to the likelihood of success, projected return on investment and how any identified risks should be mitigated. To achieve this, the most important dimensions of business viability that need to be assessed in a feasibility study are:

- Market Viability
- Technical Viability
- Business Model Viability
- Management Model Viability
- Economic and Financial Model Viability

Apart from these, consideration should also be given to traditional business techniques such as the SWOT, Porters Five Forces and PEST. Although they may not provide information which is a perfect fit to the proposed business model, they will provide a starting point for future analysis (Thomson, 2005).

However, a major challenge in conducting a feasibility study involves the solving of multi-disciplinary problems that arise frequently (UNIDO, 1978). It is therefore usually advisable to have a feasibility study conducted by a team of experts instead of an individual. As a general rule members of the team should be selected to cover major fields of the project and usually include (UNIDO, 1978) -

- Industrial economist
- Market Analyst
- Technologist – specialized in the appropriate industry
- Mechanical/Industrial engineer
- Civil engineer
- Industrial Management/Accounting expert

2.1.1 Pre-feasibility/ Conceptual Study/ Scoping Study

It is sometimes recommended to perform a pre-feasibility study before the actual feasibility study because of the large amounts of resources (time and money) that a complete feasibility study requires. When a company goes straight to the feasibility stage, the chance to eliminate "bad" projects in the early stages is also lost. As a result companies end up focusing time and effort evaluating projects that are not worth pursuing which means that there are reduced resources available to pursue more worthwhile projects, thus lost opportunities (Poos, 2004).

A pre-feasibility is the first study that should be completed on a project. The concepts and parameters assessed in a pre-feasibility study are similar to that of a complete feasibility study. It is the preliminary evaluation of a project and is based on assumptions and general factors influencing the outcome of a project. Since it is based on limited data and test work, the accuracy of these initial studies is typically ±35 to 40 per cent (Poos, 2004). These conceptual studies typically identify technical issues that will require additional examination or test work. Generally the end result of the study is a description of the general features and parameters of the project and an order of magnitude estimate of capital operating costs. A study of this level is useful to determine if the project and study are worth pursuing further. But the economic parameters are usually insufficient to arrive at a definitive overall conclusion (Poos, 2004).

During this process areas of concern that should be further researched during the feasibility study need to be identified. Skipping the pre-feasibility stages does not save time or money in most cases because issues that should have been identified early on into the process are not, causing delays while these issues are analysed and addressed, which results in increased costs. These costs are not only the actual monetary cost but also the opportunity cost of not allocating resources to more worthwhile projects (Poos, 2004).

Additionally, without a proper prefeasibility study the more costly and final feasibility study may focus on a less optimum design or process plan. Conducting a scoping of prefeasibility study quickly identifies significant problems and further work on the project can be suspended until the additional and in-depth analysis of the problem is completed, thus saving time, effort and expense (Poos, 2004).

2.1.2 Feasibility Study Angles/Dimensions

Due to the diverse applicability of feasibility studies, the concepts to be covered or kept in mind while performing a feasibility analysis are not found under a single unifying theme. But instead are distributed amongst different knowledge domains. This sub-section captures concepts from a few of these important themes/knowledge domains such as –project selection, decision making, uncertainty and scenario analysis, risk and sensitivity analysis, socio-economic and environmental impact assessment, and goodwill assessment. Additionally an explanation of these concepts from the feasibility study dimension is also given.

2.1.2.1 Project Selection Perspective

Projects transform an organizations vision into reality. To remain competitive in today's globalized business environment organizations should select and implement right projects efficiently (Dey, 2006). Project selection is therefore strategic to any organization. Projects are carried out to obtain several objectives. However, it is difficult to compare and trade off these objectives because they are in different dimensions (UNIDO, 1978).

The evaluation and selection of industrial project before investment decisions, is customarily done using marketing, technical and financial information (Dey, 2006). The market analysis of the project is done to decide the throughput of the project in line with the projected supply demand scenario. On the basis of planned throughput, preliminary engineering and design is carried out, which forms the basis for the technical analysis (Dey, 2006). Technical analysis identifies a few feasible project alternatives with respect to project sites, throughput, technology, materials usage, product/service mix, and implementation method (Dey, 2006). Subsequent financial analysis determines the most optimum project for investment. The financial analysis also considers uncertainties of the project and suggests mitigating measures. Additionally, socio-economic and environmental impact assessments of the project are also done (Dey, 2006). The outcome of the project feasibility analysis is a feasibility report, which is the instrument for receiving approval from competent authorities.

There are limited numbers of studies concerning the feasibility study analysis technique itself in the literature. However there are many studies that deal with methodologies of evaluating alternative projects (Dey, 2006). This is because in practice a feasibility study is not only used to determine if a project is feasible financially and technically, but also to help decision makers compare feasibility studies of various projects in order to choose the best project option available.

Since projects are unique in nature, each project selection method has its own pros and cons for various applications. Danila (1989), and Shpak and Zaporojan (1996) have discussed some of the project selection methodologies used. Studies have also looked at the operations research dimension of project selection. Mehrez and Sinuany-Stern (1983) used the utility function. Khorramshahgole and Steiner (1988) and Dey *et al.* (1996) applied goal programming. Chu et al (1996) and Cofin and Taylor (1996) explained the use of fuzzy theory in the project selection process. Lockett and Stratford (1987), and Regan and Holtzman (1995) have discussed the “0-1” mathematical modelling for project selection and fund allocation.

Since a feasibility study is fundamentally a process for project selection, the problems of project selection are applicable to feasibility studies as well. There is considerable amount of literature dedicated to the problem of project selection. Project selection issues have been discussed in detail in various management functions within the context of R & D (Loch and Kavadias, 2002), environmental management (Eugene and Dey, 2005), and quality management (Hariharan *et al.*, 2004).

2.1.2.2 Decision Making Perspective

Feasibility studies have often played an important role in decision making regarding the implementation and prioritization of both public and private investments (Ziara *et al*., 2002). The feasibility study forms the basis for the Go or No Go decision, which determines whether the capital project is to be recommended or not. The feasibility analysis for a capital project can therefore be considered to be a critical multi-attribute and multi-criteria decision analysis.

According to Yun and Caldas (2009), the feasibility study uses four processes that are used to analyse a capital project: project overview; economic feasibility; political viability; and total viability. The project overview examines the projects basic information such as its background, objectives, procedure and planned content. Economic feasibility estimates demand and calculates economic and financial indices such as benefit-cost ratio (B/C), net present value (NPV) and internal rate of return (IRR). It also determines the economic impact, investment suitability and overall financial viability. The political viability evaluates non-economic factors such a regional development, regional economic impact, stakeholder attitudes towards the project, compliance with governmental policies, environmental impact, as well as project specific factors (Yun and Caldas, 2009).

The total project viability should be evaluated based on the results of both an economic and political evaluation through the use of multi-attribute and multi-criteria decision analysis (Yun and Caldas, 2009). This process leads decision makers to a Go or No Go decision, to determine investment priority between projects, and to provide optimal alternatives and investment timing. One such multi-attribute and multi-criteria decision analysis tool that can be used is the Analytical Hierarchy Process (AHP). The AHP has been used frequently to solve decision-making issues in project selection (Dey and Gupta, 2001; Mian and Christine, 1999). Apart from AHP there are various complex methods to evaluate and select a project/model that best meets the various objectives of the projects owners. Examples of these methods include Delphi inquiry, Simple Matrix Analysis, Project Selection Grid and Multi Attribute and Utility theory (Sabah *et al.*, 2006; Riggs *et al.*, 1992; Zanchettin, 1992; Pettinato and Pignanelli, 1992; Moselhi and Deb, 1993).

2.1.2.3 Uncertainty & Scenario Analysis Perspective

Since all decisions are choices about the future in the face of uncertainty (Walters, 1986), and a feasibility study is about informing decision-makers about the likely consequences of project/ development alternatives (Beanlands and Duinker, 1984), the analysis must by definition engage in thought processes that deal explicitly with the future (Duinker and Greig, 2007).

Futures analysis deals with much more than just the concept of forecasting or predicting the future. It encompasses a variety of techniques to create well-grounded menus of choices about the future by describing and studying alternative possibilities (Duinker and Greig, 2007). On the whole, the methods operate within the domain of three questions associated with the future (Rubin and Kaivo-oja, 1999):

1. Possible futures – what may happen?
2. Probable futures – what is most likely to happen?

3. Preferable futures – what would we prefer to happen?

The most common methods used for Futuring are – a) scanning, b) trend analysis, c) trend monitoring, d) trend projection, e) scenarios, f) polling, g) brainstorming, h) modelling, i) gaming, j) historical analysis, and k) visioning (Duinker and Greig, 2007).

The best known qualitative, structured futures method in use today is the Delphi method (Lang, 1998). A Delphi survey is a consensus based group process for systematically soliciting, collating, and refining a set of informed judgments on issues determined by a small number of variables. The technique usually consists of a set of sequential questionnaires. With each subsequent questionnaire, information and feedback from results of earlier questionnaires is provided, allowing a structured dialogue among experts. Delphi studies are more successful when they involve experts as opposed to the general population (Caldwell, 2003), but participant diversity is desirable to help reduce bias. Delphi works best when assessing options of relatively short-term futures (e.g., less than 5 years), and is best suited to exploring issues involving both social and scientific evidence.

Futurists frequently use scenarios to try to understand uncertainty and scope of possible alternatives. This understanding supports the creation of robust management strategies, to prepare managers to respond appropriately if their expectations of what is most likely prove false, and to provide insights into events that could indicate which path one is actually on (Duinker and Greig, 2007). A scenario analysis could therefore be used complimentary to the traditional feasibility analysis.

According to Porter (1985), a scenario is an internally consistent view of what the future might turn out to be – not a forecast, but one possible future outcome. Jake et al (1998) defined a scenario as a description of a possible set of events that might reasonably take place. Schwartz (1996) defined scenarios as a set of reasonably plausible but structurally different futures. There are several other definitions as well. The important commonality in these definitions is the idea that scenario-building does not focus on making predictions or forecasts, but rather on describing images of the future that challenge current assumptions and broaden perspectives (Duinker and Greig, 2007). The main purpose of developing scenarios is to stimulate thinking about possible occurrences, assumptions relating these occurrences, possible opportunities and risks, and courses of action.

Scenarios usually serve one of two major functions – one is risk management, where scenarios enable strategies and decisions to be tested against possible futures, while the other is creativity and sparkling new ideas (Lang, 2001). Scenario planning attempts to compensate for two common errors in decision making – under prediction and over prediction of change; allowing for a middle ground between the two to be taken (Schoemaker, 1995). To address this issue, scenario analysis divides knowledge into three areas – things we believe we know something about (the "Known"), elements we consider uncertain (the "Known unknown") and the unknowable (the "Unknown unknown").

There are various approaches to developing scenarios (Schwartz, 1996; de Jouvenel, 2000; Godet, 2000; Masini and Vasquez, 2000; Wilson, 2000; Cornish, 2004). The most common contrasts in scenario-building include, back-casting vs. forecasting, descriptive vs. normative, quantitative vs. qualitative, and trend vs. peripheral (Greeuw *et al.*, 2000). Both inductive and deductive methods can be used for developing the basic structure of scenarios. The inductive method is less structured and depends on the patience of a group of individuals to continue their discussions and reach a consensus. The deductive method, in contrast follows the steps described by Schwartz (1996) as well as "intuitive logics" developed by Royal Dutch Shell, which are:

1. Define the topic/problem and focus of the scenario analysis
2. Identify the key factors/environmental influences on the topic
3. Identify critical uncertainties
4. Define scenario logics
5. Create scenarios
6. Assess implications for business, government, and the community
7. Propose actions and policy directions

A primary objective of scenario-building is to push thinking in terms of length of time (e.g. beyond 5 to 10yrs) and breadth (e.g., across a range of possible futures). It should aid in understanding how the world could unfold, and how that understanding can be incorporated in decision making. Scenarios must therefore serve the purpose of augmenting understanding and informing good decisions (Kaivo-oja, 2001).

Instead of becoming attached to a single scenario as most likely and other hypothetical, analysts should rather seek to develop alternative scenarios that each represents plausible and possible futures. Each scenario must be rooted in the present, plausible (not impossible), and internally consistent (Ruben and Kaivo-oja, 1999).

The forecasting exercise should begin with assuming that significant contextual forces – e.g., markets, climate change and human demographics- are irreverent and hold firm in current patterns. A sensitivity analysis is then performed whereby uncertainties about parameters and relationships inside the forecasting models are systematically tested (Strafield and Bleloch, 1986). Model elements in which small changes cause large shifts in forecast need to be identified. It should be remembered that for most forecasts, the external forces will interact cumulatively with the proposed project and render the expected impacts smaller or larger, or of a different nature, depending on how the project and the contextual forces interact with each other.

2.1.2.4 Risk Assessment and Sensitivity Analysis Perspective

Risk is present whenever the outcome of some defined activity is not known. Allan H Willet defined risk as the objectified uncertainty regarding the occurrence of an undesired event (Willet, 1951). The concept of risk is as old as mankind/humankind itself. Human beings have always tried to be safe, that is maximising their safety or feeling of safety. That is they have always tried to minimise risks and manage them wherever possible.

Many studies have looked at approaches to classify and deal with various types of risk involved in a project. Woody (1992) classified risk into five categories – start –up cost risk, operating risk, technology risk, market risk, and political risk. Kangari and Boyer (1989) classified risk into economic risk, contractual risk, political risk, construction risk and management risk.

One of the most common techniques used to analyse a projects risks is the sensitivity analysis. From a financial angle the sensitivity analysis is a risk analysis technique that indicates how much the net present value (NPV) will change in response to a given change in input variable, while others are held constant. In a traditional sensitivity analysis a base case feasibility study of a project is established. The components of the projects risk are then analysed by changing each parameter (at a time) and observing the changes in the projects return. The analysis is based on the concept that the total risk of a project is a function of some important risk parameters. These important parameters are those that when changed at a given percentage from base case cause comparatively greater changes in rate of return or cost than other parameters do. Usually, decision makers select by professional experience, some parameters that tend to be able to cause a big deviation of the project returns or costs from the base case. The return can be measured as NPV or IRR and cost can be measured as life-cycle cost. The main draw back with the traditional method is that it relies on changing the value of each parameter at the same percentage at a time and hence doesn't reflect the fact that in reality different parameters change within different ranges (Alkass *et al.,* 2006).

The probabilistic sensitivity analysis method overcomes this short coming by combining the concepts of scenario analysis with that of sensitivity analysis (Alkass *et al.,* 2006). A probability that each variable will change within a range is taken into account. The parameters are analysed in terms of their possible range of fluctuations and their probability of occurrence. Each parameter is assigned its maximum and minimum values (best case and worst case), other possible values in between and the most likely value at the middle. The probability of each value in the range is then evaluated. If statistical data is not available, professional judgment is used. Finally the rate of return for each scenario is calculated and a sensitivity graph is produced (Alkass *et al.,* 2006). Although the method provides more valuable information to project managers; it has some drawbacks as well. Like most risk analysis methods, this method too relies on subjective evaluation of probability values (Alkass *et al.,* 2006).

The Monte Carlo Simulation is a complex risk analysis method that takes into account both sensitivity and input variable probability distribution. There is also the decision tree method which can assist in decision making including the consideration of risks. In this method the NPV for each scenario is multiplied by the probability of the scenario to determine the final expected NPV. Additionally, there are also other methods which use statistics and standard deviation of NPV as measurement of risks in a project. The greater the standard deviation the riskier the project is assumed to be. The volatility of the projects return to the overall market return can also be used as an indicator of the degree of risk of a project (Brigham, 1991).

It needs to be noted that risk assessment models are often used as screening tools in situations where available information is sparse and imprecise. In such situations, it is questionable whether the probabilistic approach for accounting for uncertainty such as Monte Carlo simulation is always appropriate. The mathematical framework for treating vague or imprecise information was introduced by Zadeh (1965, 1978). Instead of representing parameter uncertainty by a PDF, the theory of possibility uses fuzzy numbers. Hence, the possibilistic approach like fuzzy calculations may seem more appropriate.

2.1.2.5 A Socio-economic and Environmental Impact Assessment

Although major projects tend to apply science and technology in a sustainable manner, in many instances they also adversely affect the socio-economic and environmental conditions of the region. Socio-economic and environmental impacts of projects can occur at all the four stages of project life: pre-construction (planning/policy development); construction (implementation); operation and maintenance; and decommissioning (Ramanathan and Geetha, 1998).

Due to increasing concern of the project-affected people (PAP) and statutory environmental regulatory authorities, projects usually require environmental and social clearances before receiving approval from competent authorities for implementation (Calvin and Dey, 2002). Hence environmental impact assessment and social impact assessment is done mainly to meet the requirements of statutory regulatory agencies. Sometimes the project may not meet the requirements of the statuary agencies, and the impact assessment may suggest alternate sites, technologies, designs and implementation methods as mitigating measures. This might cause considerable time delays (and costs) because the projects feasibility analysis will need to be performed again and again until it meets the requirement of the statuary agencies (Dey, 2006). Moreover, the analysis may result in a sub-optimal project because the financial analysis may eliminate better options in favour of more environment/social friendly alternative, which in itself will always be more cost intensive (Dey, 2006).

Therefore a projects feasibility analysis should be done using a holistic approach with consideration given to social and environmental factors. Hence an integrated framework that analyses projects with respect to market, technicalities, financial, social and environmental impact in a holistic manner is recommended (Dey, 2006). This could require large amounts of data, manipulating databases and making intelligent assumptions to arrive at the most appropriate option (Dey, 2006).

2.1.2.6 Good-will & Intangibles

The economic feasibility of a project can be assessed in several ways. In simplest terms there are two criteria to judge feasibility or economic merit – cost and value (Young, 1970). It’s not important if considerations of cost precede the considerations of value, however, both must be considered before a conclusion can be reached. In practice cost factors are considered first because the design/plan needs to be tailored to meet the budget of the client (Young, 1970).

From an economic viewpoint, feasibility can be demonstrated by studies which show that the value of a particular project is at least equal to its cost. Clients generally will select the design/plan which will provide the least adverse economic results. However, this may not be a useful indicator for all circumstances. An institution (or multinational company) may be more concerned about indirect benefits or intangibles – for example the project can be a symbol of prestige (Young, 1970).

Goodwill is an intangible asset which provides a competitive advantage, such as a strong brand, reputation, or high employee morale. The nature of goodwill is that it is a bundle of identifiable intangibles representing economic value (Abeysekara, 2008).Unlike tangible assets, a defining characteristic of intangible assets is their lack of physical substance, meaning they are often hard to recognise and need to be subject to a structured identification process (KPMG, 2010). For the valuation of intangible assets knowledge about the competition structure, principles and value drivers as well as industry specific knowledge is vital (KPMG, 2010). The key intangible value drivers differ significantly across industries. The Consumer Products & Services, Life Science & Health-care as well as Entertainment & Media industries show the highest percentage of intangible assets in total firm assets (KPMG, 2010). Therefore, a feasibility study, especially for projects involving these industries, should consider the impacts of/on Good-will/Intangible assets.

CHAPTER 2

LITERATURE REVIEW

Section II – Feasibility Study Approaches

2.2 FEASIBILITY STUDY APPROACHES

2.2.0 Introduction

In this section we review and describe four feasibility study approaches that can be applied to conduct a feasibility analysis of a dairy venture in India. The **first** approach is the method developed by the United Nations Industrial Development Organisation (**UNIDO** Approach) specifically for conducting industrial feasibility studies (UNIDO, 1978). This approach allows for a stage-by-stage analysis of the various components of a feasibility study. It is comprehensive, flexible and covers all the vital components of a general feasibility study.

The **second** approach (**S & S** Approach) is a simple yet useful method for conducting a feasibility study. It is adapted from the book – "*how to prepare a feasibility study"* written by Stevens and Sherwood (1982). It is not as comprehensive or in-depth as the UNIDO approach; hence it cannot be used as stand-alone method for feasibility assessment. However, there are certain elements of this approach that can be used to compliment/add value to the UNIDO approach.

The **third** approach (**R-W-W** approach) is not a feasibility study by itself, but instead is a tool that can be used for screening and evaluating projects. The tool comprises of - 1) Risk Matrix, and 2) Real-Worth -Win (R-W-W) screen and is considered to be a disciplined and systematic process to identify and fix problems that constrain a project, to contain risk, and expose problems that cannot be fixed (Day, 2007). The origin of this method lies in the area of innovation and product development and is therefore designed to specifically assess the viability of new products /technologies /services /innovations. The underlying concepts and principles of this method can be applied to assess the feasibility of a wide range of projects.

The **fourth** approach (**AgSystems** Approach) looks at feasibility studies from a (agro-industrial) systems perspective. This approach has been adapted from the work of James Austin – *Agroindustrial Project Analysis* (Austin, 1992) and focuses on the distinctive nature of agroindustrial projects and the design factors critical to its success. The approach is based on the rationale that agroindustrial projects are a part of an integrated system with vital inter-linkages and focuses on four systemic linkages -1) Production chain linkages, 2) Macro-micro policy linkages, 3) Institutional linkages, and 4) International linkages (Austin, 1992). The feasibility analysis therefore requires a comprehensive understanding of how these four linkages interact and affect the viability of the agro-industrial project. To add additional depth to this analysis, the inter linkages are viewed in conjunction with the three core operations of agroindustries – 1) procurement, 2) processing and 3) marketing. Since this approach introduces an agroindustrial angle to project analysis, it can generate vital insights that may not be revealed by the other approaches.

A detailed review and description of each of the four approaches follows:

2.2.1 Approaches to Conducting Feasibility Studies

2.2.1.1 Approach I: United Nations Industrial Development Organization: *Manual for preparation of Industrial feasibility Studies (1978)*

2.2.1.1.1 Overview

The primary objective of this approach is to put different subjects to be covered in a feasibility study in sequential order, pinpointing their interlink ages and generating feedbacks needed to arrive at the final complete study. The structure allows for a stage-by-stage analysis of the various components of a feasibility study. It also allows for a single component of the entire study to be dealt with separately, within the overall logic of the study. The concept used in this framework can be developed further to facilitate the assessment of numerous project alternatives.

2.2.1.1.2 The Structure

I. Analysis of Project Scope, Background/Context and History

Scope of the Project: The scope of the project must be clearly understood in order to accurately predict investment and production costs. To ensure the success of the feasibility study it must be clearly understood how the project fits into the framework of the economic conditions and the general industrial development of the country. Additionally, it should include - the project idea description and major project parameters (product and product mix, plant capacity and location, orientation – market or raw material, and implementation schedule). A description of the economic, financial, social, industrial and other related policies might also be required. This is followed by an examination of the logic/rationale and objectives driving the project.

The scope of the project should ideally extend beyond the boundaries of the production plant and should embrace all activities scheduled to take place at the plant site; the auxiliary operations related to the production, extraction, of-site transport and storage of inputs and the off-site transport and storage of outputs (e.g. final products, by-products, wastes and emissions); and off site ancillary activities (e.g. housing schemes, educational training, recreational facilities etc.). The reason for doing so is to look at the material and product flow not only during the processing stage but also during preceding and succeeding stages. It also helps to decide what components can be developed in-house and what need to be sourced from third parties.

II. Analysis of Market and Production capacity

Demand and market analysis: The size and composition of the present effective market demand by segment should be determined in order to estimate the possible degree of market penetration by the product.

Sales forecast and marketing of products: income from sales needs to be projected by taking into account – technology, production programme and marketing strategy (these will be developed during different stages of the feasibility study after considering product pricing, promotional measures, distribution systems and costs).

Production programme: Once sales projections are available – the detailed production program should be developed. This will cover the various production activities and their timing. The final production (plant) capacity (feasible normal plant capacity) needs to be determined based on alternate levels of production, investment outlay and sales revenues.

III. Analysis of Materials and Inputs

This analysis deals with the selection and description of materials and inputs that are required for the manufacture of specified products as well as the definition of the supply program and computation of material costs. There is close association between the definition of inputs requirements and other project formulation stages, such as definition of plant capacity, location and selection of technology and equipment, as these interact with one another. The main rationale behind the selection of materials and inputs is derived from the demand analysis and subsequent production program and plant capacity estimations.

NOTE Specific to Agricultural Products: The assessment of quality and quantity, presently and potentially available, become the cardinal feature in most pre-investment studies involving agricultural products. In food-processing industries, only the marketable surplus of agricultural products should be viewed as basic raw materials (i.e. the quantities remaining after quantities for consumption by the producers have been subtracted from the total production).

If project requires large quantities, the production of the agricultural input may have to be increased. In order to estimate the supplies and availability of agricultural products, it may be necessary to collect data on past production and their distribution by market-segment, by geographical or end-use. Factors associated with storage and transportation should also be assessed. In many cases machinery and methods of collection should also be evaluated. In some projects, the actual production on experimental farms under a series of varied conditions might be required. Finally, an in-depth test/evaluation based on the actual production from the area should clearly establish the validity and viability of the raw materials for the project in question.

IV. Analysis of Location and Site

Definition of location and site suitable for the project under consideration is an integral part of the feasibility study. The location should be selected from a wide geographical area, within which several alternative sites should be considered. An appropriate location could extend over a considerable area. Among others, the following aspects need to be considered for selection of location – public policies, material and market orientation and local conditions (infrastructure, climate and socio-economic environment).

While traditional approaches to location selection was confined to proximity of raw materials and of markets because transport costs are a major significance, other factors have assumed increased importance in recent years. Site selection should determine the specific site where the project should be set up and consequently this analysis should be more detailed.

V. Analysis of Technical/Engineering requirements

This analysis covers all activities required to supply inputs and deliver outputs and needs to be quite comprehensive. For this analysis the scope/concept of the entire project needs to be clearly understood. Based on which- the appropriate technological process to be employed, management and operational plan needed, the type and extent of machinery and equipment required and the cost of technology and equipment involved is determined. Following which, various structures and civil works, such as buildings, auxiliary structures and plant infrastructure facilities, have to be defined, the relevant cost estimates be prepared and their specific feasibility analysed.

VI. Analysis of Organizational and Overhead costs

Since engineering and organizational planning are closely related, it should be undertaken simultaneously in a series of feedback operations. Organizational planning will enable the calculation of overhead costs, which can be vital to the projects profitability. A strategic and feasible division of the plant into components (production, service, administration cost centres etc.) might be required for a realistic feasibility assessment.

VII. Analysis of Labour requirements

Once the production capacity and technological process to be employed is determined, a definition of personnel required at various levels of management, production and other related activities is needed. This assessment should consider the different stages of the project as well as the requirements of training at various levels.

The labour requirement estimations fulfil two main purposes – 1) developing a detailed manning table for the calculation of the cost of manpower as part of the production costs, and 2) a comparison of the required personnel with the structure of labour force available in the region.

Man power planning should start at the department level, defining the labour and staff requirements by functions and categories (e.g. workers: supervisory, skilled, semi-skilled and unskilled; staff: managerial, administrative and sales).

When planning for personnel requirements, consideration should be given to the following factors - a) general assessment of supply and demand of manpower and especially of labour in the area, b) appraisal of manpower and occupational skills available at national and regional levels in view of the skill and technological requirements of the project, c) note of the main provisions of labour legislation covering industrial relations (individual and collective), procedures of recruitment and discharge; as well as wage levels, fringe benefits, and their expected annual growth rates; the number of shifts; and d) the number of annual working days.

VIII. Analysis of Implementation and Scheduling

The implementation phase of the project begins from when a decision to invest is taken and ends at the start of commercial production. This is an essential part of the feasibility study because the implementation of every project must be related to a time scale. During this phase a number of stages are covered which include negotiating and contracting, project design, construction and start-up. If this phase is not planned properly, it will lead to costly overruns which may endanger the potential profitability of the project.

The entire implementation phase should be divided into stages and a realistic schedule should be drawn up. During the implementation phase, a series of simultaneous and interacting activities take place with different implications. Hence, one of the objectives of this analysis is to determine the optimum implementation program and time schedule- list of activities.

IX. Financial and Economic Evaluation

A feasibility study is a tool that helps the project promoters to take a decision on the investment proposal under review. To make this decision, both investment and production costs have to be determined clearly. The profitability of a project will depend on the size and structure of investment and production costs, and their timing.

Firstly the basic components of investment and production costs need to be determined. In the financial analysis, these component costs are assembled to obtain an estimate of the total investment cost and total production cost. From these, financial and economic viability of the project can then be determined.

Calculation of fixed assets, pre-production capital costs, working capital and production costs should have scope for correction for contingencies and price fluctuations. This is necessary because profitability calculations are made on a range of data and each set of data is only valid under specific assumptions.

Attention should also be given to the timing of expenditures and costs because they influence the cash flow of the project and it’s Internal Rate of Return. On the whole, the financial analysis should be based on discounting methods and must incorporate sensitivity analysis.

Determining Total Investment Costs- All costs associated with the investment components (except manpower and organization and overhead costs) described is summed, and annual investment expenditure is estimated.

Evaluation of Project Financing- Sources of finance are determined and cash flow analysis performed.

Determining Total Production Costs (at feasible/normal capacity) – All production costs are summarized and unit costs are estimated.

Financial Evaluation – Commercial profitability criteria are defined. The Net Present Value, Internal Rate of Return, Pay-back Period, Simple Return on Investment, and Break Even Point are determined. Also how the profitability of the project changes with different values assigned to the variables (sales price, unit costs, sales volume, exchange rates) needs to be examined. It's usually better to take a pessimistic approach, i.e. projects viability in the worst case. This helps identify the most important factors in a project (e.g. Raw material, labour energy etc.).

X. National Economic Evaluation

The contribution of the project to the national economy also needs to be evaluated. At the national level, the project should aim to increase aggregate consumption. Other objective such as job creation, annual foreign exchange savings, social costs and benefits and redistribution of income may also be taken into account. The various objectives may have to be weighted and combined in order to determine the net contribution of the project to the national economy.

2.2.1.2 Approach II: Developed by Robert E Stevens and Philip K Sherwood: *How to prepare a feasibility study.*

2.2.1.2.1 Overview

To analyse the feasibility of any undertaking in a business context is to ask one basic question: "*will the returns from the operation be sufficient to justify the investment needed to carry out the operation?"* In other words, a feasibility study evaluates if the operation can make sufficient profits. The basic purpose of the feasibility study is to analyse this question before a decision is made to undertake a business venture.

Although a feasibility study cannot assure the success of a venture, it should help reduce the uncertainties of decision making about a proposed venture. The sequence of steps, nature of data, and magnitude of decisions can differ from one situation to another. Yet, there are several identifiable decisions that should be supported by a feasibility study. Some typical decision making situations in which a feasibility study can be used are:

- Introducing a new product
- Starting a new business
- Adding a branch facility
- Offering new services that involve additional investments

Almost all business entities face some decision making situations that would justify a feasibility study because each of the four situations identified involves analysing potential returns form an investment. Irrespective of the decision making situation, a feasibility study should contain at least three basic types of analysis *–a) demand analysis, b) cost analysis, and c) analysis of return on investment(ROI) and breakeven*. The demand analysis produces an estimate of revenues, the cost analysis produces an estimate of the costs associated with those revenues, and the analysis of ROI or break even relates the profitability of the operation with investment decision making. Thus a feasibility study can also be viewed as a study of impacts on revenues, costs and returns of a decision.

Pro-Forma Income Statements

Using a pro-forma income statement can be simple yet useful way to combine the analysis of these three components. The pro forma income statement is actually a projected income statement for a specific future time period using estimates of revenues and costs within that period. It provides an estimate of cash flows to be produced by a given venture that can be discounted to determine the present value of a stream of income from the project. This estimate is then used to calculate the anticipated rate of return for the venture. The pro forma income statement can be used to project cash flow for various scenarios, usually ranging from low (pessimistic) to high (optimistic).

Because a feasibility study usually covers several years, either an annual pro forma must be estimated for an assumed project life, or an “average” year three to five years into the future can be assumed. The discounted cash flows from the most current year can be used as an average for the venture life to calculate the return on investment (ROI). Furthermore, if subjective probabilities are then assigned to each alternative, a decision tree analysis could be used to calculate an expected value for cash flow from the project. Alternatively, the ROI could be calculated for each scenario and then compared with a predetermined rate to evaluate the financial impact.

I. Demand Analysis

The analysis of demand consists of four stages, identifying a market, identifying market factors, estimating market potential, and estimating the revenues anticipated from a given venture. The fundamental concept of a demand analysis is that a market for a product or service is actually a composite of smaller markets, each with identifiable characteristics. This is because, in reality, markets are too complex and diverse to consider all consumers within a market as homogenous.

The process of breaking up a market into its constituent parts is called market segmentation. The basic rationale behind market segmentation is that consumers in one market are different from the consumers in another market, and each group represents a separate entity. There are several bases that can be used for segmentation. Most commonly these include: geographic, demographic, product usage and product type. Additionally, a market grid is used to combine multiple bases for analysis and construction of individual market segments.

Major market factors are those driving forces that cause the demand for a product. Most often, a market factor is merely people with money and motivation to buy a product. Hence population and income figures are commonly used as market factors. On a more in depth level, a market factor analysis involves – identifying the factors that influence the demand for the product/service; to determine the nature of relationship between the factor and the product/service; and to forecast that market factor into future years. Two basic techniques that can be used for this analysis are – arbitrary judgment and a correlation analysis.

Market potential is used to refer to the expected sales of a product or service of the entire market. It is a measure of a markets capacity to consume a product in a given time period and is therefore a pre-requisite for assessing profitability. The market potential can be estimated in either absolute or relative terms.

The final step of the demand analysis is estimating the expected annual sales revenue generated by the proposed project. This analysis is based on determining how many consumers will buy the particular companies product or service. This involves estimating market share. Judgmental estimates (based on sound reasoning and assumptions) and consumer surveys are two frequent and simple methods used to achieve this.

II. Cost Analysis

The bottom line of any business venture or project is significantly influenced by the underlying cost structure. The cost analysis is a complex process used to account for costs in conducting business operations. This can also be applied for analysing costs for the purpose of feasibility studies. Since profits and losses of a business are measured as the difference between the revenue received from customers and the costs associated with the delivery of the products or services, a project cannot be judged as feasible or profitable without dependable cost estimates. In the costs analysis process, costs need to be traced through the business operations as the assets and resources are converted into goods and services.

The cost analysis determines that actual financial and technical feasibility of the proposed activity. Since the cost analysis is based on cost estimates, a broad series of assumptions and decisions have to be made to give a framework for developing these cost estimates.

Technical Analysis – First and foremost an accurate cost estimates require an in depth analysis of the technical requirements of the project. A large error in the technical study of a project can have a significant impact on the project outcome. An accurate technical analysis is a pre-requisite for sound estimates of manufacturing costs, investment requirements, start-up costs, and other related expenses. The technical analysis should address in depth seven basic questions -

1. Will process work? Can product be produced? Can service be delivered?
2. Are proper inventory estimates made?
    a. Raw materials
    b. Work in process
    c. Finished goods
3. Has a production schedule been developed?
4. Are special tools and equipment necessary?
5. Have labour requirements and costs been established?
6. Have various space requirements and costs been established?
7. Has the project cost summary been completed?

Cost forecasting- The objective of cost forecasting is to approximate the real expenses involved in an undertaking so that profitability can be projected. There are several procedures that can be used for cost forecasting and these can vary from project to project. The actual procedure that needs to be used can be decided by examining the objectives and resources of the venture. Some simple and frequently used techniques include – judgmental techniques, survey techniques and historical data techniques.

Determining the Types of Costs – There are many different types of costs. Consequently cost must be selectively chosen to match the purpose for which they are used. Costs can be divided in several categories. Some of the commonly used categories are:

- Period costs
- Product costs
- Fixed costs
- Variable and semi variable costs
- Direct and indirect costs
- Controllable and Non-controllable costs
- Sunk costs
- Differential costs
- Opportunity costs

Cost Sensitivity Analysis- A sensitivity analysis can illustrate how the costs of an operation or activity will be affected by changes in variables or by data errors. The analyst can use the sensitivity analysis to ask all the *"what if"* questions necessary to see the effect of changes in variables such as product price, raw material costs, and operating costs on the overall results of a project. From this, it can determined which variable has the most negative or positive effect to the projects profitability. Moreover it indicates that more sensitive the outcome is to the tested variable, the more serious an error in estimating the variable would be.

Risk Analysis– The sensitivity analysis has limitations. Though it can be used to determine the consequences of changes in variables, it does not identify the likelihood of a change in the variable occurring. The risk analysis addresses this issue. It is the process used to identify and assign a degree of likelihood to changes in important variables that may be essential in determining the feasibility of a project.

III. Financial Analysis

The depth of economic analysis depends on the type of project, its urgency, and the objectives of the firm. A frame work for decision making should be established before proceeding with a detailed analysis of the profitability of a project. For this purpose a decision flow chart can be used. It involves four steps -

1. Defining the problem
2. Identifying the alternative

3. Identifying relevant costs and revenues
4. Determining the most beneficial alternative

Financial analysis and capital budgeting consists of the process of selecting among alternative investments in land, buildings, productive equipment, or other assets for future gain. Sine these decisions commit the firm to a long term course of action, a careful analysis is required. In theory capital budgeting is quite simple and involves the listing of investment opportunities, ranking them according to profitability, and accepting all investments up to the point where marginal benefits equal marginal costs. However, in practice capital budgeting is far more complex and is influenced by complexity of the project and planning timetable.

Methods for Analysing Investments- The final and most important aspect that needs to be considered in determining the feasibility of a project is the potential profitability it represents. One of the major objectives of a project is to generate a good profit. The return on investment is a frequently used measure to assess the profitability of a project and is particularly useful when it comes to choosing between multiple project alternatives. In simple terms the ROI is a measure of how much the investments return to the business/company on an annual basis. The simple ROI is calculated by dividing the net profit by the total investment required to generate the profit.

Capital Budgeting - The main objective of capital budgeting is to make a decision that maximizes the value of the firm's investment, or in other words to answer the question *"which is the most profitable alternative"?* The common methods used are either non-time value methods (basic) or time vale methods (advanced). The concepts associated with non-time value methods include Payback period; Simple return on investment; and Average return on investment. Likewise, the concepts commonly associated with time value methods include– Net present value, Internal rate of return, and Present value index.

Risk Analysis- The definition of riskiness of an asset is the probability that the expected future returns will fall below predicted levels. This is measured by the standard deviation (or coefficient of variation) of expected returns. Projects with large variability in expected returns require an even more formal approach to dealing with risk. The risk analysis should therefore attempt to identify the likelihood of events occurring. These can vary considerably form project to project. In general risk results from lack of experience, misinterpretation of data, bias in forecasting, errors in analysis, and changes in economic conditions. In project feasibility studies there are usually number of such variables to consider. Some of the most common risk analysis techniques used by companies include - Risk adjusted discount rates, Risk adjusted cash flow and Risk adjusted payback periods.

2.2.1.3 Approach III: Using the Risk Matrix and R-W-W Screen to Analyse Project Feasibility- *A Innovation/Product Development Approach* - by Day (2007)

2.2.1.3.1 Overview

It's the risky projects – new to the company or new to the world – that push the firm into adjacent markets or novel technologies and can generate the profits needed to close the gap between revenue forecasts and growth goals. However, the probability of failure rises sharply when a company ventures beyond incremental initiatives within familiar markets. But avoiding risky projects altogether can strangle growth. The solution is to pursue a disciplined and systematic process to assess and manage risk. The Risk Matrix and R-W-W (Real, Win, Worth) screen, also called the Schrello screen are two tools that can be used to evaluate risk in individual projects.

I. The Risk Matrix

The Risk Matrix employs a unique scoring system and calibration of risk to help estimate the probability of success or failure for each project based on how big a stretch it is for the firm: The less familiar the intended market and product or technology, the higher the risk. A projects position on the Matrix is determined by its score on a range of factors, such as how closely the behaviour of targeted customers will match that of the company's current customers, how relevant the companies brand is to the relevant market, and how applicable its technological capabilities are to the new product.

This process is usually done by a project/portfolio review team who rates each project independently and explains their rationale. They discuss any difference in opinion and seek consensus. The resulting scores serve as a projects coordinates on the risk matrix. The determination of each score however requires deep insights. For the purpose of this analysis, failure can be defined as – "*significantly missing the objectives that were used to justify the project/alternative*".

Including Revenue assessments to the Matrix can considerably aid in decision making process. Each innovation (project alternative) in the company's portfolio can be represented by a dot on the matrix. The size of the dot is proportional to the projects estimated revenue. The larger the size of the dot, greater the rewards. After combining both Risk and Reward assessments, the Matrix of the project portfolio can be used to reflect the distribution of project alternatives from low-risk, low-reward to high risk-high reward.

Positioning projects on the Matrix

The X- axis, intend market in this example is measured using 6 parameters. Each parameter is given a score from 1 to 5. The six scores are then added up to determine the projects X- axis coordinate on the risk matrix. Similarly, the Y-axis, intended product/technology, is measured using seven parameters. Each parameter is given a score from 1 to 5. The seven scores are then added up to determine its Y axis coordinate. The project is then positioned on the risk matrix based on its X & Y coordinates (scores). The risk matrix thereby creates a visual starting point for an on-going analysis about a company's mix of projects and their fit with strategy and risk tolerance.

II. Screening with R-W-W

Following the risk matrix analysis, the projects/products/innovations are screened using the RWW framework. The RWW screen is a simple but powerful tool built on a series of questions about the innovation concept or product, its potential market, and the company's capability and competition. It's is not an algorithm for making Go/No Go decisions but instead is a disciplined process that can be employed at multiple stages of product/model development to - identify and help fix problems that are constraining projects, expose faulty assumptions, gaps in knowledge, and potential sources of risk, and to ensure that every avenue for improvement has been explored.

RWW guides the project development team to seek answers to six fundamental questions -

- Is market real?
- Is product real?
- Can product be competitive?
- Can the company be competitive?
- Will product be profitable at ***acceptable*** risk?
- Does launching the project/product/innovation make strategic sense?

The development team needs to dig deeper in order to search for answers to each of these questions. This can be achieved by analysing each question by breaking it up into sub-components and sub-questions. The team needs to identify where the answer to each of these questions fall – in a spectrum form Yes to No. A definite No to any of the first 5 questions would mean that the project needs to be terminated. For example, if the consensus answer to "*is the product real*"- is a No, and there is no alternative which can change the answer to a Yes, then the project has to be terminated.

III. Applying the Concept

A. IS IT REAL?

i. *Is Market Real?*

Identifying whether a market exists and whether a product can be made to satisfy that market are the first steps in product/project screening. These steps indicate the degree of opportunity for any firm considering the market. The market assessment should come before assessing if the manufacturing of the product is even a possibility. There are two reasons for this – a) the robustness of the market is always less certain than the technological ability to make a product, and b) the probability of a product failure becomes greater when the market is unfamiliar to the company than when the product or technology is unfamiliar. [For example, Procter and Gamble reported that 70% of product failures occur because companies misconstrue the market. This is mainly because companies tend to emphasize more on "*how to solve a problem*" rather than "*what problem needs to be solved*" or "*what customer desires need to be satisfied*"].

A market opportunity is real only if it meets four conditions:

1. The product will clearly meet a need or solve a problem better than available alternatives
2. Customers are able to buy it
3. The potential market is big enough to be worth pursuing
4. Customers are willing to buy the product

ii. Is the Product Real?

a. Is there a clear concept?

Before development actually begins, the technology and performance requirements are usually vague or poorly defined. The team members often have diverging ideas about the products/projects precise characteristics. At this stage, those ideas need to be explored further so that what is to be developed is clearly identified. As market realities begin to emerge, the requirements should get more clarity. This process not only relates to identifying technical specifications, but also evaluating the concepts legal, social and environmental acceptability.

b. Can the product be made?

If the concept is solid, the team must next explore if the project/product is feasible. This would involve examining if the product can be created with available technology and materials, or would it require some sort of a breakthrough. If the product can be made, an assessment of whether it can be produced and delivered cost effectively is required. Finally it needs to be examined if either a value chain for the proposed product exists or that it can be easily and affordably be developed, and that de facto technology standards can be met.

c. Will the final product satisfy the market?

During the development stage, trade-offs might be made in performance attributes; unforeseen technical, manufacturing, or systems problems; and features are modified. Failure to carefully monitor these changes can result in an offering that looked great on paper but no longer satisfies the market.

B. CAN WE WIN?

The more real an opportunity, the more likely it is for competitors to be eying it as well. After assessing if the market and product are real, the project team must then assess the company's ability to gain and hold onto an adequate market share. This analysis looks to distinguish between the offerings ability to succeed in the marketplace and the company's capacity – through resources and management talent – to help it do so.

a. Can the product be competitive?

Customers will choose one product over alternatives if it's perceived as delivering superior value with some combination of benefits. The analysis must consider all sources of perceived value for a given product and consider the questions – ***does it have a competitive advantage? can the advantage be sustained?*** *And* ***"how will competitors respond?*** This can be assessed by looking if someone else's offering is providing customers with same results or benefits. The analysis should consider if the product offers additional tangible advantages such as lifetime cost savings, greater safety, higher quality, and lower maintenance etc.; or intangible benefits such as greater social acceptability and the promise of reduced risk.

b. ***Can the company be competitive?***

Once it's established that the offering can "win", the analysis must determine if the company's resources, management, and marketing insights are better than those of the competition. Otherwise it's highly unlikely that the advantage can be sustained. The odds of success increase greatly when a company has or can get resources which enhance the customer's perception of the products value and surpass those of competitors. Superior engineering, service delivery, logistics, or brand equity can give the products an edge.

An analysis of the management resources must look at – whether the organization has direct or related experience in the market, whether its skills are appropriate for the scale and complexity of the project, and whether the project fits company culture and has a suitable champion.

Successful product development also requires an understanding of market research tools and openness to customer/stakeholder insights. Repeatedly seeking feedback from customers/stakeholders to refine concepts, prototypes, and pricing ensures products won't have to be recycled through the development cycle to fix deficiencies thus saving time and costs.

C. IS IT WORTH DOING?

This final stage of the screening process provides the basis of whether a project needs to be pursued or not. The analysis is based on a rigorous assessment of the financial and strategic value of the product/project.

a. Will the project be profitable at an acceptable risk?

Most projects are terminated at this stage if the answer to the question - *are forecasted revenues greater than costs?* Is a No or Maybe. It has to be a definite YES for management to consider pursing the project. This requires projecting the timing and amount of capital outlays, marketing expenses and costs, and margins; applying time to breakeven, cash flow, ROI, net present value, and other standard financial performance measures; and estimating the profitability and cash flow from both aggressive and cautious approaches.

However, forecasts of financial returns of new projects are quite unreliable. This is because of the susceptibility of financial forecasts to manipulation (as they are competing with other projects for scarce resources), overconfidence and bias. Hence relying on rigorous answers to all the prior questions in screening process can help decision makers arrive at their own conclusions on profitability.

b. ***Are the risks acceptable?***

A forecast's riskiness can be assessed with a standard sensitivity test: how will small changes in price, market share, and launch timing affect cash flows and breakeven points? A big change in the financial outcomes as a result of small changes in input assumption indicates a high degree of risk. The financial results should also consider the opportunity costs – committing resources to one project may hamper the development of others. To thoroughly understand risk, the analysis should consider all the potential causes of project/product failure that have been identified by the RWW screen and devise ways to mitigate them.

c. Does launching the product make strategic sense?

Even when a market and concept are real, the product and company could win, and the project is profitable, it may not make strategic sense to launch. To assess if the project makes strategic sense, two questions can be used- *Will it have a positive or negative impact on brand equity?* That is will it cannibalize or improve sales of the company's existing products; will it enhance or harm relationships with stakeholders (dealers, distributors, and regulators), and does the business create opportunities for follow-on business or new markets that would not be possible otherwise; and *Does the product/project fit the overall growth strategy?* That is, will it enhance the company's capabilities (for ex. by driving the expansion of manufacturing, logistics or other functions).

2.2.1.4 Approach IV: A Systems Approach to Agro-industrial Project Feasibility Analysis – Adapted from: *Agroindustrial Project Analysis – Critical Design Factors*, by Austin (1992)

2.2.1.4.1 Overview

An agro-industry is an enterprise that processes materials of plant or animal origin. Processing usually involves transformation and preservation through physical or chemical alteration, storage, packaging, and distribution. Agroindustrial projects are unique because of three characteristics of their raw material: *seasonality, perishability, and variability*. Additionally, three other factors can influence agro-industrial projects –

First, raw materials usually form a major cost component of agroindustries. Hence procurement operations fundamentally shape the economics of the enterprise. But the uncertainty in agro-production leads to instability in raw material prices, thereby complicating budgeting and management of working capital.

Second, many Agroindustrial products are necessities or of major economic importance to countries. Hence governmental interest and involvement in agroindustrial activities are often high. Social, economic, political and legal considerations and governmental actions become very relevant to project analysis.

Third, same agricultural commodities are produced in different parts of the world. Therefore, local agricultural industries are linked to international markets, which represent alternative sources of raw materials, competitive imports, and export opportunities. International commodity markets experience considerable price volatility which affects the agroindustries financial uncertainty on the input and output sides. Moreover in some countries the climatic conditions give the agroindustry a distinct advantage in producing certain export oriented products. These distinctive characteristics of the agroindustry call for a special analytical framework that takes these features into account.

I. A Systems Approach to Agroindustrial Project Analysis

This approach to feasibility analysis views agroindustries as systems and focuses on four types of systemic linkages.

- *Production Chain Linkages.* These consist of the operational stages that agroindustrial materials flow through as they move from the farm through processing and then to the consumer
- *Macro-micro policy linkages*. These concern the multitude of effects that governmental macro-policies have on an agroindustry's operations

- *Institutional linkages*. These involve the relationships among the different types of organizations that operate and interact with agroindustry production chain
- *International linkages.* These deal with the interdependencies of national and international markets in which the agroindustry functions.

Each of these linkages deals with a different dimension of the agroindustrial system, but they are all interrelated. The project analyst needs to understand how the *production chain, macro-policy, institutional, and international linkages* interact and affect the viability of the agro industry. On the whole, the aim of this framework is to create a deeper understanding of the distinctive nature of agroindustrial projects and the design factors critical to success. A complete analysis will however need to include financial and economic analysis.

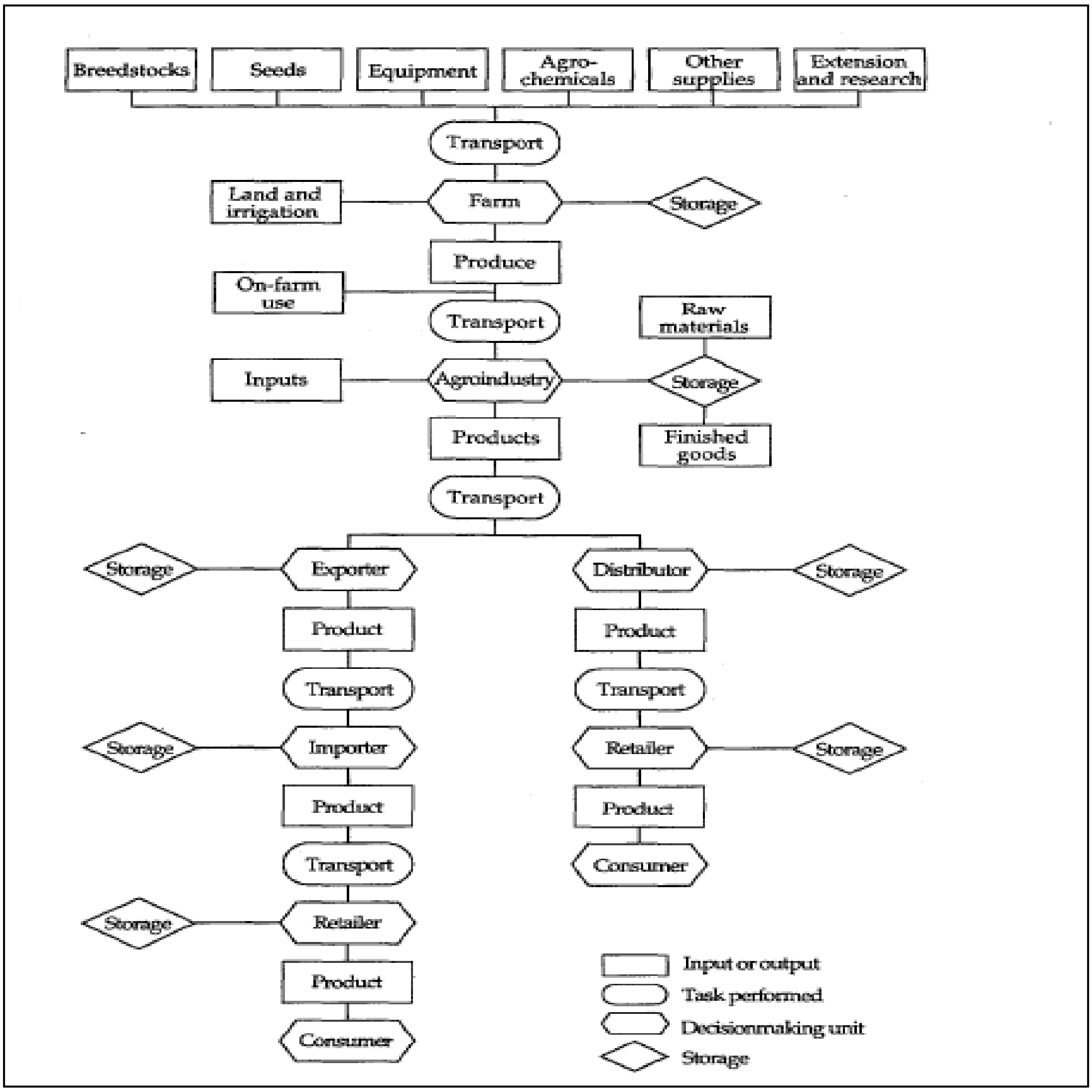
i. Analysing the Production Chain Linkages

Analysts are often confused about whether to examine agroindustrial ventures as agricultural projects or manufacturing projects, resulting in an *"analytical schizophrenia"*. For agroindustrial project analysis the dichotomy is false and counterproductive. Agroindustries are inherently sectoral; it is essential to view the operation as links in a production system and therefore scan the entirety of the chain because of the interdependencies of the links (Figure 2.1).

When a project analysis focuses only on parts of the production chain without taking into account all the links and interdependencies it results in the *"analytical myopia"* problem. For example, in several developing countries the introduction of newer technologies has resulted in an increase in production output. However, the projects failed due to bottlenecks or inadequate planning in downstream agroindustry stages of the production chain, mainly resulting in wastage of production output.

Since an agroindustry system is filled with interdependencies, an analyst must carefully examine all the backward and forward linkages. It is also important to understand the dynamic nature of the production chain (Figure 2.1). The interdependent nature of the production chain means that changes at one point often trigger changes elsewhere, significantly affecting the functioning of the entire system.

Figure 2.1 Agro-Industry Production Chain



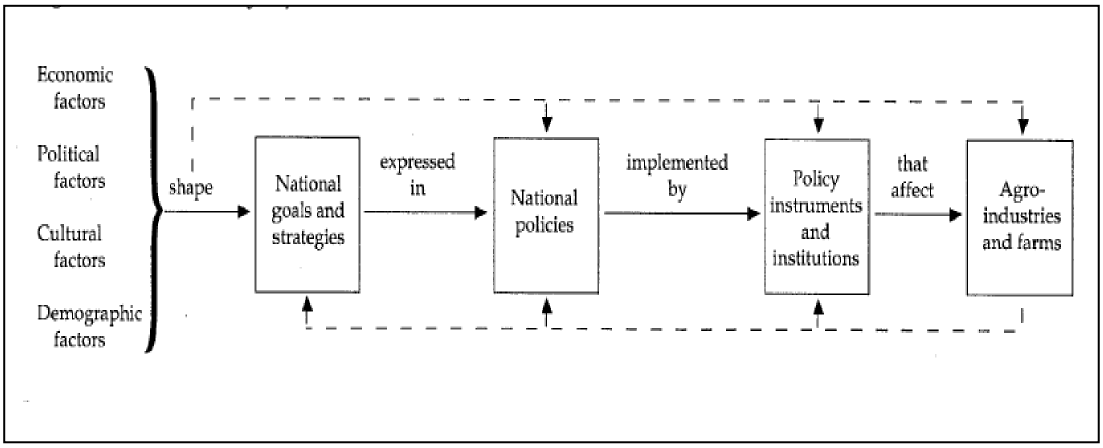
Source: Austin (1992)

Each of the direct and indirect productive functions that occur throughout the length of the chain adds value in the cumulative process of creating the final product (Figure 2.1). The amount of value created will depend on how each function is carried out and how it is linked with others in the chain. For the designer of an agroindustry system this perspective is particularly important in considering which functions in the chain it should perform itself (that is, its degree of integration) and how it should relate to its suppliers and buyers to maximize their collective value creation effort. This ability to structure creatively the "value activities" in the chain is vital to gaining a sustainable competitive advantage (Porter, 1985). The attainment of this advantage could be through either cost leadership or differentiation (Porter, 1985).

ii. Analysing Macro- Micro Policy Linkages

Because of the economic, political, and social importance of food and agriculture, most governments are heavily involved in their nation's agro systems (Figure 2.2). Since governments constitute a large-force in a nations food and fibre production chain, the systems approach must encompass an examination of the government's role as well.

Figure 2.2 Public Policy Impact Chain



Source: Austin (1992)

Macro-polices can be grouped into the following categories: fiscal (revenues and expenditure), monetary (credit and interest rates), and trade (foreign exchange and import/export controls), and incomes (prices and wages). In addition, governments also formulate macro-policies for specific industries such as agriculture, health, education etc.

The analysis needs to identify how the macro-policy will affect the agroindustry being examined, specifically with regard to access to inputs and markets, costs and types of inputs, competition, and prices. The affects are usually pervasive, permeating the procurement, processing, and marketing operations of an agroindustry. Additionally they can directly and indirectly affect the agroindustry's strategy, operations and viability.

iii. Analysing Institutional Linkages

The structuring and managing of institutional relationships are critical to effective design and operations of agroindustries. The project analysis must therefore encompass institutional analysis. For any agroindustry the primary operating and bargaining relationships within the production chain are with its suppliers (mainly farmers) and buyers. From a competitive perspective, an agroindustry interacts with rival processing companies and faces threats from new companies and also product substitutes.

Five main types of economic institutions generally operate in the production chain: farmers and producer cooperatives, state-owned enterprises, multinational corporations, local firms, and marketing intermediaries. The critical task of this analysis is to identify the most significant institutions in the production chain, understand the nature of those organizations, and design relationships that strengthen the agroindustry.

iv. Analysing International Linkages

The final element in the systems approach framework is the international dimension. Agroindustries do not operate in isolation; they are connected in various ways with the international economy. Technological advances in communication and transportation have shrunk the world. All markets are increasingly more quickly and economically accessible. Advances in financial institutions have led to the emergence of highly integrated capital markets. As a result, there are much closer links between international financial and agriculture commodity markets.

International markets pose both threats and opportunities for agroindustries. The analysis needs to identify the possible international nexus point for the agroindustry and assess their implications. This international perspective becomes more important when governments remove protective insulation of import substitution strategies and turn more towards promoting exports and becoming internationally competitive.

II. Applying the Systems Approach Framework

The core operations of an agroindustry are – *procurement, processing, and marketing*. All agroindustries need to obtain raw materials, transform them into products, and then distribute them to buyers. Since the four systemic linkages affect each of these three core operations, they need to be considered throughout the analysis.

i. Marketing Factor

The marketing factor is the logical starting point for project analysis: unless there is adequate demand for a project, it has no economic basis. Agroindustrial project demand must therefore be market focused. A marketing analysis examines the external environments possible or actual response to a firm's product by analysing consumer characteristics and the competition. Based on the systems approach, the marketing analysis should consider the effects of both government policies and international markets.

The agroindustrial system obviously requires both markets and supplies. In addition to market demand, an agroindustry's viability is determined by the agronomic capacity to produce its raw material supplies. A production bias, however, has historically dominated agriculture and agroindustrial project analysis, and markets were considered secondary issues. Too often projects have failed because of a mismatch of production and marketing. There is no point in growing something if cannot be sold. On the other hand, it cannot be sold if it cannot be produced! Thus this is an iterative process, but because agronomic feasibility testing consumes time and resources, it is often economical to identify market needs first. In addition, land has multiple crop or livestock usage and market information can help choose among such alternatives. Furthermore a market analysis can help identify a product need that is agronomically feasible but has not been considered.

The primary factors that need to be considered in the marketing analysis of an agroindustrial project are:

- *Consumers* – The purpose of marketing is to define and meet consumer needs. A consumer analysis ensures that a project will be directed towards and tailored to real market needs. The consumer analysis should include - consumer needs, market segmentation, the purchasing process and market research
- *The Competitive environment*- The analysis includes market structure, the basis of competition, and governmental influence. Agroindustrial projects do not exist in vacuum. They enter a marketplace crowded with agroindustrial firms and products, and their success partly depends on their ability to compete with other firms. This analysis in effect looks at Porters five sources of competition within the market structure: rivals, potential entrants, substitutes, suppliers and buyers.
- *The Marketing plan*- It defines elements of project design, pricing, promotion, and distribution – all with respect to the firms marketing strategy
- *Demand forecasting*- The analysis identifies data needs and forecasting techniques for projecting sales.

ii. Procurement Factor

Agroindustries transform inputs; if those inputs are defective, processing and marketing will suffer. In addition because raw material costs are the major costs for most agroindustries, the procurement system is a vital determinant of the projects economic feasibility and competitive advantage. Moreover, the organization of a projects procurement system can significantly determine its socioeconomic benefits.

An effective agroindustrial procurement system has five characteristics that provide solid foundation for the processing operation: sufficient quantity of inputs, adequate quality of inputs, time-sensitive operations, reasonable cost, and efficient organization. A well-organized procurement system is able to supply enough raw materials of acceptable quality at the appropriate time and at a reasonable cost.

iii. Processing Factor

The functions of processing are both technical and strategic and understanding them is vital for the analysis. From a technical point of view, the purposes of processing are to make a plant or animal product – portable, palatable and preserve-able (the 3p’s of food processing). Form a strategic context, processing ads value in the production chain and creates competitive advantages. These goals are achieved by designing and operating processing activities in ways that attain cost economies or product differentiation. The technical functions of processing should therefore be viewed from this strategic perspective.

CHAPTER 3

METHODOLOGY

3.0 METHODOLOGY

3.1 Research Method

The purpose of this research is to- 1) develop a comprehensive framework that can be used for assessing the feasibility of large scale dairy ventures in India, and 2) to test the robustness of the framework by applying it to a case study (a dairy venture project that Fonterra is considering to implement in India). To achieve these objectives, a case study based qualitative research approach has been selected.

Qualitative research usually starts with a loosely defined research problem (Leedy and Ormrod, 2001). But as the study progresses the researcher gains a better understanding of the problem being researched, and is able to ask specific questions (Leedy and Ormrod, 2001). The qualitative research process is thus evolutionary in nature and assumes structure and shape over the course of the study. This has been the case in this research study as well.

Case study approach is one of several methodologies that can be used for conducting research (Yin, 1994). It represents a research strategy that can be likened to - an experiment, a history, or a simulation, which may be considered alternative research strategies (Yin, 1981). As a research strategy, the distinguishing characteristic of the case study is that it attempts to examine: (a) a contemporary phenomenon in its real-life context, especially when (b) the boundaries between phenomenon and context are not clearly evident (Yin, 1981). Experiments differ from this in that they deliberately divorce a phenomenon from its context (Yin, 1981). Moreover, the types of research questions best addressed by case studies are "explanations", as opposed to other research strategies which focus on addressing incidence questions (Yin, 1981). Case study is also the preferred method for examining contemporary events (Yin, 1994).

To define a research work as being a case study might mean (a) that its method is qualitative, small-*N* (Yin 1994); (b) that the research is ethnographic, clinical, participant-observation, or otherwise "in the field" (Yin 1994); (c) that the research is characterized by process-tracing (George and Bennett 2004); (d) that the research investigates the properties of a single case (Campbell and Stanley

1963, 7; Eckstein [1975] 1992); or (e) that the research investigates a single phenomenon, instance, or example (the most common usage) (Gerring, 2004). But these definitions are useful for describing certain kinds (subtypes) of case studies, rather than the general phenomenon itself (Gerring, 2004). Hence a *"case study," can be best defined as an intensive study of a single (relatively* bounded phenomenon) *unit with an aim (by the scholar) to generalize (elucidate) across a larger set of units* (larger class of similar phenomena) (Gerring, 2004).

In our research the relatively bounded phenomenon that we are investigating is the feasibility of the Nellore dairy project with the larger objective of generalising our findings to the feasibility of other large scale dairy ventures across India. Due to these reasons, a qualitative research approach using a case study is the selected methodology for this research.

3.2 Research Design

There are three types of case study research – descriptive, explanatory and exploratory (Yin, 1994; Leedy and Ormrod, 2001). This research study described the structure and mechanics of a unique framework that could be applied for assessing the feasibility of a large scale dairy venture in India. It then explained the practical applicability and utility of the framework by applying it to assess the feasibility of a case study (large scale dairy venture). For these reasons, this research study can be defined as being both descriptive and explanatory in nature.

3.2.1 Study Protocol

An explanation, and not a single variable or factor, is what is being tested in our study. Hence a single-case study is sufficient (Cook *et al.*, 1979; Yin, 1981). The single-case study approach can also be useful in making comparisons or generalizing to other similar cases well. As suggested by Yin (1981) the example of a crime detective can be used to explain this – "*Assume that a detective has already produced a tentative explanation for a single crime (within-case analysis). Now the detective is confronted with another case, where the relevant conditions appear to be similar to those of the first case, and where the detective may be able to use the first explanation and establish that both crimes were committed by the same person. Modification may be necessary in applying the* *explanation to the second case, and the detective must learn to ignore irrelevant variations from case to case. How the detective carries out this work in (a) constructing an adequate explanation for each case singly, and (b) knowing the acceptable levels of modification in the original explanation as new cases are encountered, may be considered analogous to what confronts the researcher in doing a single case study analysis and then applying it similar cases".*

This research consists of a single case study and the unit of analysis is a specific large scale dairy venture project in India that could be undertaken by a New Zealand based dairy co-operative (Fonterra). Based on the guidelines suggested by Yin (1994) for undertaking a case study based research, a case study protocol was developed. It consisted of the following parts:

a. Review of preliminary information
b. Determination of case study to be studied
c. Development of case study database
d. Semi-structured interview (45 min to 1 hour long), using open ended questions
e. Overview of the case study
f. Descriptive information
g. Analysis
h. Outline of individual draft reports
i. Revision by key personnel
j. Final individual case study report

3.2.2 Issues of Research Quality

Lack of rigour is one of the major concerns of case study based research. In order to limit this, and ensure quality of the case study design, special emphasis was laid on constructing validity and reliability in the study based on guidelines suggested by Yin (1994). These practices included –

a. Using multiple sources of evidence when collecting data (a wide array of books, reports, journal papers, media articles were used).

b. Submission of draft case study reports to key informants/participants
c. Use of a case study protocol
d. Development of case study database

Moreover, during the course of this research project, the framework of feasibility analysis as well as the outcomes of the feasibility analysis of Nellore dairy project using the framework was provided to Fonterra management. Also, on a specific request by Fonterra management, the framework was used to assess feasibility of a large scale dairy farm in Sholapur region of Maharashtra state. Additionally, the framework was also used to identify possible regions in India that might be relatively more suitable for such large scale dairy farms. The results of these analyses were presented to group comprising of a director, senior management and middle management of Fonterra. Both the framework and the outcomes were well accepted by the group. This process indicates the utility of the framework and reiterates the validity of the research.

3.2.3 Ethical Considerations

It is very important to ensure that the rights, privacy and welfare of the people and communities that form the focus of the study are protected (Berg, 1998). In our study precautions were taken to ensure the confidentiality and anonymity of key participants/informants. All information collected form participants/informants were kept confidential and individual details were not revealed at any time.

3.3 Selection of Participant

As discussed earlier, a single case study was the selected research design. In line with the design, a project to be undertaken by a New Zealand based dairy co-operative (Fonterra) was analysed as a case study in our research.

Before the start of this research study, we learnt that the New Zealand based dairy co-operative Fonterra (along with its Indian partner Indian Farmers Fertilizer Cooperative (IFFCO)) was considering establishing a (first of its kind) large scale dairy farm in India. This project (Nellore project) gave us a unique opportunity to practically apply (and test) our framework on a specific large scale dairy venture project in India. Hence the Fonterra Nellore project was selected as the case study upon which this research project is be based. We believe interesting gains can be obtained from analysing this case study.

3.4 Data Collection

Given the unique nature of the research problem being addressed, most of the data used was obtained from secondary sources. An extensive literature review was performed to understand the purpose, mechanics and methods used for conducting feasibility studies. Based on the specific issues related to this research, four approaches that could be used for developing a feasibility framework were identified from available literature sources.

When the framework was applied to the case study project, once again data from secondary sources was used. For example, for the analysis of the world dairy sector, information was primarily collected from reports published by the International Dairy Federation, International Farm Comparison Network, and Food and Agricultural Organisation. For the analysis of the Indian dairy sector a wide range of secondary sources such as news and magazine articles, journal publications, industry/government reports and internet sources were used. For the analysis of the Indian business environment secondary data sources included reports published by Business Monitor International, Economic Intelligence Unit, World Bank and Political Risk Services.

For each of the project specific parameters that needed to be assessed in our framework, data was collected from both primary and secondary sources. Primary sources included practicing field veterinarians, professionals in dairy companies, engineers, and agricultural officers. Secondary sources included internet resources, magazine and news articles, and journal publications

Additionally an interview of a core team member of the co-operatives international farming investments division was conducted. This interview was semi-structured, with open-ended questions. The main purpose was to get a better understanding of the co-operatives India specific strategy and the reasons and implications behind it. Also, through the interview the researcher was able to obtain an understanding of the co-operatives overall international farming investments strategy. The interview was approximately 90 minutes long.

3.5 Data Analysis

All relevant data sources were initially screened to identify factors and conceptual themes that were outlined as critical in our framework. Following which a filter was applied and only essential data that reflected a vital concept or phenomenon were recorded. This data were then condensed and categorised in a logical manner to meet the specific requirements and reinforce each theme they represented.

The data analysis process is divided into three stages. In the first stage, data from the review of feasibility studies is consolidated and an integrated, holistic framework of feasibility analysis is developed. In the second stage, data pertaining to the three contextual factors is analysed and significant trends/themes are identified. In the third and final stage, data relevant to each project specific parameter is analysed, and the feasibility spectrum (Yes, Maybe, No) for that parameter is determined. After considering the feasibility of all parameters, an overall feasibly profile for the project is arrived at.

3.6 Presentation of Results

The framework of feasibility analysis that was developed as well as a description of the company (Fonterra) and Nellore dairy project report (case-study) are included in the results. Additionally, the outcome of testing the framework on the case-study is also presented in the results. The study ends with conclusions, recommendations, answers to the original research questions, and probable areas of further research.

The target audience of this report would consist of leaders in multi-national and Indian dairy companies, management consulting firms with dairy companies as clients, specialist researchers, and general audience with an interest in feasibility studies of dairy ventures and/or international dairy farming strategies.

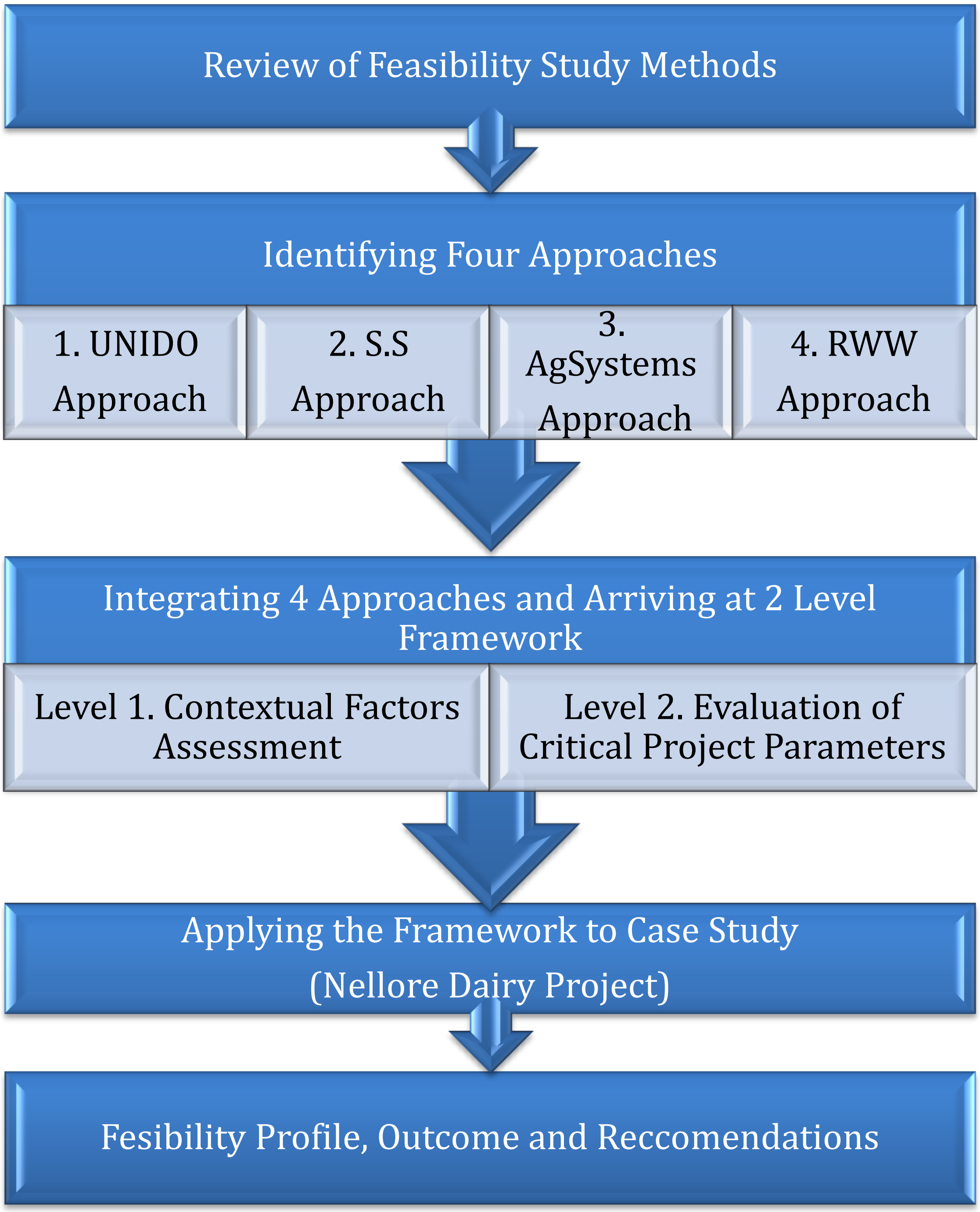
3.7 Summary

This study primarily focuses on the development of a unique framework for assessing the feasibility of large scale dairy ventures in India. It then examines the robustness of the framework that was developed by applying it to a specific case study (a large scale dairy venture project in India).

A single case study is the selected methodology for this research. Data for this research was obtained from mainly secondary sources. These sources included journal publications, annual reports from Government of India, newspaper and magazine articles, and internet based sources.

Based on available information and the underlying context, a comprehensive framework for feasibility analysis of dairy ventures in India was developed. Following the guidelines prescribed by the framework, relevant information was critically analysed and an individual case study was outlined.

Figure 3.1 A Model Explaining Framework Development and Its Application Process



CHAPTER 4

RESULTS & DISCUSSION (PART A)

Section I – Framework of Feasibility Analysis

4.0 RESULTS AND DISCUSSION (PART A) SECTION I – FRAMEWORK OF FEASIBILITY ANALYSIS

4.1 The Framework of Feasibility Analysis

Each of the four approaches that were reviewed and described in the literature review has distinct strengths and weaknesses (Table 4.1). On the whole, to use as a stand-alone approach, the S&S approach is the weakest while the UNIDO and RWW approaches are much more robust (Table 4.1). Although each of these approaches appears to be different, their end objectives are similar – to identify if a particular project is worth pursuing. However, to increase the accuracy of a feasibility study, as well as to make it multi-dimensional, it would be essential to follow a more holistic approach.

In order to have a more holistic approach, the feasibility study framework that was developed integrates elements from all four approaches. It also includes most of the important concepts/dimensions that were described in the review of literature on feasibility studies. In general guidelines and principles recommended by all four approaches were used for assessment of the parameters identified. But importance given to each approach, depended on the relative strength of that approach with regards to the parameter being assessed. For example, in the assessment of Project Rationale and Context, the exact order of importance of approaches used was Approach I> Approach IV > Approach III > Approach II. This is in line with the relative strength of Approaches' for that particular parameter (Table 4.1).

Table 4.1 A Comparison of the relative Strengths and Weaknesses of the Four Approaches Chosen

S. No	**Parameters/ Factors Considered**	**Approach I** (UNIDO)	**Approach II** (S & S)	**Approach III** (R-W-W)	**Approach IV** (AgSystems)
1.	Contextual Factors	☆☆☆☆	☆	☆☆☆	☆☆☆☆☆
2.	Project Rational & Context	☆☆☆☆☆	☆☆	☆☆☆	☆☆☆☆
3.	Demand & Market	☆☆	☆☆☆	☆☆☆☆☆	☆☆☆☆
4.	Production, Technical & Engineering	☆☆☆☆☆	☆☆	☆☆☆☆	☆☆☆
5.	Material Input/Supply	☆☆☆☆	☆	☆☆☆	☆☆☆☆☆
6.	Location & Site	☆☆☆☆☆	☆	☆☆☆	☆☆☆☆
7.	Labour & Management	☆☆☆☆☆	☆	☆☆☆☆	☆☆☆
8.	Project Economics	☆☆☆☆☆	☆☆☆	☆☆	☆
9.	Financial Analysis	☆☆☆☆☆	☆☆☆☆	☆☆☆	☆
10.	Risk Issues	☆☆☆☆	☆	☆☆☆☆	☆☆
11.	Implementation & Scheduling	☆☆☆☆☆	☆☆	☆☆☆☆	☆
12.	Political & Legal Issues	☆☆	☆	☆☆☆	☆☆☆☆☆

13.	Socio-Economic Impacts	☆☆☆	☆	☆☆	☆☆☆☆
14.	Environmental Impacts	☆☆☆	☆	☆☆	☆☆☆☆
15.	Sustainability*	☆☆	☆	☆☆☆	☆☆☆☆
16.	Degree of being “HOLISTIC”	☆☆☆	☆	☆☆☆☆☆	☆☆☆☆
17.	Ease of Application	☆☆☆	☆☆☆☆☆	☆☆☆☆	☆☆
18.	Flexibility of Assessing other parameters (Ex. Goodwill, Follow on opportunities, etc.)	☆☆	☆	☆☆☆☆☆	☆☆☆

Note: This is a relative assessment

☆☆☆☆☆ -Indicates the approach that is BEST suited of the five for assessing a given parameter/ factor

☆ -Indicates the approach that is LEAST suited of the five for assessing a given parameter/ factor

* For the assessment of Sustainability, a modification of the method recommended by IFCN (2010) was used.

The application of the framework and the feasibility analysis process is divided into two levels. The first level of analysis focuses on describing the underlying contextual factors that shape and influence the outcomes of large scale dairy ventures in India. The second level of analysis is specific to the project/ model being assessed. The main focus is on identifying the project/model specific feasibility parameters to be assessed, and subsequently capture necessary data for each of these parameters and critically analyse them. Additionally outputs from level 1 were rigorously screened/ evaluated and put it into context for the specific model being evaluated.

4.1.1 Level 1 Analysis

This analysis is based on rationale that agro-industries in general and the dairy sector in specific do not exist either in a vacuum or in isolation. But instead they exist in a largely interconnected global web of governments, markets, institutions and industries (Austin 1992). The dairy sector in particular is an integral part of the global food market and the key to understanding the global food industry lies with understanding changing consumer demands/preferences and the food industry's efforts to meet these demands (Gehlhar 2006). However, the global food market in itself is extremely dynamic and the process of transporting food from the farm to the table has become more complex, and involves diverse local, national, and global agents and networks (Regmi, 2003). These evolving food markets are driven not only by changes in consumer preferences, but also by technology, linkages between members of the food supply chains, and prevailing policies and business environments (Regmi, 2003).

Based on this rationale and principles recommended primarily by approach IV and secondarily by approach I of our framework, we identified three critical contextual factors that need in-depth analysis and understanding. These were – The World dairy sector, the Indian dairy sector and the Indian business environment. We believe this analysis will identify any significant barriers to entry as well as critical factors that influence the success (or failure) of a dairy venture in India. The concepts and themes covered in this analysis (Level 1) are not bound to a specific dairy project/model, but instead have a significant bearing/influence on any/all large scale dairy ventures in India.

4.1.2 Level 2 Analysis

In this analysis, each of the 15 parameters identified in our framework are assessed individually using the guidelines prescribed by two or more approaches (Table 4.2). Using the mechanics of the RWW (approach III) as an example, the process of assessing each parameter in our framework was simplified through the framing of well-defined questions and identifying answers (Table 4.2). Based on a subjective analysis of data/information pertaining to each question, a best answer is identified. The flexibility of this method allows the researcher to incorporate and analyse any specific issues/concerns that might arise within the context of the larger parameter being assessed.

To add further structure to the analysis, answers to the questions were classified into one of three categories – Yes, Maybe and No. Additionally, to make interpretation easier a scoring system was also introduced. Based on the analysis of the data, a Yes answer could receive a score from 1 to 3, Maybe answer a score from 4 to 6 and No answer receives a score between 7 and 9. Depending on the relative importance of each theme a particular question represents, weights can be assigned by a researcher if required. Following which an average feasibility score (Ranging from 1 to 9) for the parameter can be calculated.

Once feasibility scores for all 15 parameters have been derived, the overall feasibility score (Ranging from 1 to 9) and also feasibility profile for the project can be arrived at. Once again weights can be included if required by a researcher to stress the relatively greater importance of certain parameters to the company/model.

An overall feasibility score of less than 3 indicates that project/model is feasible, and is worth pursuing provided most critical parameters are not in the not-feasible spectrum. A score greater than 3 and less than 6 indicates that further study is required to try and identify if more feasible options are possible. And a score greater than 6 indicates that the project/model is not feasible, and hence not worth pursuing any further (at this point in time).

Table 4.2 Assessing Feasibility of Dairy Ventures using Framework of Analysis

S. No	Parameters (Weightage %)	Questions framed	Answer (Score)		
			Yes (1 to 3)	**Maybe (3 to 6)**	**No (7 to 9)**
1.	**Project Rationale/ Context** (6)	Is model rationale sound?			
		Does model fit into the larger context?			
		Does company have prior experience in executing similar model?			
		Does company have superior resources?			
		Is it in line with the vision & strategy of the company?			
		Average Score			
2.	**Demand & Market** (8)	Is there a demand for the product?			
		Are factors driving demand known/clear?			
		Can customers buy it?			
		Is size of potential market large enough?			
		Can an adequate market share be achieved			
		Will customers buy it?			
		Can company understand and respond to market?			
		Average Score			
3.	**Production & Engineering** (10)	Are the technical specifications known?			
		Can project/model be executed with locally available technology & materials?			
		Can technology &			

		operational standards be met easily?			
		Are local supply/support services NOT critical/ essential?			
		Are local support services available/ dependable?			
		Does a value chain for the product exist?			
		Can logistical challenges be easily addressed?			
		Average Score			
4.	**Material Input/ Supply** (8)	Can critical raw materials be produced/ sourced?			
		Is it of sufficient quantity?			
		Is it of acceptable quality?			
		Average Score			
5.	**Location & Site** (8)	Are climate and environment conditions favourable?			
		Can a project site be easily acquired?			
		Is it at reasonably close proximity to markets?			
		Is it at close proximity to raw materials?			
		Is local infrastructure adequate?			
		Can it function without support of political establishments and bureaucracy?			
		Average Score			
6.	**Labour & Management** (4)	Are sufficient un-skilled and semi-skilled workers available locally?			
		Do they (local skilled and semi-skilled workers) have adequate/appropriate experience/background?			

		Are sufficient supervisory & managerial personnel available locally?			
		Do they (local supervisory & managerial personnel) have adequate/appropriate experience/background?			
		Can project be implemented without Ex-pat managerial presence?			
		Is threat & impact of industrial strife low?			
		Average Score			
7.	**Project Economics & Financial Analysis** (8)	Can costs be accurately determined?			
		Will forecasted returns be greater than costs?			
		Is forecasts riskiness low?			
		Is time to breakeven acceptable			
		Is ROI adequate (greater than 15%)?			
		Is NPV/IRR adequate?			
		Average Score			
8.	**Risk Issues** (10)	Is there a market risk*			
		Is there a product risk*			
		Is there a significant input price risk?			
		Is there a significant output price?			
		Is there a food safety/human health risk?			
		Is there an animal health/biosecurity risk?			
		Is there a security risk?			
		Are there any potential causes for project failure that cannot be mitigated?			

		Are overall risks acceptable?			
		Average Score			
9.	**Sustainability** (6)	Can model be profitable without government subsidies?			
		Is cost of production less than US$ 30/100 kg milk?			
		Is operating profit margin greater than 16%?			
		Is milk yield per cow greater than 7000 kg/year?			
		Is feed efficiency (kg milk/kg DM) greater than 1.2			
		Is milk price greater than US$ 40/100 kg milk			
		Is labour price less than US$ 6/hour			
		Is quality of milk good? (SCC less than 150,000/ml & Bacterial count less than 150,000 cells/ml)			
		Average Score			
10.	**Implementation & Scheduling?** (4)	Can a definite project timeline be defined /designed?			
		Can the targets in the timeline be met?			
		Are significant project overruns NOT expected?			
		Average Score			
11.	**Political & Legal/ Regulatory Issues** (6)	Is model NOT a politically sensitive issue?			
		Is general political environment stable and favourable			
		Do political threats exist?			
		Are impacts of political threats small/ insignificant?			

		Can political system be prevented from giving competitors unfair advantages?			
		Is legal environment stable and favourable?			
		Are rules, regulations and policies affecting the model clearly defined/ transparent?			
		Can legal/regulatory system be prevented from giving competitors unfair advantages?			
		Average Score			
12.	**Socio-Economic & Cultural Impacts** (6)	Does it fit with the local culture & norms			
		Does it include participation of local stakeholders			
		Does it deliver significant benefits to local communities			
		Does it contribute towards development of local dairy industry			
		Will it NOT cause displacement of local farmers			
		Average Score			
13.	**Environmental Impacts** (6)	Does model pose a threat to environment?			
		Can environmental damage be mitigated/contained?			
		Is environmental damage (if any) significantly less than existing practices/systems?			
		Average Score			

14.	**Good-will & Follow on Opportunities** (4)	Will project generate good-will locally?			
		Will it enhance companies brand equity?			
		Does it provide for follow-on opportunities & new market access?			
		Average Score			
15.	**Other** (6)	Does model have a competitive advantage?			
		Can the advantage be sustained?			
		Is it known how competitors will respond?			
		Can company be competitive?			
		Average Score			

* For the assessment of Market Risk & Product Risk the guidelines (Risk Matrix) suggested by Day (2007) were followed.

CHAPTER 4

RESULTS & DISCUSSION

(PART A)

Section II – Description of the Case Study

SECTION II – DESCRIPTION OF THE CASE STUDY

4.2 Overview of Fonterra

Fonterra Co-operative Group was formed in October 2001 by the merger of the New Zealand Dairy Board, New Zealand Dairy Group and Kiwi Co-operative Dairies. The company is co-operatively owned by 10,485 New Zealand dairy farmers, and accounts for about 89% of milk production in the country.

Today, Fonterra is one of the largest dairy companies in world. In 2011 it collected more than 15 billion litres of milk from its farmer-suppliers and had an annual turnover of NZ$ 19.9 billion (Table 4.3). It is also the world's leading exporter of dairy products and the largest diversified milk processing company. To say that it is an export driven company would be an understatement. It currently exports 95 per cent of its New Zealand-made dairy products to customers and consumers in more than 140 countries (Fonterra, 2011). It also accounts for more than 35% of world trade in dairy products. Clearly indicating that vast majority of its revenue is generated from foreign markets.

In addition to being one of the top producers of base dairy nutrition for export, including milk powders, cheese and butter, it has substantial interests in consumer branded businesses across Asia, Latin America, Australia and its home market of New Zealand (Fonterra, 2011). Fonterra Brands is the consumer products division of Fonterra. It handles the production, distribution, marketing and sales of ready-to-use dairy products throughout the world. In the supply chain, this division is positioned closest to Fonterra’s millions of consumers across the globe. To cater to the specific needs of each market Fonterra brands has a network of regional teams that have an intimate knowledge of local tastes and the requirements of customers on the ground.

The brands that support this wide range of products are one of Fonterra's most important assets. Fonterra has five core brands whose products cover the entire dairy spectrum - from milk and cheese to prenatal, infant and growing up formulas, mobility formulas, yoghurt, ice cream and innovative snacks. These products are targeted at consumers around the world who put a premium on taste, nutrition, health, craftsmanship - and sheer indulgence. Its best known brands are:

Anchor, Tip Top, Anlene, Anmum, Mainland, Fresh 'N Fruity, Soprole and Fernleaf (Fonterra, 2011).

Fonterra also has considerable expertise in R & D and is able to deliver innovative dairy solutions for global food companies. Its R &D division constantly works with its customers to unlock the hidden properties of milk and provide ingredients for a range of application categories, such as beverages (ClearProteinTM), bars and snack foods (Power ProteinTM), cultured foods, ingredients for cheese, cheese for meals, organics, medical foods (SureProteinTM), and paediatric nutrition. Additionally, the range of standard dairy ingredients supplied by Fonterra includes, milk and whey proteins, milk powders and cream products (Fonterra, 2011).

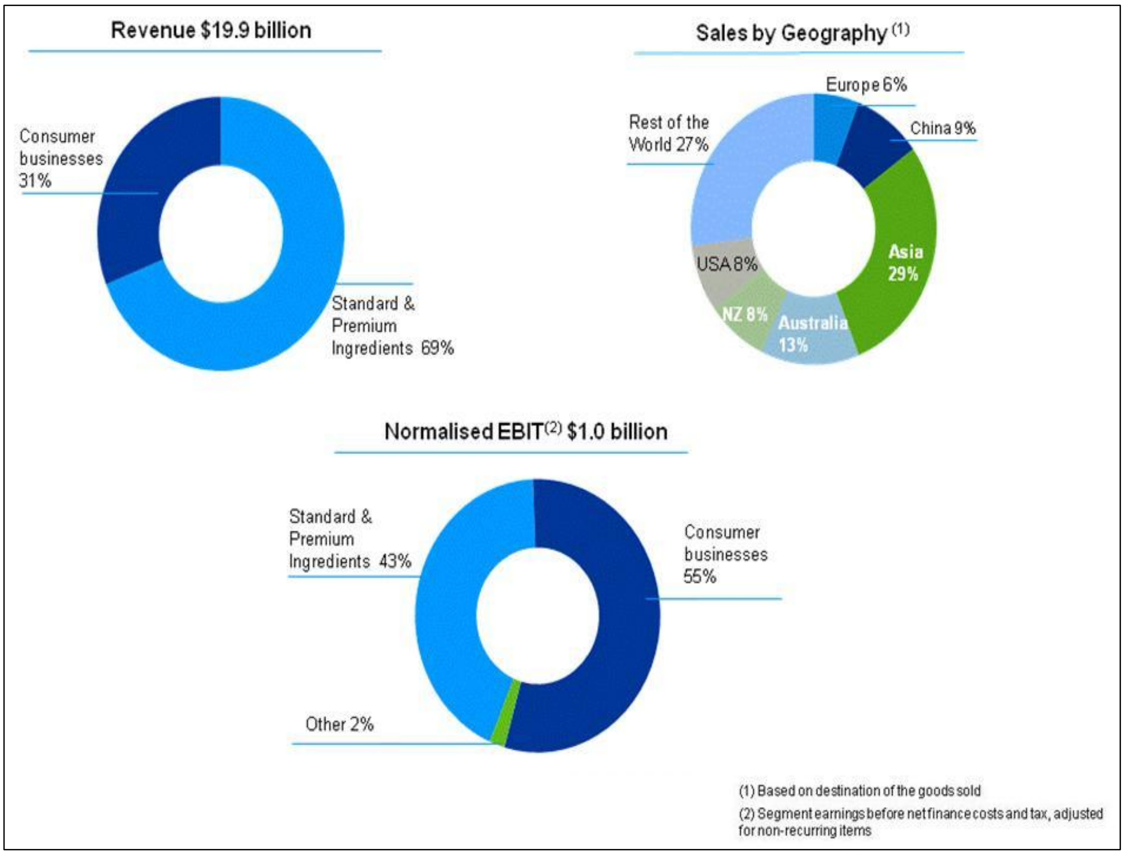
Over the years Fonterra has also built strong partnerships with other leading global dairy companies such as Nestle, Dairy Farmers of America and Royal Friesland Campina through supply chain integration and innovation. These strategic partnerships have given Fonterra vital access to several markets.

Table 4.3 Overview of Fonterra

Total Assets Employed (Billion NZD)	15.5
Total Equity (Billion NZD)	6.5
Annual Turnover (Billion NZD)	19.9
Milk Solids Collected (Million Kg)	1,346
Employees	16,800
Shareholders	10,485

Source: Fonterra (2011)

Figure 4.1: Fonterra Revenue, Sales & Profit for 2010-11



Source: Fonterra (2011)

Amongst destination markets, Asia (excluding China) accounts for highest proportion (29%) of Fonterra's exports, followed by the rest of the world (27%) and Australia. Surprisingly, China with a population close to 1.4 billion accounts for just 9% while New Zealand with a population of 4 million accounts for 8%.

Interestingly, the consumer business accounted for 31% of the NZ$ 19.9 billion in sales revenue, but 55% of the NZ$ 1 billion profit. While the standard and premium ingredients business accounted for 69% of sales revenue but only 43% of profits. Clearly indicating the lower profit margins of the commodity based ingredients business compared to the branded consumer products business.

4.2.1 Governance

There are up to 13 directors on the Board of Fonterra. Nine are elected by shareholders and the rest are appointed by the Board. Additionally there is a Shareholders' Council that bridges the gap between board and shareholders. It is made up of 35 shareholders representing 35 wards all over New Zealand. The

Council operates independently of Fonterra and its main responsibility is to make sure the needs of supplier shareholders are recognised by the Board. The Shareholders' Council appoints a Milk Commissioner to mediate any disputes between shareholders and Fonterra.

4.2.2 Strategy

In order to meet the challenges and opportunities in the dairy industry, Fonterra’s strategy focuses on four areas:

1. Ensure Fonterra remains one of the lowest costs, sustainable dairy co-operatives in the world.
2. Build trusting partnerships with customers by being a multi-origin supplier, allowing us to build more valuable relationships through supply chain integration and innovation.
3. **In high growth markets, where it is not practical to use New Zealand milk, we will leverage our cow to consumer expertise to take leadership positions using locally produced milk.**
4. Make Fonterra products the first choice of customers and consumers wherever we do business

4.2.3 Business Units

Fonterra executes its strategy through four distinct business units. These units are based on product type and geographic area, and it defines how the business is managed. These are:

1. Fonterra Trade & Operations – This includes all operations from farm gate to customers. This comprises of - Milk Supply, Shareholder Relations, Milk Collection, NZ Operations, Offshore Milk Sourcing and Processing (except those activities already under other Strategic Business Units), Supply Chain, Sustainability, Government Relations and Global Trade.
2. Fonterra Global Ingredients and Foodservice – operations in North Asia, North America and Europe, Corporate and equity accounted joint ventures.

3. ANZ – operations in New Zealand and Australia, including businesses marketing brands such as Anchor, Tip Top and Mainland.
4. Asia & AME – operations in Asia, Africa and the Middle East.

All Fonterra's operations are aligned with either the processing of dairy nutrition or sales of branded products to consumers.

4.3 Fonterra Farm in China

China is a very important market for Fonterra. In 2011, China ranked as the number one market for Fonterra's ingredients (Fonterra, 2011). And while Fonterra's consumer brands are relatively new to the China market, they have been growing quickly (Fonterra, 2011). Fonterra recognised quite early that China is a market in massive transition, with a rapidly emerging middle class and expanding appetite for fresh dairy. However, local milk supply in China was not growing as fast as the market, the industry is fragmented, and dairy supply chain has had serious quality issues to confront over recent years (Fonterra, 2011). This situation creates unique opportunities for Fonterra and it is the reason behind Fonterra establishing its own dairy farms and milk supply chain in China.

In 2008 Fonterra established its first dairy farm in China at the Hangu County of Hebei province near the city of Tangshan (Oliver, 2009). With 3000 Friesian heifers imported from New Zealand, the 35ha farm was set up as a pilot project to build a reliable source of quality milk to supply its local Chinese partner (Oliver, 2009). Dairying knowledge from New Zealand with feed lot expertise from USA was combined and applied on this Farm.

The farm is a feedlot system with the animals housed in barns and feed bought from local farmers. About 50,000 tonnes of corn silage was bought from neighbouring farmers during the first year of operation (Oliver, 2009). Meadow hay, lucerne, brewer's grain, whole cottonseed, soybean meal, soybean hulls, ground corn and protein concentrates make up the rest of the feed ration. Different formulations are fed to the milking herd, dry stock and young stock. Three Sortie type Total Mixed Ration (TMR) feed wagons are used to mix and distribute the feed.

Newly calved and high-producing cows are milked three times a day with the others milked twice in two low-maintenance high throughput swing over type herring bone milking parlours. The average production per cow target is 25kg/day. Milk is sold on a volume basis with a base price agreed with the customer; this price can fluctuate based on the market price as well as incentives for additional protein and fat. There are also additional incentives or penalties based on other factors such as bacterial counts and somatic cell counts (Oliver, 2009).

Temperatures can fall well below freezing in the winter and rise into the mid 30's in the summer (Oliver, 2009). Heat stress can be highly detrimental to milk production so good ventilation and a system of fans and sprinklers are used in the barns. Also since the farm is situated on a coastal plain with the water table about 60cm below ground, surface flooding can be an issue during summer downpours. After the first summer of operation a few design changes have been implemented.

The farm employs 100 full-time workers including office staff; and temporary workers are also employed when needed (Oliver, 2009). Farm workers are divided into teams for milking, feeding and cleaning. Workers and management are all housed on the farm while the senior management's families live in Beijing. A large wall surrounds the farm and access is limited. This is a biosecurity measure as well as to help prevent petty thieving (Oliver, 2009).

However, in China things don't always go according to plan and setting up this farm was no exception (Oliver, 2009). Construction of the farm was managed by Beca International from NZ and incorporated design features from around the world. Site selection took longer than expected and involved navigating through a lot of bureaucratic red tape that delayed the start of construction. During the winter there were delays in concrete being poured, including heavy fog preventing trucks from coming to the site. Over the Chinese New Year period most construction projects come to a standstill for two weeks as labourers go home to be with their families. The cows arrived in Chinese quarantine in October and farm construction was originally expected to be completed and milking started by December 20, 2007. However it was only completed in May 2008, meaning that the cows had to be housed in temporary facilities where they were calved and then milked. Some were dried off early. These less than optimal conditions have meant that first year production has been lower than budgeted (Oliver, 2009).

When asked what would have been done differently, a Fonterra executive based in China told the author …"*there are a number of things that we would do differently at the farm level including design changes and ways of saving money while retaining quality. Also, resourcing earlier and training earlier; as well as having legal and regulatory requirements around land absolutely locked down at an early stage*" (Oliver, 2009)

Following the success of its China farm, in 2011, Fonterra confirmed plans for establishing its second and third farms in China and outlined a vision to develop more farms to play a bigger role in the development of the Chinese dairy industry (Fonterra, 2011). The farms will give Fonterra the ability to source high quality local milk both for its customers and potentially over time for its own branded products (Fonterra, 2011).

4.4 Description and Critical Review of Nellore Dairy Project

Background

The challenges presented with milk supply in India are quite similar to that observed in China - demand growing faster than local supply, large un-organised sector, fragmented industry and serious milk quality concerns. Like in the case with China, this situation creates unique opportunities for Fonterra and it is the reason behind Fonterra considering the establishment of its own dairy farms and quality milk supply chain in India.

Based on their China experience, Fonterra has decided to establish a very similar large scale dairy farm (3500 cows) model in India to meet its milk supply needs. It was proposed that this farm be established in the Nellore region of Andhra Pradesh because Fonterra's local partners in the venture (IFFCO) have control of a sizable amount of land in this region. In order to identify the right model and assess the locations suitability, Fonterra performed a preliminary scoping/pre-feasibility study. The outcome of this study is the Nellore Dairy Project Report. This sub-section of the thesis focuses on describing the salient features of the report as well as critically evaluating it.

4.4.1 Overview

The report has rightly identified climate and feed (specifically land for forage cultivation) to be the two significant constraints to large scale dairy farming in the Nellore region. However, it has been highly "feed" focused and other factors/constraints were not considered in depth. Since, maize was identified as an ideal feed as well as a significant limiting factor, the analysis has logically been maize focused. A detailed description of maize farming and all factors that are necessary for successful maize farming were outlined. Following which an assessment of the Nellore region for each of those identified factors was performed. The report has also covered in detail possible soil and crop management practices that would be needed for successfully growing maize in the Nellore region.

4.4.2 Feeding Options and Challenges

As the report has been highly feed resource centric, it includes a comprehensive and in-depth analysis of several feeding strategies. The report identifies that a significant portion of feed must be derived from agro-industrial by products. [Due to the food security concerns in India, using agro-industrial by products (and crop residues) to a significant proportion in the ration is the best option as this ensures valuable (and scarce) agricultural land is not used for producing livestock feed]. Based on feed requirements of dairy animals, a review/analysis of locally available agro-industrial products was performed and few potential feeds were identified- broken rice, cotton seed extract, rice bran and palm kernel extract. A brief description of strengths and weaknesses of each was also provided. The report also mentions that there are several other alternative by products available for feeding.

4.4.3 Primary Forage Options

Forages form the most important component of the diets of dairy animals. The report has clearly identified that forage options are the biggest constraints to the development of the dairy farm. The analysis has therefore spent considerable amount of time and effort in identifying the various forage feeding options and associated challenges. However, the analysis seems to be biased towards maize silage as being the best option- based on the fact that maize is the most widely used forage in intensive feedlot operations elsewhere in the world. Although significant challenges/constraints to maize production (land and soil quality primarily) have been identified, it does not give sufficient importance to the possibility that maize might not be the best option in this context– given the local conditions. The analysis has identified two other primary alternate forage options in Napier grass and Leuceana as well. Napier grass was not preferred (over maize) because of its lower nutrient quality, which would result in lower milk production. Leuceana, which is tree fodder, was identified as a potential fed source to compliment the maize based diet and not as a standalone forage option.

A more in-depth analysis would reveal that Napier grass is the most widely used green forage option in India. Realizing the potential of this grass, several research institutes in India have been working for many decades to constantly improve and produce superior varieties. Thus Napier grass varieties that are most suitable to a given environment in India (soil, rainfall, climate etc.) can be more easily (than maize) identified. Moreover, as there is considerable local knowledge about this grass it can be grown/sourced from local farmers. This would reduce land requirements for the farm as well as ensure local community participation in the project. Leuceana (a tree forage), is a recommended forage source for subsistence type of framing systems that are widely prevalent in India. This tree usually grows in the wild, or a farmer might have one or two trees at home/on farm. The possibility of local farmers having an entirely Leuceana based crop is unlikely. Moreover, since this forage contains a toxin called Mimosine, local farmers are told (by local extension agents) not to include it by more than 15% in the diet.

4.4.4 Alternate Forage Options

Apart from the primary forage sources the study has also identified alternate forage sources such as rice straw, sugar cane and soya/legume residue. Nellore is predominantly a rice and sugar cane growing region. There is plenty of rice (paddy) straw (a by-product of rice crop) available locally and is used considerably by local dairy farmers to feed their livestock. The study has rightly pointed out that rice straw has poor digestibility and nutritional value. As a solution, the study suggests treating rice straw with urea to improve digestibility. This process (called urea- ammonisation of paddy straw) has been widely recommended to local dairy farmers by extension agents in India. However, uptake by farmers has generally been low mainly due to palatability issues, resulting in lower feed intake by cows. The authors also suggest the feeding of whole sugar cane to cows. Given the competitive nature of the sugar industry, this may not be well accepted by the local sugar barons. Also given the priority status of sugar in India's food security policy, this approach could face considerable opposition from elements within government as well. Instead of feeding whole cane, it might be a better option to consider feeding sugar cane tops (a by-product). This tactic is used by local dairy farmers. The final option of feeding legume residue from local pulse production (pigeon-pea, chick-pea and black gram) might be a viable option to a certain degree and is worth further investigation.

4.4.5 Dairy Cow Ration/Diets

Based on forage and feed options available, the analysis formulated and evaluated three lactating cow diets and compared it with an optimal (ideal) diet. The diets were formulated using the widely accepted (for intensive feedlot based operations) Cornell Net Carbohydrate and Protein system and Friesian cows were used as representative dairy animals. All diets (except optimal diet) included a significant amount of locally available agro-industrial by products. The main difference between options 1 and 2 is the quality of maize silage. In option 2 the quality of maize silage is expected to be lower (and variable) because it will be sourced from local farmers, whereas in option 1 maize will be own grown. As a result the total feed intake and milk yield per cow is expected to be lower in option 2. In option 3, no maize silage is included; instead Napier grass forms a significant forage component of the diet. The total feed intake and milk yield in case of option 3 is expected to be further lower. Amongst the three options, Option1 has the highest feed cost/ cow per day ($5.55) and milk production/day (30.3 litres) while Option 3 has the lowest feed cost per cow ($4.79) and milk production/day (22.2 litres). Based on this assessment, the report suggests that Option 1 is the preferred/best diet, because it has the lowest feed cost/litre of milk produced. It does not describe/analyse the possible risks and benefits associated with each of the diets

Using Option 1 as the preferred diet, the analysis then compared the effects of this diet on Friesian and Jersey cows. The Jerseys consumed less feed (17.1 kg DM/day) and produced less milk (23 litres/day). However Jerseys had higher milk solids/ kg DM feed conversion efficiency. The report also acknowledges that Jerseys are better suited to higher temperatures. But Friesians were still preferred because its higher milk yield results in higher margin over feed costs and better return on capital cost for the free stall barn. Once again, this analysis is not as in-depth as it should be. Ideally all risks and benefits associated with farming either Holsteins or Jerseys need to be compared and contrasted before a decision is made. Apart from the factors mentioned above, the selection of dairy breeds should be based on a holistic assessment of the farming model and risks. The analysis could have also included other potential breeds (Zebu X Taurus cross breeds) and perhaps even buffaloes.

4.4.6 Effluent Management

The report has given due consideration to two issues that are vital but often disregarded in dairy farming in India– effluent management and bio-security. Due to its environmental impacts, efficient and effective/safe disposal/utilization of effluent is vital for any dairy farming operation. It's certain that a farm with close to 3500 milking cows will produce a considerable amount of manure/effluent. The study has proposed to dispose of the effluent by spreading it onto the maize/forage crop fields. This not only ensures safe disposal but also aids in improving soil quality. However this would require large amounts of land (crop fields) at a reasonably close proximity from the dairy (barns and parlour). Since securing large amounts of land close to the dairy might not be possible, alternative methods for effluent disposal could have been considered. Based on our analysis, one strategy that can be considered is turning the effluent into energy through the construction of a bio-gas (methane) plant. This strategy would be ideal in case an option with zero/much less forage crop production (and land) is considered or if environmental regulations change. The energy generated could be used as a power supply source for the farm/local community. Moreover, the Govt of India provides several subsidies for the construction of such plants. Its therefore worthwhile studying in more depth the viability of building and operating such a bio-gas plant.

4.4.7 Animal health & Bio-security

Bio-security would be a major challenge for a large scale dairy farm in India and the study has highlighted its significance. The report has suggested feeding of silage instead of fresh forage as a tactic to reduce risk of Foot & Mouth Disease (FMD) virus outbreak on farm. It has also been suggested that proper precautions such as fencing need to be taken to keep other livestock (potential carriers/transmitter of FMD) out of the crop growing fields. However, a more comprehensive analysis of bio-security threats and management options is required. Moreover the report fails to mention that the impact of a bio-security hazard would be much more severe (complete shutdown of operations) because the proposed farming model involves using dairy animals from New Zealand – which have near zero exposure/tolerance to several livestock diseases prevalent in India (FMD, Anthrax, Haemorrhagic septicaemia being most critical).

4.4.8 Climatic Conditions

The report has rightly pointed out that climatic conditions in Nellore would be unfavourable for efficient dairy farming. In the Nellore region climatic conditions are quite extreme (hot and humid) with summer temperatures reaching as high as 45^0 C. This environment is unsuitable for maintaining high production (temperate) dairy breeds such as Jersey and Holstein Friesians (HF's). Although the problem has been identified and cooling systems have been suggested as a solution- it has significant risks, especially because of infrastructural issues (energy scarcity being most important) prevalent in India. Also, since the animals will be under additional stress due to lactation, a new environment, feed issues ,animal health challenges etc.– the potential impact of a cooling system failure (heat stress) will be very significant.

4.4.9 Dairy Cow Breed/Genetics

Given the challenges associated with sourcing a large number of "high genetic merit" (with known pedigree) livestock in India, and the need to act upon the opportunity right away – it's suggested that importing animals from New Zealand is the best option. However, as mentioned earlier, there are several risks associated with farming Holstein Friesians in Nellore. Therefore an alternative strategy is worth investigating.

It's well accepted and understood that North American/European Holsteins are not suitable (ideal) to farming systems in New Zealand. The most suitable cow for New Zealand is not the highest milk producer, but instead is the one most "suited" to the farming (pasture based) system. Similarly, the ideal cow (or buffalo) for dairy farming in India would be the one that is most suited to the local conditions/challenges – feed, climate, diseases etc. Our analysis for example has identified that India has several dairy cattle breeds (and buffaloes), the important ones being Sahiwal, Sindhi and Gir. These breeds are well adapted to the local conditions (and stress factors) in India. One strategy could involve integrating Indian genetics with imported dairy animals, to produce more tolerant cross bred offsprings that can be used as replacements. There are however several challenges to using Indian genetics as well – the most important being lack of credible information (records) on pedigree, breeding worth, production worth, health status, etc.

4.4.10 Degree of Fit with Framework of Feasibility Analysis

Table 4.4 shows the 15 feasibility parameters that were identified by our framework and the degree to which these parameters were assessed/ considered in the Nellore Dairy Project report. For a feasibility study to be accurate (predictor of success/failure), we recommend that an in-depth assessment of all the identified parameters is performed. It's quite clear from Table 4.4 that most of the parameters we identified were not analysed in-depth. Moreover, several important parameters such as Demand and Market, Labour and Management, Socio-Economic Impacts, Political and Legal Issues, Sustainability, and Goodwill and Follow on opportunities were either not considered at all or were given very low consideration.

Table 4.4 A Summary of Importance/ Consideration given to Feasibility Analysis Parameters Identified in our Framework.

S. No.	Parameters/ Factors	Degree of Consideration/ Importance Given
1.	Contextual Factors	✰
2.	Project Rationale/Context	✰✰
3.	Demand and Market	✰
4.	Production, Technical and Engineering	✰✰✰
5.	Material Input/Supply	✰✰✰
6.	Location and Site	✰✰
7.	Labour and Management	✰
8.	Project Economics and Financial Analysis	✰✰
9.	Risk Issues	✰✰
10.	Implementation and Scheduling	✰
11.	Political and Legal Issues	✰✰
12.	Socio-Economic Impacts	✰
13.	Environmental Impacts	✰✰
14.	Sustainability	✰
15.	Other parameters (e.g. Goodwill, Follow on opportunities, etc.)	✰

Scale	Comments
✰	No/Very Little Consideration
✰✰✰✰✰	Maximum Consideration

4.4.11 Conclusion

In conclusion, this report can be considered to be a feasibility analysis of just one aspect of a project involving the establishment of a large dairy farm in India. Based specifically on our framework, this report can be considered to be a comprehensive analysis of a critical “Material Input” – Feed. Although it’s well accepted that feed is a significant constraint/limiting factor to the success of dairy farming, there are several other issues (identified in our framework) that need to be considered as well. For these reasons, the current analysis is considered to be uni-dimensional and not as holistic as a feasibility analysis should be.

Additionally, another drawback with this analysis is that it has started off with the pre-set notion (bias) that the most suitable dairy farming model in the Nellore environment is – a 3500 cow intensive feedlot with cooling systems. Although this approach ensures that there is focus and structure to the “problem” being analysed- it does not allow for flexibility. Due to which, alternative farming models, (e.g. smaller scale, less intensive (semi-intensive), with Indian genetics and no cooling systems) were not evaluated.

CHAPTER 5

RESULTS & DISCUSSION

(PART B)

Feasibility Analysis of the Nellore Dairy Project

5.0 RESULTS & DISCUSSION (PART B)

FEASIBILITY ANALYSIS OF A NELLORE DAIRY PROJECT

5.1 Level 1 Analysis

The dairy sector is an integral part of the global food market. The global food market is extremely dynamic and the process of transporting food from the farm to the table has become more complex, and involves diverse local, national, and global agents and networks (Regmi, 2003). The key to understanding the global food industry lies with understanding changing consumer preferences and the food industry's efforts to meet these demands (Gehlhar, 2006). Additionally, it's important to remember that the evolving Food markets are driven by changes in consumer preferences, technology, linkages between members of the food supply chains, and prevailing policies and business environments (Regmi, 2005).

Based on this rationale, and principles recommended primarily by approach IV and secondarily by approach I of our framework, we identified three critical contextual factors that need in-depth analysis and understanding. These were – the World dairy sector, the Indian dairy sector and the Indian business environment. We believe this analysis will identify any significant barriers to entry as well as critical factors that influence the success or failure of a dairy venture in India. The concepts and themes covered in this analysis (Level 1) are not bound to a specific milk supply model, but instead have a significant bearing/influence on any/all of the milk supply models identified. Although an in-depth assessment of world dairy sector, Indian dairy sector and Indian business environment was performed, only a brief summary is presented here. For a detailed description and analysis of the World dairy sector, Indian dairy sector and Indian business environment please refer to Appendix I, Appendix II and Appendix III respectively.

5.1.1 World Dairy Sector

Over the last three decades the livestock sector in general and dairy sector in particular has witnessed rapid global expansion in both production and consumption. The main driver of this livestock revolution has been population and income growth, coupled with increased urbanization and change in consumer preferences to livestock products- mainly in the developing world.

Dairy has been a core element of this livestock revolution. World milk production has increased by nearly 40% over the last three decades and was 699 million tonnes (MT) in 2009. The largest milk producing countries/regions were EU-27 (150 MT), India (110 MT) and USA (86 MT) (International Dairy Federation (IDF), 2009). However, the per capita production has decreased by 9% indicating that production is not keeping pace with population growth. In general, milk production growth in developed countries has remained more or less stagnant, whereas in developing countries milk production has grown considerably. From 2005 to 2008, India, China and Pakistan alone contributed to 55% of the global annual growth in milk volume. Much of the growth in India and Pakistan has been due to greater contribution from buffaloes. Buffalo milk currently accounts for 13% of world milk production. In both these countries Buffaloes are playing an increasingly important role in milk production. Buffaloes accounted for more than half of the milk produced in both India (56 MT) and Pakistan (21 MT) (IDF, 2009).

Milk production worldwide is characterised by a distinct dichotomy of two disparate but coexisting systems – the smallholder production systems that are dominant models of production in the developing world and the large scale production systems which are dominant models in the developed world. Globally, the average herd size is 2.4 cows per farm (Hemme and Otte, 2010). In developing countries of Africa, Asia and Latin America, most farms have less than 15 dairy animals. In contrast, the average farm size in developed countries is around 50 cows /farm; with NZ having the highest statistically average farm size (200 cows/ farm) (IFCN, 2010).

Growth in milk production in developing countries has been mainly due to increase in numbers of dairy animals and farms. Whereas developed countries are focused on increasing yields and intensification of milk production. As a result milk yields per cow (dairy animal) vary considerably between developing and developed counties : <500kg/year (in Uganda) to > 10,000kg/year (in Israel, Western Europe, USA). Although dairy animals in New Zealand have moderate yields (4400 kg/year), the large farm size has ensured that they have the highest average milk volumes per farm (IFCN, 2010).

Milk is an extremely volatile agricultural commodity and small fluctuations in supply or demand can have a significant influence on prices. The coefficient of variation of milk prices from 1998 to 2009 was the highest among all agricultural commodities (IFCN, 2010). For nearly two decades, the milk prices fluctuated between 10 and 25 US$/100kg of milk. This situation changed drastically in 2007, when milk prices reached as high as US$ 58/100 kg- mainly due to demand outstripping supply by a small margin (IFC, 2010). However, with supply catching up and consequently overtaking demand, the prices crashed and fell to as low as US$ 20/100 kg in early 2009. Milk prices vary considerably form one region (country) to another, and ranged from US$ 16/100 kg (in Uganda) to US$ 91.4/100 kg (in Japan) in 2009 (IFCN, 2010). The regions that had market milk prices that were consistently lower than world price were parts of– Latin America, South and South East Asia and Africa. Similarly countries that had prices which were consistently higher than the world price were – Norway, Iceland, Switzerland, Canada, Japan, Korea and Taiwan (IFCN, 2010).

The cost of milk production too varies considerably between regions and is primarily a function of the type of farming system being practiced. In 2009, the lowest average cost of milk production was seen in Africa (US$ 18/100 kg) and the highest in Western Europe (US$ 58/100kg) (IFCN, 2010). This is a reflection of the low cost subsistence type of farming in Africa where the cost of land, labour and feed is quite low compared to the relatively intense systems in Western Europe. Interestingly the cost of milk production in many parts of Eastern Europe, Asia, South America and Oceania were similar (around US$ 25 to 30/100 kg) (IFCN, 2010). The capital intensity (level of investment required to produce 100 kg milk) also varies between countries. In 2009 it ranged from US$ 30 in Belarus to US$ 700 in Austria. In the specific case of India, capital intensity varies significantly depending on farm type – US$ 100 for small farms to US$ 500 for large farms (due to their larger land requirements) (IFCN, 2010).

The returns of a dairy farm are form 3 main sources – milk price, non-milk returns, and direct payments (coupled and uncoupled) (IFCN, 2010). Due to the subsistence type farming systems in Africa and Asia, most dairy farms are profitable. However because of small farm sizes the total farm income is quite low. The large farm sizes and low input grazing system ensures that total farm income is quite high for dairy farms in NZ (IFCN, 2010). Direct payment supports form a significant part of total farm income for dairy farms in Western Europe. In 2009, the magnitude of coupled direct payments ranged from – US$5/100 kg (in most European countries and USA) to US$ 40/100 kg (in Norway, Switzerland and Finland) (IFCN, 2010). If these payments were stopped, a number of dairy farms in these regions will be put out of business or forced to restructure.

In 2009, the highest Return on Investment (ROI) (> 20%) were seen in CIS (Common Wealth of Independent States), the Middle East and Africa. Moderate to high ROI (5 to 20%) were seen in farms from Oceania, Latin America and Asia. The lowest (0 or negative) ROI were seen on farms in USA and EU (IFCN, 2010). It must be noted that output (milk) prices were quite low in 2009 while input (feed) prices were relatively high. Farms in USA and EU are very intensive and use large amounts of feed inputs. Hence their ROI was lowest in 2009. When milk price to feed price ratio is high (a high milk price and relatively low feed price), farms in these countries tend to have a much better ROI. Also, if all sources of payments (both coupled and uncoupled) are included in income, the ROI of farms in EU would be higher.

On the processing side, only 62% of milk produced is actually delivered to processing plants. In USA and Europe 100% of the milk produced is delivered and they account for 51.3% of total world deliveries. In contrast South Asia accounts for only 5.1% of world deliveries. In general, the proportion of milk delivered to processing plants is lower in developing countries due to lower levels of mechanization and the presence of a large informal sector.

Globally the dairy industry is extremely fragmented with the top 21 processors accounting for just 21% of world milk production (IDF, 2010). The industry is dominated by many small players that operate at the regional/local level. In terms of volume the top three dairy companies in 2010 were Fonterra (18.6 MT), Dairy Farmers of America (16.2 MT) and Nestle (12.0 MT). In terms of revenue (in Billion USD from dairy alone) the top three dairy processors were Nestle (27.3), Danone (16.0) and Lactalis (11.8) (IDF, 2010). The leading customer's for dairy products are food retailers, food service industry and the food processing industry. These companies tend to be larger than the players in the dairy industry and hence have significant market power. Due to which, the concentration process in the dairy industry by means of mergers, acquisitions and strategic alliances has been very pronounced (IDF, 2009).

In 2009, Asia had the highest share in dairy consumption (38.4%) followed by Europe (29.6%) and North America (13.3%); and the world average per capita milk consumption was 103.4 kg/year (IDF, 2010). The per capita consumption was higher in developed countries (100 to > 300kg) and lower in developing countries (10 to 100 kg) (IDF, 2010). The demand for dairy products has remained stagnant in the developed nations. As a result dairy companies operating in the big and mature markets such as Europe and USA face limited market growth opportunities in terms of volumes per capita and growth can only occur by increasing market shares or switching to higher value-added products. In contrast the demand for dairy products has been quite robust in the developing countries and multi-national dairy companies are increasingly looking towards these markets for ensuring growth in sales and revenue.

Trade in dairy is region centric, because milk is bulky and perishable, dairy products are mostly consumed in the region that they are produced. Moreover, since dairy is a sensitive industry (from a food security and national food policy perspective), it is highly protected in many countries by trade and non-trade barriers. As a result, only 7% of milk produced is traded internationally. In 2009, the three largest exporting nations were New Zealand (27%), EU-27 (24%) and Australia (9%) (IDF, 2009). The top 10 exporting countries account for nearly 98% of world milk production. On the import side, markets continue to remain fragmented with 6 of the largest importing nations accounting for less than half of the world market (IDF, 2009). However, in future, it's expected that developing nations will play a major role in imports; absorbing 96% of Whole Milk Powder deliveries, 92% of Skim Milk Powder shipments, 57% of traded butter and 44% of cheese exports (IDF, 2009).

Although the dairy sector today is far more liberalized than it was a decade ago, it still remains one of the most distorted agricultural sectors (Beghin & Aksoy, 2003). Production subsidies as well as export subsidies are prevalent in many developed countries. These policies not only stimulate over production but also results in the dumping of excess production in world markets and depressing world price. Furthermore, tariff and non-tariff barriers are used by both developed and developing countries to protect their domestic dairy industries. These market and trade distortions have significant but different impacts in the developed (food secure) and developing (food insecure) countries.

As mentioned earlier, much of the future growth in consumption of dairy products is expected to take place in the developing world. Most of these countries view food security as integral part of their nations overall security. The agricultural policies in these countries are therefore focused on promoting domestic production and keeping imports out. This situation poses a major challenge for agriculture export oriented countries such as New Zealand, for whom entry into these fast growing markets is strategically essential.

One tactical option for export oriented firms is to support the growth and development of the domestic dairy industry of countries they want to export to. In the long term, this will help them understand local markets as well as build trade relationships and trust, which in turn could pave the way for acceptance of exports from the foreign firm at some point in the future. This tactic will have several positive spill over benefits because local companies will be forced to raise product quality and efficiency to be able to withstand competition from the foreign firm.

5.1.2 Indian Dairy Sector

Agriculture plays a vital role in India's economy by contributing to 19% of GDP and providing employment for 68% of the work force. Currently the area under agriculture in India is 159 million ha, which is a decline of -2.4 % from 1995-96 (GOI, 2011). Among agricultural commodities, milk and milk products are the largest category in terms of value and account for 32% of India's agricultural GDP (GOI, 2011). However the fund allocated to the dairy sector under the economic budget is quite low (< 5%).

The total value of the Indian dairy market is estimated to be around 42.2 billion US$ (Dairy India, 2007). The liquid milk market alone accounts for 51% (US$ 21.8 billion), followed by unbranded Indian products market (41%, US$ 17.3 billion), Western products (5%, US$ 2.1 billion) and branded Indian products (3%, US$ 1.2 billion) (Dairy India, 2007).

Currently, India is both the largest producer (121.5 Million tonnes (Mt)) and consumer of milk and milk products in the world (GoI, 2011). Dairy farming is a traditional occupation and is deeply linked with India's culture and traditions. In 2000-01 there were 107.7 million dairy farms and the average landholding size was 1.33ha (GOI, 2011). Consequently, 81% of milk in India is produced by marginal (< 1ha) and small (1 to 2 ha) farmers with 3-5 animals. Large farms (> 10 ha) that have more than 30 dairy animals account for only 2% of milk production (GOI, 2011).

For most of the small farmers, dairy farming is a secondary occupation and off-farm employment or crop farming is the primary source of income and employment. In rural India it's quite common to find 1 or 2 dairy animals in almost every household. The primary purpose of these animals is to produce milk for consumption by the house hold and satisfy a nutritional need. Selling milk for a profit is secondary objective for these farmers. As a result nearly 35% of milk produced is retained within the producer household and only about 65% termed the marketable surplus enters the national exchange economy. Of this, nearly 85% finds its way to urban areas indicating that urban demand is the main source of cash for rural milk producers (GOI, 2011).

In the early years of India's independence, milk production was extremely low (17 Mt in 1951) and there was a growing gap between milk supply and demand. This caused per-capita availability to drop to as low as 110g/day in 1968 (GOI, 2011). To address this issue a nationwide dairy development program called *"operation flood"* was launched in 1970. Due to this initiative (which lasted till 1996), milk production growth ranged from 2.8% in the early 70's to 6.7% in the mid 80's and India was able to substantially increase milk production (GOI, 2011). The major activities of operation flood included (through the establishment of cooperatives) - building a unique rural milk procurement system, marketing system, development of milk animals, utilization of food aid for market stabilization, and manpower training and development.

During this period of growth in milk production, there was increase as well as considerable change in composition of the national herd. The change was characterised by a shift to buffaloes and crossbred's from traditional indigenous animals. In 2009 the size of the national herd (cattle and buffalo) was estimated to be around 279 million (male & female – adult & young), comprising of 172 million cattle and 107 million buffaloes (GOI, 2011). The *in-milk* dairy animal population was 74.5 million and comprised of 35.5 million buffaloes, 28.8 million indigenous cattle and 10.2 million cross bred cattle (GOI, 2011). Buffaloes are the most important dairy animals in India and account for 55% of milk production, followed by crossbreds 24% and indigenous cattle 21% (GOI, 2011).

The milk yield per animal is quite low in India and has not increased substantially over the years. The main reasons for low productivity are poor genetics, lack of adequate (quality) feed, unfavourable climatic conditions, widespread prevalence of diseases, and lack of market access for producers (Gautam *et al.*, 2010). Also, there is considerable difference in milk yields between the three animal types and also between states. In general, milk yields of indigenous animals (2.1 kg/day) are much lower than that of buffaloes (4.6 kg/day) and crossbreds (6.8 kg/day) (GOI, 2011). The northern state of Punjab has the highest milk yields for all three animal categories, while the north eastern states of Meghalaya, Assam and Nagaland had the lowest yields for indigenous, crossbreds and buffalo respectively (GOI, 2011). Milk production and degree of dairy development also varies considerably between states. In 2010, the 10 largest milk producing states accounted for 85% of milk production. Of these states, Uttar Pradesh (20.2 million tonnes) was the highest producer while Tamil Nadu (5.7 million tonnes) was the lowest (GOI, 2011).

Despite three decades of "operation flood", a large proportion of milk and milk products continues to be marketed through the informal or un-organised sector. Although the share of organized sector has increased over the last three decades, the informal sector comprising of middlemen, private milk traders and direct sale from producer to consumer, still accounts for 70% of marketed milk and milk products in India. In several villages and towns, the informal sector is the only milk marketing channel available for both producers and consumers. Trends clearly suggest that the informal sector will continue to play a dominant role in the foreseeable future. The key factor that has been driving the informal sector is the poor willingness of customers to pay the extra costs of formal processing and packaging. The informal sector does not incur these costs and has higher margins. It can therefore offer higher prices to producers and lower prices to consumers. Consumers also appear to believe that the milk supplied by the informal sector is of better quality (quality is perceived as freshness, taste and richness - degree of cream formation) (Raja, 1992; Sharma, 2000).

Due to the large role played by the informal sector, only 35% of India's milk production is delivered to processing plants. The processors and marketers of dairy products continue to be challenged by the difficulty in obtaining timely, cost-effective and adequate supplies of quality milk. In 2009 there were 841 milk processing plants in India – 562 were owned by private dairy companies and 243 were owned by cooperatives (GOI, 2011). These processing plants handled on an average 98.3 million litres of milk each day. The 10 largest milk producing states accounted for 89% of the processing plants and 87% of the volume of milk processed (GOI, 2011).

Based on market orientation, there are three distinct groups of milk producers in India – 1) independent producers who sell milk in the open market, 2) independent producers who sell milk to vendors, and 3) contract producers who sell their milk to a dairy company/agent (Birthal *et al.*, 2008). Of these three groups, production costs were found to be lowest for contract producers (US$ 20.8/100 kg milk) and highest for independent producers selling in the open market (US$ 25.1/ 100 kg milk) (Birthal *et al.*, 2008). This is mainly due to higher transaction costs associated with the acquisition of inputs, market information and disposal of milk for independent producers. The highest price was offered by the open market (US$ 28.8/100 kg milk) and the lowest by milk vendors (US$ 26.2/100 kg milk) (Birthal *et al.*, 2008). The net revenue per unit of milk was highest for contract producers (US$ 6.0/100 kg milk). This indicates that contract farming can increase the profit margins for dairy producers in India. Also, contract farming introduces a greater degree of competition in rural markets and thus lessens the possibility of exploitation of milk producers by the vendors (Birthal *et al.*, 2008).

From 1996 to 2009, both farm gate and consumer prices of milk have increased. In 2009, the average farm gate prices were US$ 28.8/100kg milk and average consumer prices were US$ 46.6/100kg milk (IFCN, 2010). But the increase in consumer prices (133%) was far greater than the increase in farm gate prices (73%). As a result the farmers share in consumer price decreased from 80% to 62%. At the same time, margins for processors/retailers increased from US$ 4.6/100 kg to US$ 18/100 kg.

The whole sale price indexes (base year 1993-94 =100) of the major dairy commodities have increased as well. In 2009, the whole sale price index of SMP (313) was highest followed by fluid milk (228), butter (211) and ghee (202) (GOI, 2011). During the same year, the whole sale price index of major farming inputs – processed cattle feed and green fodder were 213 and 203 respectively. The low milk price to feed price ratio indicates that high input dairy farming may not be sustainable in India.

Due to a growing population and rising per-capita incomes, the demand for milk and milk products is expected to increase considerably over the next decade. A report by the National Dairy Development Board (NDDB) of India estimated that the demand could be around 200 Mt by the year 2021-22 (NDDB, 2011). Given the import sensitivity of the dairy sector, the increased demand will have to be met by increasing domestic production. This would require increasing domestic milk production by 7 – 8 Mt/year over the next 10 years. But milk production has increased by an average of only 3.64 Mt/year over the past 10 years. Since the country is already home to an extremely large cattle population, increasing cattle numbers (as done in earlier decades) is not a viable option. Thus increasing the productivity of dairy animals appears to be the only solution.

The ability of the production systems in India to respond to the demands of productivity enhancement will depend upon addressing the issues related to the six drivers of productivity- 1) genetic improvement, 2) feed and fodder supply, 3) delivery of livestock support services, 4) technology transfer, 5) R & D and 6) climatic conditions (Gautam *et al.,* 2010). Of these the lack of quality feed and fodder is the most important factor limiting growth of milk production in India. With increase in demand for food for human consumption, the availability of feed and fodder for livestock is expected to be reduced further. Although genetic improvement can result in the development of more productive dairy breeds such as crossbred cattle and "graded up" buffaloes, the lack of quality feeds, in-adequate support services (such as health & breeding), poor technology transfer systems and un-suitable climatic conditions drastically limits the utility of this productivity enhancement tool. As a result productivity of dairy animals in India is expected to remain low by world standards. This indicates that meeting domestic demand will be a huge challenge for the India's (domestic) dairy industry.

The Government of India has acknowledged the significance of this challenge and has put in place a massive program called the National Dairy Plan (NDP).

The objective of the NDP is to increase the productivity of milk animals in India and improve market access for milk producers. This project has received funding of about 350 million USD from the World Bank and will run from 2012 to 2017. Apart from the NDP, dairy development has been given priority status in two other projects being implemented by the Government of India (Rashtriya Krishi Vikas Yojana [RKVY] and National Agriculture Innovation Project [NAIP]).

5.1.3 India Business Environment

The sustained economic growth of over 7%, large population and rising incomes has made India a popular destination for several multinational firms. The success of multinational firms in foreign countries such as India is strongly influenced by the prevailing local business environment. Thus understanding the business environment is critical for a multinational firm that is planning to enter the Indian market.

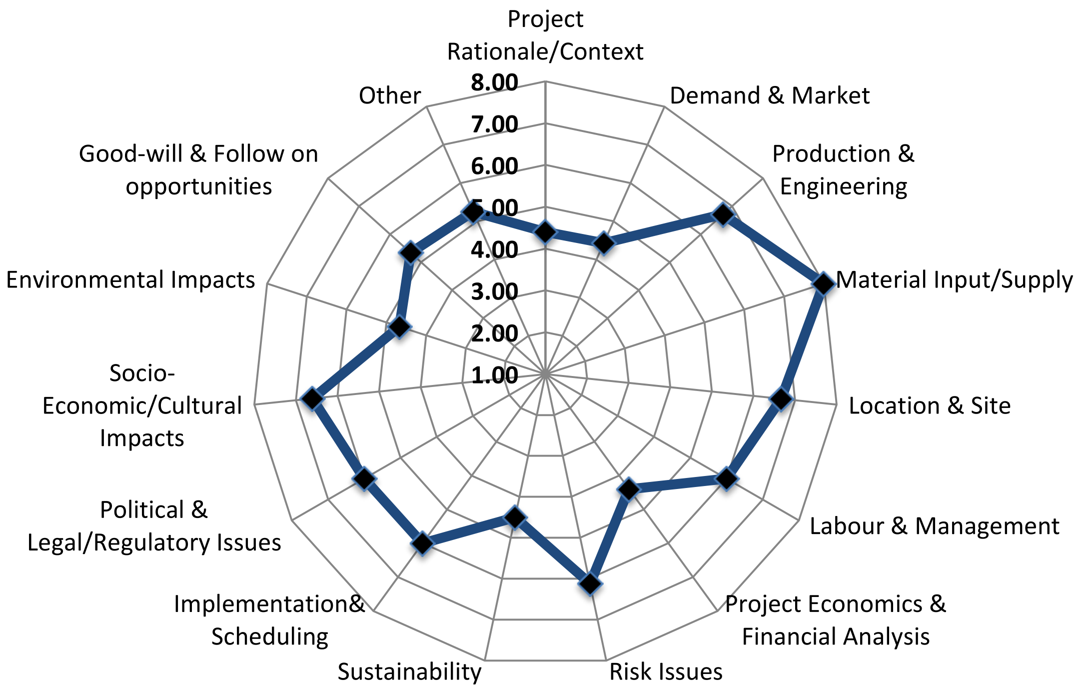
According to Porter (1998) the Local Context (which is analogous to the business environment) is intricately linked to the performance of a firm in any industry. It defines the association between the four vital elements that govern the performance of a firm – 1) Factor input conditions, 2) Firm strategy and rivalry, 3) Demand conditions, and 4) Related and supporting industries. In general a good business environment is characterised by an efficient legal system, strong creditor and shareholder rights, small regulatory burden for conducting business, and tax system that does not discriminate against incorporated firms (Demirguc-Kunt *et al.,* 2006).

The overall business climate in India is characterised by excessive red tape, lack of transparency, high levels of corruption, an archaic legal system, weak labour conditions and a volatile security outlook. Foreign businesses have to manoeuvre through a maze of rules and certifications to obtain the estimated 70 separate approvals needed for setting up businesses in India (unless they are operating within a special economic zone). Meanwhile, delays are routine and liquidating a bankrupt company can take up to 20 years (BMI, 2011). Moreover, opposition from strong labour unions and political constituencies has slowed reform in such areas as FDI, privatisation, exit policy, bankruptcy, and labour law. Additionally a significant challenge affecting the business environment in India centre on its poor infrastructure. India's infrastructure output continues to lag behind overall GDP growth and appears to be restricting growth (BMI, 2011). Due to these issues, India scores relatively low for its business environment assessment by several organisations, including the World Bank. Tackling all these issues and improving the overall business environment in India will be a key challenge for the current government as well as governments to follow.

5.2 Level 2 Analysis

The parameters assessed, specific questions asked, scores obtained for each question, average score for each parameter and overall feasibility score of the project are presented in this section (Table 5.1). A brief explanation of the rationale behind the scores allotted is presented next. Additionally a detailed explanation is provided in Appendix IV.

Figure 5.1 Feasibility Profile of Nellore Diary Project



Score 1 to 3 = Yes (Feasible)
Score > 3 to 6 = Maybe (Further Study Required)
Score > 6 to 9 = No (Not Feasible)

i. **Project Rationale & Context:** The project obtained an average feasibility score of 4.4 for *project rationale & context* (Figure 5.1). The project rationale is clearly defined; the company has executed a similar model in China and has superior resources. It also fits with the vision and strategy of the company. But large farms like that proposed are non-existent in India. A typical large farm in India has about 30 to 50 animals.

But even these large farms account for less than 5% of India's milk production. Since farming systems in India are essentially small-holder driven low in-put subsistence type operations, the proposed model does not fit into the local context (Table 5.1).

ii. **Demand & Market:** The feasibility score for *demand & market* was 4.5 (Figure 5.1). Demand for milk is robust and good markets exist in most Tier I and Tier II cities. There is an increase in consumer awareness about milk quality/safety issues and demand for quality milk is rising as well. A niche segment of affluent Indians (10% of the population) can pay a premium price and buy the product. Across India, the market size of this segment is expected to be 117 million customers. But since the customers for this project will be restricted to the large cities (Chennai & Vijayawada) near project location, market size will be around 1 million. Competition from local/regional players in these markets is intense. Moreover, quality alone might be insufficient to offset the high price for the product. Apart from quality, other factors such price, convenience, freshness also influence a consumers purchasing behaviour. It is not clear if the product will be able to outperform the incumbents on other measures as well. Also being new to India, the ability of the company to understand and respond to the market is also limited (Table 5.1).

iii. **Production & Engineering:** Although new to India, similar farming systems are wide spread in other parts of the world (USA, Canada, Western Europe, Saudi Arabia) and this model's broad technical specifications are well known. But it needs considerable local adaptation, which may not be possible. Moreover it cannot be executed with local technology & materials. Local supply services are essential for smooth operations. But reliance on "un-dependable" local supply services poses a challenge. A value chain for the product exists, but not in the specific region. Logistical challenges are also significant, especially with sourcing of material input (feed). For *production & engineering* the project received a sore of 6.5 (Figure 5.1, Table 5.1).

iv. **Material Input & Supply:** The production of material input (feed) is constrained by climate, soil quality, water availability and land supply. Alternatives (feed) can be obtained from local sources but meeting quantity and quality requirements will be extremely difficult. The project received an average score of 8 for *material input & supply* (Figure 5.1, Table 5.1).

v. **Location & Site:** The average feasibility score for *location & site* is 7.0 (Figure 5.1, Table 5.1). The climate in Nellore is extremely unfavourable for executing this model. But the ability of IFFCO to acquire the site is a significant plus. The closest markets are far off- Chennai is 180 km and Vijayawada is 300 km away. The proximity to raw materials is also an issue because a large amount of raw material (feed) will need to be sourced from adjoining districts or states. The local infrastructure is inadequate especially in terms of power supply, water availability & roads. Although the project will need support from the political establishment/bureaucracy, being in a SEZ reduces the dependence (relatively).

vi. **Labour & Management:** Availability of un-skilled labour is not a big issue. But lack of adequate/requisite experience and imparting sufficient training is a concern. Availability of management personnel in the local area is an issue. Also, staff turnover and strife can be a challenge. The *labour & management* feasibility score obtained is 6.0 (Figure 5.1, Table 5.1).

vii. **Project Economics & Financial Analysis:** Most costs can be determined accurately. But material input (feed) price can be un-predictable. Also, output price is uncertain. Assuming that the output will get a premium price, the projects RoI and economics appears to be good. The project received a score of 4.2 *for project economics & financial analysis* (Figure 5.1, Table 5.1).

viii. **Risk Issues:** There is market and product risk as indicated by the risk matrix. The price of inputs and output can show considerable volatility. There is also a significant animal health/bio-security concern. Due to the extreme environment/climate, lack of quality feed, and considerable animal health hazards, the likelihood of productivity of animals falling below expectations is high. The poor infrastructure and lack of a robust political & legal environment introduce uncertainty as well. The average feasibility score for *risk issues* is 5.8 (Figure 5.1, Table 5.1). But given the nature of risks and their potential impacts, the overall risks associated with this project are not acceptable.

ix. **Sustainability:** The average feasibility score for *sustainability* is 3.6 (Figure 5.1, Table 5.1). The farm is not dependent on any government subsidies/payments. The cost of production is high (relatively), but so is the anticipated milk price. As a result, operating profit margin greater than 16% is expected. The labour price is quite low, and milk quality standards can be met. On the downside, feed efficiency can be poor because of the extreme environmental conditions (animal stress) and poor quality of feeds.

x. **Implementation & Scheduling:** Defining a timeline and meeting targets/project deadlines will be challenging, resulting in project overruns. Mainly because, bureaucratic red tape, hazy regulations and difficulty in enforcing contractual obligations makes this task difficult. The average feasibility score for *implementation & scheduling* is 5.3 (Figure 5.1, Table 5.1).

xi. **Political & Legal/Regulatory Issues**: The politically sensitive nature of dairy in India, un-stable political atmosphere, centre vs. state government rivalry, ad-hoc reforms/policy changes, and an archaic/inefficient legal system can pose significant challenges. Also a prevalent culture of corruption/graft can result in competitors gaining unfair advantages. The project received an average score of 5.6 for *political & legal/regulatory issues* (Figure 5.1, Table 5.1).

xii. **Socio-Economic & Cultural Impacts:** Industrial type dairy farming does not fit well in a culture where cows are sacred and dairy farming is dominated by small holdings. Also, the exclusion of local dairy farmers from the supply chain and possible displacement of small farmers in the long run suggests that the project is not beneficial to the local community. Issue related to animal welfare and culling of cows also appear to be constraints. However, this project is a significant positive step towards development of local/Indian dairy industry. The average feasibility score for *socio-economic & cultural impacts* is 6.6 (Figure 5.1, Table 5.1).

xiii. **Environmental Impacts:** This farm can cause environmental damage- both directly and indirectly. However, it can be easily mitigated using proven practices/solutions. Given that the farm will implement environment friendly practices and comply with global & local standards, environmental impacts will be much lesser when compared to current farming practices in India. The average feasibility score for *environmental impacts* is 4.6 (Figure 5.1, Table 5.1).

xiv. **Good-will & Follow on opportunities:** Promise of reduced food safety risk, commitment to developing domestic milk supply and forging good local relationships might provide for follow on opportunities and new market access. But this project will be perceived as detrimental to small farmers and generating goodwill could hence be difficult. Hence it receives a score of 5.7 for *good-will & follow on opportunities* (Figure 5.1, Table 5.1).

xv. **Other:** The other parameter evaluated in the project was related to competition**.** Vertical integration with a focus on quality gives this model a distinct competitive advantage that cannot be matched by existing milk supply models. Fonterra has some of the best resources in the areas of management, engineering, service delivery, brand equity, and logistics. This ensures that the company can remain competitive. But if this model is successful, it’s quite likely that existing or new dairy companies will imitate it. Hence sustaining advantage maybe difficult. For this parameter, the project received a feasibility score of 5.2 (Figure 5.1, Table 5.1).

Table 5.1 Feasibility Score of Nellore Dairy Project

S. No	Parameters (Weightage %)	Questions framed	Score
1.	**Project Rationale/ Context**	Is model rationale sound?	3.0
		Does model fit into the larger context?	8.0
	(6)	Does company have prior experience in executing similar model?	4.0
		Does company have superior resources?	4.0
		Is it in line with the vision & strategy of the company?	3.0
		Average Score	**4.4**
2.	**Demand & Market**	Is there a demand for the product?	3.0
	(8)	Are factors driving demand known/clear?	3.0
		Can customers buy it?	3.0
		Is size of potential target market large enough?	5.0
		Can an adequate market share be achieved	5.0
		Will customers buy it?	6.0
		Can company understand and respond to market?	6.0
		Average Score	**4.4**
3.	**Production & Engineering**	Are the technical specifications known?	6.0
	(10)	Can project/model be executed with locally available technology & materials?	8.0

		Can technology & operational standards be met easily?	7.0
		Are local supply/support services NOT critical/ essential?	7.0
		Are local support services available/ dependable?	7.0
		Does a value chain for the product exist?	6.0
		Can logistical challenges be easily addressed?	6.0
		Average Score	**6.7**
4.	**Material Input/ Supply**	Can critical raw materials be produced/ sourced?	8.0
	(8)	Is it of sufficient quantity?	8.0
		Is it of acceptable quality?	8.0
		Average Score	**8.0**
5.	**Location & Site**	Are climate and environment conditions favourable?	9.0
	(8)	Can a project site be easily acquired?	6.0
		Is it at reasonably close proximity to markets?	6.0
		Is it at close proximity to raw materials?	6.0
		Is local infrastructure adequate?	7.0
		Can it function without support of political establishments and bureaucracy?	6.0
		Average Score	**6.7**

6.	**Labour & Management**	Are sufficient un-skilled and semi-skilled workers available locally?	4.0
	(4)	Do they (local skilled and semi-skilled workers) have adequate/appropriate experience/background?	7.0
		Are sufficient supervisory & managerial personnel available locally?	6.0
		Do they (local supervisory & managerial personnel) have adequate/appropriate experience/background?	6.0
		Can project be implemented without Ex-pat managerial presence?	8.0
		Is threat & impact of industrial strife low?	5.0
		Average Score	**6.0**
7.	**Project Economics & Financial Analysis**	Can costs be accurately determined?	5.0
	(8)	Will forecasted returns be greater than costs?	4.0
		Is forecasts riskiness low?	6.0
		Is time to breakeven acceptable	4.0
		Is ROI adequate (greater than 15%)?	4.0
		Average Score	**4.4**
8.	**Risk Issues**	Is there a market risk*	6.0
	(10)	Is there a product risk*	7.0
		Is there a significant input price risk?	7.0
		Is there a significant output price?	6.0

		Is there a food safety/human health risk?	2.0
		Is there an animal health/biosecurity risk?	8.0
		Is there a security risk?	5.0
		Are there any potential causes for project failure that cannot be mitigated?	
		Are overall risks acceptable?	8.0
		Average Score	**6.2**
9.	**Sustainability**	Can model be profitable without government subsidies?	2.0
	(6)	Is cost of production less than US$ 30/100 kg milk?	8.0
		Is operating profit margin greater than 16%?	5.0
		Is milk yield per cow greater than 7000 kg/year?	4.0
		Is feed efficiency (kg milk/kg DM) greater than 1.2	7.0
		Is milk price greater than US$ 40/100 kg milk	5.0
		Is labour price less than US$ 6/hour	3.0
		Is quality of milk good? (SCC less than 2000,000/ml & Bacterial count less than 150,000 cells/ml)	2.0
		Average Score	**4.5**
10.	**Implementation and Scheduling?**	Can a definite project timeline be defined /designed?	5.0
	(4)	Can the targets in the timeline be met?	7.0
		Are significant project overruns NOT expected?	6.0
		Average Score	**6.0**

11.	**Political & Legal/ Regulatory Issues** (6)	Is model NOT a politically sensitive issue?	7.0
		Is general political environment stable and favourable	5.0
		Do political threats exist?	5.0
		Are impacts of political threats small/ insignificant?	5.0
		Can political system be prevented from giving competitors unfair advantages?	6.0
		Is legal environment stable and favourable?	6.0
		Are rules, regulations and policies affecting the model clearly defined/ transparent?	7.0
		Can legal/regulatory system be prevented from giving competitors unfair advantages?	7.0
		Average Score	**6.0**
12.	**Socio-Economic & Cultural Impacts** (6)	Does it fit with the local culture & norms	7.0
		Does it include participation of local stakeholders	7.0
		Does it deliver significant benefits to local communities	7.0
		Does it contribute towards development of local dairy industry	6.0
		Will it NOT cause displacement of local farmers	6.0
		Average Score	**6.6**

13.	**Environmental Impacts**	Does model pose a threat to environment?	6.0
	(6)	Can environmental damage be mitigated/contained /limited?	4.0
		Is environmental damage (if any) significantly less than existing practices/systems?	4.0
		Average Score	**4.6**
14.	**Good-will & Follow on opportunities**	Will project generate good-will locally?	7.0
	(4)	Will it enhance companies brand equity?	5.0
		Does it provide for follow-on opportunities & new market access?	4.0
		Average Score	**5.4**
15.	**Other**	Does model have a competitive advantage?	4.0
	(6)	Can the advantage be sustained?	7.0
		Is it known how competitors will respond?	6.0
		Can company be competitive?	4.0
		Average Score	**5.3**

* For the assessment of Market Risk & Product Risk the guidelines (Risk Matrix) prescribed by Day (2007) were followed.

The overall weighted average feasibility score of this project was 5.5. This indicates that the project falls in the “Maybe” spectrum and further investigation/study is definitely required (Figure 5.1). Although answers to a few specific questions fell in the feasible spectrum (score <3), none of the 15 parameters had a feasibility score less than 3 (Table 5.1). Ideally, for a project to be feasible, the answers to all 15 parameters should fall in the feasible spectrum (score < 3). Moreover answers to a number of specific questions for this project fell in the No (not-feasible) spectrum (Table 5.1). Also, 6 out of the 15 parameters had an average score greater than 6 (Figure 5.1). This suggests that the project is Not Feasible on many counts. Importantly, Production & Engineering, Material Input/Supply, Location & Site, Risk, and Socio-Economic/Cultural issues appear to be significant constraints for the project (Figure 5.1). Unless more feasible options for these parameters can be identified or developed, it is recommended that the project in its current form is not worth executing at this point in time.

5.3 Alternate Milk Supply Options

Given that the current project/model is not feasible, we suggest that the company adopt a different model or make significant changes to this model or both. Based on the suitability (fit with) to the broad (general) vision, objectives and operations of multinational dairy companies, we identified **four possible models** a multinational dairy company can use for meeting its milk supply needs in India.

In the **first model (Single Tier Dairy Farming Model)** we suggest establishing (multiple) large scale dairy farms that are owned (either wholly or in partnership) and operated by the dairy company. This is similar to the Nellore model that was assessed in this study. But we suggest that the scale be reduced to around 1000 - 1200 cows/farm and also that it be considerably adapted to local conditions. The smaller farm size will fit better into the local context and will reduce visibility (below the radar approach), especially during the initial stages. Also, since total feed requirements will be much lesser, the farm could source its entire feed from a mix of local farmers and agro-industries. Thereby by-passing the need to procure large amounts of productive agricultural land and have own-cropping operations. A contract farming system for procuring maize, hybrid napier and perhaps lucerne from a select group of local farmers can be developed. To reduce animal related risks, instead of NZ Holsteins Friesians, breeds more tolerant to Indian conditions such as crossbred Jerseys and/or crossbred Indian breeds (Gir, Sahiwal or Sindhi) can be used. Also, a seasonal production pattern, with entire herd drying off in early summer (March/April), to reduce impacts of heat stress might be a better option. On the whole by developing 5-6 such farms within a region, sufficient scale (100,000 litres/day) can be built up to justify establishment of a processing plant. No dairy company has used this model in India as yet.

In the **second model (Two Tier Dairy Farming Model)** we suggested establishing a two level farming model consisting of – 1) nucleus farms and 2) satellite farms. The nucleus farms would be the focus of this operation and will be fully owned and operated by the dairy company. It will be significantly larger than existing commercial dairy farms (about 500- 600 animals). Operationally, the nucleus farm will be very similar to a farm described in the single tier dairy farming model (first model).

The satellite farms however will be smaller in size (average size of 50 milking animals/farm) and in relatively close proximity (<150 km) to the nucleus farm. Each of the satellite farms will be owned and managed by local farmers, and will function as distinct entrepreneurial units. But the dairy company will have complete ownership of dairy assets (cows and equipment) and some degree of management control of satellite farms. The dairy company will provide feed and standard support services (health care, breeding, etc.) to all satellite farms at no cost. Costs associated with labour and other operational expenses will be borne by the farmer. The satellite farms will be open to frequent audit/inspection by the dairy company to ensure compliance with mandatory operational standards.

On an average each satellite farm will have 50 milking cows and produce 750 litres/day. The lower production is because these farms will be more adapted to local conditions, especially animal genetics & management systems. Also animals will be on a once a day milking regime because of logistical challenges associated with twice a day collection from all farms. The satellite farms will have a contractual obligation to produce milk of a standard quality and supply 100% of their production to the dairy company. Like in the case of most contract farming models, the dairy company will pay farmers a pre-determined price (approximately Rs 6/litre) plus premiums for quality and volume. Once the model is perfected it allows for a two directional expansion strategy by increasing size and numbers of 1) nucleus farms, and 2) satellite farms.

In the **third model** (**Retail Procurement Model**) we suggest sourcing milk from small and large dairy farmers without owning or controlling dairy farms. Most cooperatives and private dairy companies in India use this approach to source milk. The cooperative usually establishes a milk collection centre at each of its primary milk societies (at village level) covering a few hundred farmers and the farmers deliver milk (usually twice a day) to the collection centre. The milk from each collection centre is then transported to a chilling station or processing plant by the cooperative.

Unlike cooperatives, most private companies do not deal with producers directly but instead work with milk procurement agents at the village level. The dairy company negotiates its terms of trade with the agent and the agent in turn negotiates his terms of trade with the producer. The dairy company supplies the agents with milk coolers (Bulk Milk Tanks/ Vat) and necessary equipment for performing routine milk testing at a milk chilling centre. The costs of running the milk chilling centre are usually borne by the agent. The agent has a contractual obligation to supply milk of standard quality and pre-determined volume to the dairy company. A significant drawback with this model is the high risks associated with milk quality and food safety.

In this model instead of investing in farms, we suggest that the dairy company invest in developing a *"milk-shed"* or *"quality milk catchment area"* within a region. This milk shed could comprise of around 1000 local (progressive) dairy farmers. Each farmer would have at least 10 dairy animals (i.e. a total of 10,000 milking animals). The farm would be entirely owned and managed by the dairy farmer. But farms would have to comply with certain mandatory good management practices framed by the dairy company. The dairy company will supply farmers with milking equipment (portable milking machines), support services free of cost, and if required feed (at cost). Milk will be picked form each farm twice a day and transported to one of 10 chilling stations (bulk tanks) by the dairy company. Farmers would be paid a premium price for their milk. Additionally premiums based on quality and volume will also be paid.

In the **fourth model (Wholesale Procurement Model)** we suggest using one or more "third" parties to supply milk. The third party will ideally be an existing dairy processor (either privately owned or a cooperative) with well-developed milk sourcing operations in India. The third party will have a contractual obligation to supply milk of specified standard and volume on a regular basis to the dairy company. Through this approach large volume of milk can be sourced from one or few suppliers, thus eliminating the need to establish the elaborate infrastructure required for sourcing milk directly from producers. A few well known dairy/food companies in India (Nestle, Unilever, and Danone) use this model to meet some of their supply needs. But the strength of this model is heavily dependent upon on the capabilities (integrity!) of the third party. The risks associated with poor milk quality and safety is considerably high for this model. The dairy company would therefore have to invest in developing and implementing milk quality/safety monitoring systems across the supply chain. Also, support services and other incentives (premiums) would need to be provided by the dairy company to promote production and ensure compliance.

CHAPTER 6

SUMMARY AND RECOMMENDATIONS

6.0 SUMMARY & RECOMMENDATIONS

India provides tremendous growth opportunities to multinational companies. This is mainly because the Indian economy is growing at the rate of 7-9 % per year and it also has a very large upwardly mobile middle-class (around 350 million). Multinational business companies are keen to enter the Indian market from a growth perspective - the aim being to capture a share of the market (market seeking).

India is a traditional dairy products consuming country, and milk and milk products account for the largest source of protein in a predominantly vegetarian diet of Indians. As a result India is the largest producer and consumer of milk in the world. Moreover, dairy cows and milk are integrally linked to the history and socio-cultural environment in India. But the farming systems in India are essentially small-holdings (2-5 animals) and of the subsistence type. The industry is also highly fragmented with a large unorganized (informal) sector controlling the marketing of almost 70% of milk produced.

The Indian dairy industry is at a major crossroad and its biggest challenge is increasing both production and quality of milk to meet rising consumer demand and expectations. Due to various reasons (poor animal genetics, lack of quality feed, in-adequate support services, poor market access, unfavourable climate, supply chain complexities etc.) it appears highly unlikely that the domestic industry will be able meet this challenge. This situation (expected domestic Supply-Demand gap) presents multinational dairy companies with an opportunity to enter the Indian dairy sector with alternate milk supply models. However, to capitalize on the opportunity effectively, management needs to understand the ground realities and localize their business strategy/project model. One proven method of developing/assessing a business strategy/project model and doing due diligence, is the feasibility study. However, no research study has looked at developing a framework of feasibility analysis of dairy ventures in India.

Therefore the main purpose of this study was to answer the questions:

1. What is the best suited, comprehensive and holistic framework of feasibility analysis that can be applied when assessing the feasibility of a large scale dairy venture in India?

2. Is this framework of feasibility analysis robust enough to determine the feasibility of a **Case Study** dairy venture in India (a proposed large scale dairy farming venture in Nellore region of India)?

To answer these questions a review of literature on feasibility studies was performed and four approaches were identified and described. Following which elements from all four approaches were integrated and a unique holistic **framework of feasibility analysis** for large scale dairy ventures in India was developed. This framework was then tested by applying it to a case study- large scale dairy farming model that Fonterra is considering using.

Fonterra is a New Zealand based dairy cooperative and is one of the largest dairy companies in the world. Being an export oriented firm, capitalizing on the opportunities presented by a rapidly growing Indian dairy market is strategically essential for Fonterra. But Fonterra cannot capture the market by simply exporting its products to India because the import of dairy products into India is strictly regulated by means of tariffs, quotas and non-tariff barriers. It would therefore have to produce or source milk in India and venture into the domestic dairy sector. However sourcing milk from domestic producers is not an option for Fonterra due to serious milk quality and safety issues. Instead Fonterra plans on producing its own milk by establishing a large scale (industrial type) dairy farm in Nellore region of India. Fonterra has successfully executed an almost identical model in China.

The framework of feasibility analysis that was developed has two levels analysis. In the first level a thorough study of the contextual factors (world dairy sector, Indian dairy sector and the Indian business environment) that could significantly influence the outcome of dairy ventures in India was performed. The various global and local issues specific to the Indian dairy market were highlighted through this process; all are critical to the success of any dairy venture into India. In the second level of analysis, the project/model was evaluated on the basis of 15 feasibility parameters that were identified as being essential in the framework. Each parameter was further broken down to sub-parameters/themes via the framing of specific questions. An average score for the parameter was calculated based on the answers to each specific question. Based on the feasibility score obtained of each parameter, the overall feasibility profile and score of the Nellore project was arrived at.

The overall feasibility profile and score for the Nellore dairy project indicated that the project was not feasible for many parameters. Also none of 15 parameters obtained a score which indicated feasibility. Moreover, for most parameters, further study/investigation is required to arrive at a definite conclusion (Feasible or Not feasible). Hence, based on the framework of analysis it is recommended that the project is not worth executing at this point in time.

Since the Nellore dairy project/model was not feasible, four alternate milk supply options that a multinational dairy company can consider using were identified. Future research should now focus on developing sub-models (scenarios/options) within each model to identify milk supply options that are most feasible as well as a best "fit" with a dairy company's vision, values and goals. The framework of analysis can then be used to identify the most feasible option within each model.

The benefit of a rigorous feasibility analysis using this framework is presented in this thesis as primarily being the ability to forewarn of issues and so avoid the slower 'learning by experience' that is a common outcome when multinationals venture into new countries. On the whole, by means of this framework a robust, disciplined and scientific method of evaluating the feasibility of large scale dairy ventures in India was achieved. However, since a qualitative case study based approach was the chosen methodology for this thesis, a quantitative dimension could not be applied. Moreover, the scaling of feasibility parameters was done by researcher based on the specific objectives of the dairy company (Fonterra). It is recommended that future studies should incorporate quantitative approaches (such as the Analytical Hierocracy Process discussed in the literature review) and the scaling of parameters should be validated by a panel of experts.

APPENDIX I

Overview of the World Dairy Sector

TABLE OF CONTENTS – APPENDIX I

OVERVIEW OF THE WORLD DAIRY SECTOR

List of Tables

Pg. No

List of Figures

Pg. No

A-1.1 INTRODUCTION

Over the past three decades, a rapid global expansion in production and consumption of animal products has led to a "livestock revolution". This revolution is primarily driven by population and income growth coupled with urbanization. Cheap, often subsidized feed grain and rapid technological change, particularly in poultry, pork and dairy production, have accelerated the livestock sector's growth to such an extent that it is expected to provide 50 per cent of global agricultural output in value terms in the next ten years (Food and Agriculture Organisation (FAO), 2008). Rapid structural change has been associated closely with this growth process in developed and rapidly growing developing countries. As a result large-scale commercial production, based mostly on feed grain and often globally connected, has emerged to provide growing urban markets with food (FAO, 2008).

Milk is quite different from other agricultural products and has unique characteristics which shape its production, processing and trade (Griffin, 1994). Unlike grains, milk is a very bulky and heavy commodity which requires high-cost storage and transportation as it spoils quickly without cooling (Griffin, 1994). Furthermore, no single dairy farm can provide adequate quantities to supply the requirements of a processing plant. Instead each dairy farm supplies a very small share of the total milk processed. For these reasons, the value chain of milk is quite complex and unique.

Globally, the dairy sector is arguably one of the most distorted agricultural sectors (Beghin and Aksoy, 2003). Producer subsidies are in place in many developed countries which encourages surplus production. Export subsidies are paid by governments to place the excess production on the world markets. Moreover, tariff and non-tariff barriers are used by both by developed and developing countries to protect their dairy sector from 'unfair' competition (Knips, 2004). These market distortions have significant and different impacts on producers and consumers in developing and developed countries. Having said that, it's important to note that the dairy markets are far more liberalized and open today than they were about 10 years ago. This has made the international playing field much more level, fair and competitive.

On the production side, the global dairy sector is characterized by a pronounced dichotomy of two disparate but co-existing systems. On one side we have the smallholder production systems –supporting numerous family livelihoods and household food security and contributing to rural food security; and on the other side we have large scale commercial production systems – supporting the global food supply system and providing employment to producers and others in associated processing, distribution, marketing and support services (FAO, 2008). The smallholder systems are by far the most dominant production models in the developing regions of the world, whereas the large scale commercial production systems are the dominant models in the developed world.

The early part of this decade witnessed some phenomenal changes in the industry with both milk production and consumption growing at a robust rate. In 2007, the milk prices reached a record high, mainly due to gaps between supply and demand. However, in 2008, supply overtook demand for the first time in several decades and consequently the milk prices began to drop rapidly and fell to its lowest price in over a decade. The low prices of dairy products due to a decrease in demand from the international market as well as local markets, global financial crises and distressed dairy farmers posed a huge challenge for the dairy industry worldwide. Dairy farmers and the industry – which had more or less experienced stable and un-fluctuating milk prices for a long time - were suddenly subjected to these extreme fluctuations (International Dairy Federation (IDF), 2009).

The year 2008 in particular was one of the worst ever for the dairy industry with more milk being produced than was consumed. The accumulation of new stocks of milk powder and butter placed tremendous pressure on the prices of dairy products. As a consequence, market forces have responded by ensuring that the growth in milk production in 2009 was the lowest in a decade. This has helped clear stocks and brings back balance to the market. An unfortunate downturn of these global events has been the reintroduction of policy regulations in the dairy market, especially in the EU and USA (IDF, 2009). However, with the recovery of the global economy it is expected that there will be an increased demand for dairy products, mainly driven by income and population growth in many parts of the world, and also by changes in the consumer's preference to dairy products. Hence the long term prospects of the dairy market appear to look optimistic and will not change significantly.

Dairy companies all over the world face a number of challenges. These challenges vary depending on the market they operate in. The most important challenge is meeting the growing demand for dairy products. The world demand is growing by 2 per cent a year, and milk supply is growing at a slower pace. The demand for dairy products is stagnant in developed countries but is strongly increasing in some developing regions. Companies operating in the big but mature dairy markets of Europe and the USA face limited market growth opportunities in volume terms as per capita consumption levels are among the highest in the world and growth can only occur by increasing market shares or switching to higher value-added products (IDF, 2009). Due to these limited market opportunities in developed countries, multinational dairy companies are attracted by the strong growth markets in developing countries. To benefit from the growth of their own domestic markets, local companies are being forced to raise product quality and efficiency to be able to withstand foreign competition.

Food retailers, foodservice industry and food processing industry are the key customers for dairy products. The leading companies in this sector tend to be significantly larger than the players in the dairy industry. In addition the on-going global consolidation process is further increasing their market power. Consequently, the concentration process by means of mergers, acquisitions and strategic alliances in the dairy industry has been very pronounced and is expected to continue in the future as well (IDF, 2009).

On the whole the future of the dairy industry looks quite bright. With consumption expected to increase once again, demand for dairy products will outstrip supply resulting in increased prices and profits. It is also expected that the traditional dairy superpowers, USA and EU, will soon be challenged by the likes of New Zealand, Australia as well few developing dairy countries such as China, Brazil and India (IDF, 2009).

A-1.2 MILK PRODUCTION

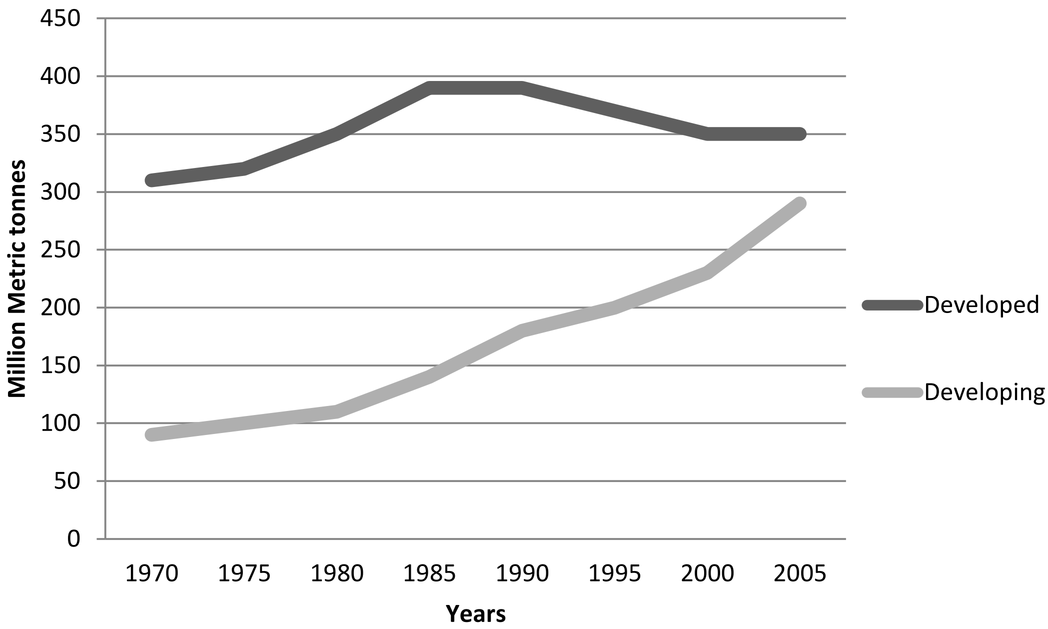
A-1.2.1 Global Perspective

Over the last 3 decades, total world milk production has increased by almost 40 per cent; whereas per capita world milk production has declined by nine per cent which indicates that world milk production has not kept pace with the increase in world population. The decline in global milk production per capita can be attributed to falling production in the developed countries whereas per capita milk production in the developing countries has slightly increased (IDF, 2009).

In 2009, the Food and Agricultural Organisation (FAO) reported that the global milk production was an estimated 699 million tonnes which is an increase of 1.6 % over the previous year (Table A-1.1). The low increase in milk production could be due to declining world market price for milk in 2008 which discourages farmers to increase production, the melamine crises in China, unfavourable weather conditions (Latin America) and the global economic crisis (IFCN, 2010).

The increase in milk production of developing countries has been substantial when compared with developed countries (Figure A-1.1). In the year 2009, the largest milk producing region was the EU-27 (150 million tonnes), followed by India (101 million tonnes) and USA (86 million tonnes) (IDF, 2009). Milk production in developed countries remained more or less stagnant and hence almost all the increase in milk production was contributed by the developing countries (377 million tons).Only 14 countries accounted for 91% of the growth in milk volume from 2005 to 2008 with China India and Pakistan alone contributing to 55% of the global annual growth volume of milk (IFCN, 2010). The share of developing countries in global output is currently about 48 per cent. From 2008 to 2009, India, Pakistan and New Zealand supplied nearly 60% of the rise in global milk production (IFCN, 2010). However, the positive growth in these countries was compensated to a large extent by countries with a decline in milk production (IFCN, 2010). In 2008, China's milk production stagnated due to the Melamine crises. In response to this challenge, the Chinese government has taken several steps to improve quality control measures over the supply chain. It is expected that these measures will re-in still consumer confidence and China's milk production will increase again.

Figure A-1.1 Milk Production Trends – Developed vs Developing Countries



Source: FAO, 2009

Table A-1.1 Overview of Global Dairy Production, Consumption and Price Trends

	2007	2008	2009	Change: 2009 over 2008
	million tonnes milk equivalent			*%*
WORLD BALANCE				
Total milk production	**676.1**	**687.7**	**699.0**	**1.6**
Skim Milk Powder (SMP)	24.1	24.6	25.0	1.6
Whole Milk Powder (WMP)	30.8	31.6	32.1	1.6
Butter	60.3	62.3	64.0	2.7
Cheese	85.9	87.9	89.8	2.2
Other products	475.1	481.3	488.0	1.4
SUPPLY AND DEMAND INDICATORS				
Per caput food consumption:				
World *(kg/year)*	102.4	103.1	103.6	0.5
Developed countries *(kg/year)*	245.4	246.9	249.6	1.1
Developing countries *(kg/year)*	64.0	65.5	66.9	2.1
Trade – share of prod. (%)	5.8	5.8	5.6	
	2007	**2008**	**2009**	**Change Jan-May 2009/ Jan-May 2008 (%)**
FAO Dairy Price Index (2002-2004=100)	**212**	**220**	**119***	**-52**

Source: FAO, 2009

The production growth in developing countries is mainly due to increasing numbers of milk animals (and dairy farms) and only to a small part due to productivity gains. In contrast developed countries have focused on intensification of milk production. Large parts of Latin America, Africa, South Asia and CEEC have low (<4000 kg/year) average milk yields. These regions are characterised by low input systems and small herd sizes (IFCN, 2010). In New Zealand and Ireland, the average milk yields are moderate (4400 to 6000 kg/year) which is a characteristic of the large scale extensive grassland-based production systems that are predominant in the regions. High milk yields (> 6000 kg/year) are seen in Saudi Arabia, Israel, USA, Canada and Western Europe where a very intensive system of dairy farming is practiced (IFCN, 2010). The largest milk volumes per farm are however produced in New Zealand and Australia. This is because, the large herd sizes compensated for the lower average milk yields in these regions (IFCN, 2010).

Unfortunately, there's is no authentic data on the total number of dairy animal in the world. But the top 5 regions in terms of number of dairy animals as of 2005 were as follows, India (36 million cows and 33 million buffaloes), EU-27 (25 million), Brazil (15 million), China (12 million) and Russia (9.6 million) (IDF, 2009).

A-1.2.2 Milk Production by Region

Milk production in *Asia* (277 million tonnes) increased by 3.5 % in 2009 with the biggest milk producing nations India and Pakistan reporting increases in production by 2.8 and 6 per cent respectively (FAO, 2009). In *South America*, milk production grew by 3.5 % and reached 58 million tonnes in 2009. The milk production of Brazil increased by 5% to 29.5 million tonnes and that in Argentina by 2.9% to 10.6 million metric tonnes in 2009 (FAO, 2009). In *USA*, milk production decreased to 86 million tonnes after 7 consecutive years of growth. Milk production in Canada remained stagnant at 8.3 million tonnes (FAO, 2009). Milk production in the *European Union* (EU – 27) also decreased to about 150 million tonnes (FAO, 2009). Amongst the *Eastern European* countries, Belarus is emerging as a strong player with an increase in milk production of 5%. Milk production in the Russian federation increased marginally, by about 1%. However, the regions strongest producer, Ukraine has reported a nearly 6% drop in its milk production (FAO, 2009).

In *Oceania* region, milk production increased in both Australia and New Zealand, by 1.9 and 6 per cent, respectively. Australia's milk production reached 9.4 million tonnes the first yearly increase in four years. In New Zealand, the world's largest exporter of milk products, milk production reached a high of 16.2 million tonnes in 2008-09 (FAO, 2009). Milk production in *Africa* improved by only 1.0 per cent in 2009 to 36 million tonnes. Egypt, the continent's largest milk producer, continues on its growth path of 1.0 per cent per annum. However, production in Algeria, which is by far Africa's most significant importer of milk products, is expected to expand by 2.2 per cent, as a result of programmes to boost the dairy sector (FAO, 2009).

A-1.2.3 Milk Production by Type

Cow Milk – the growth of cow milk has been a marginal 0.6% in 2009 and was 587 million tonnes. Cow milk still forms a significant part (84%) of the total world milk production (IDF, 2009). There has been a decrease in cow milk production in USA, EU, Ukraine, Australia, Japan, South Africa and China. The decrease in the USA was mainly due to a culling program that resulted in the decrease in cow numbers by 250,000 heads (IDF, 2010). On the other hand countries like New Zealand (+8.7%), India (+3.3%), Pakistan (+3.8%), Belarus (+5.7%), Turkey (+2.9%) and Iran (+3.5%) reported increases in production (IDF, 2010).

Buffalo Milk – Buffalo milk production has been growing at a faster rate than cow milk production (IDF, 2010). Over the last decade, the growth in buffalo milk has been almost 3.5% per year. Worldwide buffalo milk production was estimated to be around 90 million tonnes and it constitutes nearly 13% of the total world milk production. Interestingly, almost 90% of the total volume is produced by India (56 million tonnes) and Pakistan (21 million tonnes) (IDF, 2010). Apart from these countries, buffalo milk is also produced in Egypt, China, Iran and Italy.

A-1.2.4 Farm Size

There is considerable variation in farm sizes both within and between countries. Globally, the average dairy herd size is 2.4 cows per farm (Hemme and Otte, 2010). In developing countries of Africa, Asia and Latin America, most dairy farms are small with less than 15 cows. Within this context, three distinct farm types exist in developing countries– 1) subsistence farms with 1-5 cows or buffaloes (the average size farm in India and Pakistan), 2) Small scale market oriented farms with 5 – 10 cows (larger farms in India, Indonesia and Pakistan) and 3) Business farms with more than 10 cows (Nigeria and South Africa) (IFCN, 2010). In contrast, most dairy farms in developed countries are much larger.

Dairy farms in Eastern Europe are characterised by a dual milk production system where very large farms exist alongside very small ones (Belarus and Ukraine). Prior to the break-up of the Soviet Union, the agricultural policy was focused on the development of large farms. However, after the break-up of the Soviet Union, the policy has changed and different trends are noticed. Large farms continued to be dominant in Belarus and the Czech Republic, but large farms were broken up and the cows re-distributed to smaller household farms in Ukraine and Russia (IFCN, 2010). In Poland, the family farm culture is extremely strong with nearly 95% of dairy farms being family-owned, having less than 20 cows per farm (IFCN, 2010).

For countries influenced by the milk quota system (mainly Western Europe, Canada and Israel) most farms are small and family owned. However, even the average and large farms in these countries and family-owned (IFCN, 2010). The average sized farms have between 35 to 50 cows/farm and the larger farms have greater than 200 cows/farm. The Oceania region has the highest statistically average (above 200 cows per farm) farm-sizes in the world (IFCN, 2010). The main reason for this is that consistently lower milk prices have pushed farmers to lower their cost of production (via achieving economies of scale). Additionally, the relatively liquid land market makes it easier to buy adjacent operations and merge farms (IFCN, 2010).

In the northern parts of China a unique farming model called the “cooperative” farm exists. In this system, an investor sets up the farm infrastructure (barn, parlour, feed storage, roads, electricity, etc.) and small farmers (3 to 40 cows) rent these facilities, as well as services such as milking, veterinary and insemination. These small farmers supply milk to the investor at a lower price (Hu, 2009).

A-1.2.5 Milk Yields

There is considerable variation in the milk yield per cow between countries. In 2009, the lowest average milk yields per cow were observed in Uganda (500 kg) and the highest in Israel (11,500 kg) (IFCN, 2010). In Western Europe, USA and Israel, almost all farms have Holstein Friesian cows with intensive management and feeding systems. The average milk yield of these cows ranges from 7000 kg to 11,000 kg (IFCN, 2010). The dairy farms in the CEEC, Latin America, China and Oceania are generally grazing based with less intensive feeding and/or management and with other breeds (cross bred and dual purpose breeds). The milk yield per cow on these farms typically ranges from 4000 to 7000 kg. The dairy farms in Africa, South and South East Asia (except Japan) are characterised by milk yields of less than 4000 kg. In these countries buffaloes, local breeds and cross breeds have a high share of genetic composition (IFCN, 2010).

A-1.3.0 PRICES AND COSTS

A major setback for the dairy industry in recent years has been the fall in prices of dairy products. It is reported that the FAO (2009) Dairy Price Index of international dairy product prices (100 in Index year 2002-2004) fell by 58 per cent from its peak in November 2007 (270), to a value of 114 in February, 2009 (Figure A-1.2). A controversial outcome of this price drop has been the re-introduction of dairy subsidies by the EU.

Figure A-1.2 Monthly Indices of International Prices of Selected Dairy Products

Source: FAO (2009)

A-1.3.1 Milk Prices

Milk price levels differ significantly from country to country, partly driven by supply control and border protection policies (IFCN, 2010). Overall, due to the global economic downturn and recession, milk and milk product prices weakened in 2008-2009 (Figure A-1.2). The year 2008 and 2009 saw a large drop in prices of raw milk and dairy products. However, this drop has not been uniformly seen in all parts of the world. In parts of the EU, USA and Oceania prices dropped to their lowest levels since 1970's. But in some Asian countries the price still remains quite high.

For nearly two decades the world milk price fluctuated between 10 and 25 US$/100kg of milk. This trend changed drastically in 2007 when world milk prices reached a record high of 58 US$ per 100kg of milk (IDF, 2009). Since then milk prices have fallen by over 60% to as low as 20 US$ per 100kg of milk at the beginning of 2009 (IDF, 2009). In 2009 the world market price of milk was

US$ 26.2/100 kg of milk, which is a decrease of 14.1 US$ (35%) compared to 2008 (IFCN, 2010). However, the world milk price has started rising again and by mid-2010, the world milk price had peaked at US$ 45/100 kg (IFCN, 2010).

A close look at the situation reveals that milk is an extremely volatile agricultural commodity. The coefficient of variation for milk prices from 1998 to 2009 was the highest (43%) amongst agricultural commodities (IFCN, 2010). A small fluctuation in quantities can significantly influence the prices. For example, a small gap in supply to demand of 0.5% (2 - 4 million tonnes milk) in 2007 resulted in increase in prices (IDF, 2009). In addition the slow reaction of dairy farmer’s production to changes in prices and the delay in milk demand reaction in response to changes in dairy commodity prices also contribute the volatility of milk (IDF, 2009). Since milk production largely results from a long biological process and cannot be quickly adjusted downwards, the impact has been quite significant. One method dairy companies have used to ensure that product prices do not fall drastically is by holding stocks off the market.

In 2009 the market milk prices showed considerable variation form country to country and ranged from US$ 18.2/100 kg milk in Uganda to US$ 91.4/100 kg milk in Japan (IFCN, 2010). 47% of the countries had national milk prices that were on average US$5 above the world market level. From 2006 to 2009, the regions that consistently had milk prices that were lower than the world price were Latin America, South and Southeast Asia, and countries such as Belarus, Nigeria and Uganda (IFCN, 2010). Similarly, countries that consistently had national milk prices that were above world price are Norway, Iceland, Switzerland, Canada, Japan, Korea and Taiwan (IFCN, 2010).

A-1.3.2 Milk Product Prices

In 2008-09 the demand for dairy products lagged behind the accelerated increase in milk production. This coupled with the global financial crises in 2008, first resulted in the decrease in international dairy product prices. This was followed by a drop in wholesale prices of commodities in exporting countries. The retail prices were affected much later. In some countries the prices still remain high due to the devaluation of local currencies (IDF, 2009).

The prices of Butter and Cheese have increased by 252% and 107% respectively over the last 10 years (Table A-1.2). The prices reached a peak in 2007, after which they fell considerably till early 2009. Since then the prices have increased once again and were US$ 4763/tonne for Butter and US$ 4488/tonne for cheese in mid-2011.

The price of whole milk powders has increased substantially over the last decade (Table A-1.2) However, the price of whole milk powders witnessed considerable fluctuations from 2008 to 2010. It reached a record high of US$ 5005/tonne in 2007 and then dropped to US$ 2000/tonne in early 2009, which is lower than the price in 2004 (IDF, 2009). Since then the prices have increased and in mid-2011 were US$ 3938/tonne.

The price of skim milk powder (SMP) has increased considerably over the last decade as well (Table A-1.2). But, the prices of skim milk powders saw a tremendous drop in 2008. It reached a record high of US$ 5200/tonne in 2007 and then dropped to US$ 2000/tonne in 2009, which again is lower than the price in 2004 (IDF, 2009). The prices have increased since then and by mid-2100 were US$ 4000/tonne.

Table A-1.2 Prices of Important Milk Products

Commodity (US$/ Tonne, Oceania, indicative export prices, f.o.b.)	July 2011	July 2010	5 Years Ago	10 Years Ago	% Change in the last 5 years	% Change in the last 10 years
Butter	4763	4050	1725	1350	176.1	252.8
Cheddar Cheese	4488	3950	2675	2163	67.7	107.4
Skim Milk Powder	4000	3225	2050	2100	95.1	90.4
Whole Milk Powder	3938	3850	2063	2025	90.8	94.4

Source: FAOSTAT, 2011

The retail price of milk varies considerably from country to country. But on the whole retail milk prices (per litre of milk) reached a high in 2008 and then began to drop. Among countries for which data is available, in 2008 the highest price was recorded in Canada (US$ 1.53) and the lowest in USA (US$ 1.0/litre) (IDF, 2009). In 2009 these prices ranged from 0.82 US$/litre in USA to US$ 1.41/litre in Australia (IDF, 2009).

A-1.3.3 Farm Gate Prices (in 2009)

There is considerable variation in farm gate milk prices between countries. The milk pricing systems adopted can differ between countries and this could be one of the reasons for the variation. In 2007 and 2008, milk producer (farm gate) prices increased almost all over the world to record high levels. In addition, for the first time, milk prices around the world came closer together (less variation) than ever before. This was due to a more liberalized trade environment and global absence of stocks (IDF, 2009). In 2008 and 2009, the prices fell in most milk producing countries as a result of reduced global demand, decreasing international prices and increasing stocks. Prices fell at a faster rate in the major exporting countries. However, a reversal of this price trend is expected when the surplus milk supplies disappear due to decreased growth in production an increased demand.

In 2009 all most all countries (85%) reflected the world market trend of a decrease in farm gate prices (IFCN, 2010). The producer milk prices ranged from US$ 16 in Uganda to US$ 64 in Canada (IFCN, 2010). The lowest farm gate milk prices (< US$ 20/100kg) in 2009 were seen in Uganda and Ukraine. In Uganda, milk is produced in rural areas which are far away from the urban consumption markets. Due to which, middle men (agents) buy milk from the rural producers at very low prices and sell it directly to urban consumers, in the process making huge margins. In the case of Ukraine, the farm gate milk prices were very low because of the devaluation of the national currency to the US$ (IFCN, 2010). The highest producer milk prices (>US$ 50/100kg) were seen in Norway, Switzerland, Finland, and Canada, which have highly protected markets (IFCN, 2010). Additionally, such high milk prices were also found in Israel, Jordan, Egypt and Cameroon (IFCN, 2010).

In the EU 15, the farm gate milk prices decreased in 2009 after reaching a historic peak in 2008. Apart from Finland, the farm gate prices in 2009 were less than that in 2007. The lowest milk prices were in Belgium (US$ 30.9/100 kg milk) and highest in Greece (US$ 52.6/100 kg milk). However, all countries had farm gate milk prices that were above the world milk price. In the other European countries and new EU members, the farm gate prices fell below the 2007 level, except for Bulgaria, Turkey and Albania which had prices higher than the EU 15 average of US$ 39.7/100 kg milk. The lowest prices were seen in Lithuania (US$ 22.7) and Latvia (US$ 24.3) (IFCN, 2010). Within the EU, Spain and Italy had higher milk prices as compared to EU's weighted average farm gate milk price because both these countries are net importers of milk (IFCN, 2010). In Germany, the farm gate milk prices were higher in the southern regions when compared to the north. This is because most of the milk in the south is used to produce higher value added products whereas the milk in the north is used for butter and SMP production (IFCN, 2010).

The farm gate milk prices in the US can differ from one state to another (US$ 29 in Wisconsin and US$ 33 in New York). Farms in the West generally have a lower milk price than the farms in the East. On the whole, the average farm gate milk prices were above (by US$ 5) world milk prices (IFCN, 2010). However, the US prices were lower than the weighted average milk price for the EU (by US$ 6), indicating that it is probably cheaper to source milk from the US instead of the EU (IFCN, 2010).

Milk prices in Australia and Newland tend to follow the world milk prices. From 2008 to 2009, both countries showed decreases in farm gate prices (30% in Australia and 18% in New Zealand) and were more or less the same as the world market price level (IFCN, 2010).

The farm gate milk prices (US$ 35/100 kg) in Brazil, which is rapidly emerging as a leading player in global agribusiness is higher than the world milk price. This is because Brazil has a rapidly growing domestic consumer market and milk supply is not able to keep pace with domestic demand (IFCN, 2010). The farm gate milk prices is China are much higher than the world milk price as well. In the case of the "cooperative farm", there are two farm gate prices – the price the farmer receives from the investor (US$ 41/100 kg) who has set up the farm and the price the investor receives (US$ 46/100 kg) (IFCN, 2010). The farm gate milk prices in India can vary substantially between rural and peri-urban farms, with rural farms getting a much lower price. On the whole, the average producer level milk prices in India were almost exactly the same as word milk prices (US$26/100 kg) (IFCN, 2010).

A-1.3.4 Cost of Production (in 2009)

An analysis of cost of milk production provides considerable insights into the competitiveness and profitability of a dairy farming business. In 2009, the average cost of milk production ranged from US$ 18 (Africa) to US$ 58 (W. Europe) per 100 kg of milk (IDF, 2010). The lowest cost of production of average sized farms was in Cameroon (US $ 4/100kg milk) and the highest in Switzerland (US$ 104/100kg milk) (IFCN, 2010). This is a reflection of the low cost subsistence farming system in Cameroon where the cost of land, labour and feed is quite low as compared to the relatively intensive systems in Switzerland. When Cameroon's cost of production is viewed in conjunction with its average farm gate prices (US$ 60/100kg milk), it presents a very interesting picture.

The cost of milk production in Africa and the CEEC was relatively much lower (< US$ 20/100kg milk) because of the availability of cheap resources (mainly land and labour) and their less dependence on expensive feed imports (IFCN, 2010). Dairy farmers in Chile and Indonesia have also been able to produce milk at less than US$ 20/100 kg. In the case of Chile, the use of a grazing system of dairy farming along with lower labour and land costs reduces milk production costs. The higher cattle returns, cheaper land costs and extremely fertile soils (which give high crop yields) have resulted in lower milk production costs in Indonesia (IFCN, 2010).

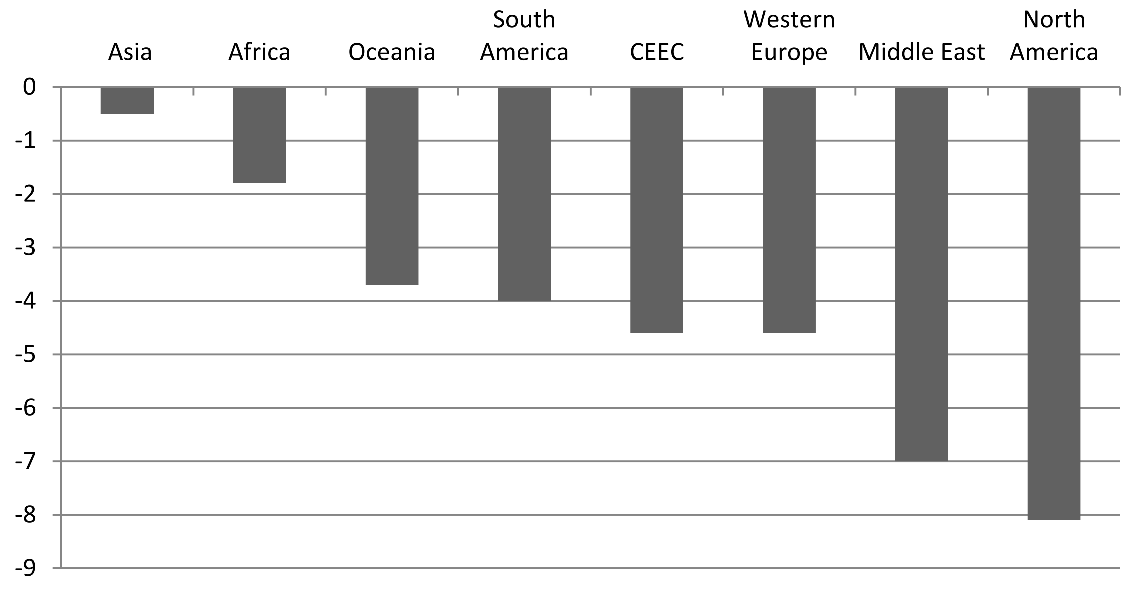
The highest cost (> US$ 50/100kg of milk) of milk production was seen in Norway, Switzerland, Finland, Austria and South Germany. These countries have less favourable conditions for dairying and also high feed costs. The cost of milk production in UK and Ireland were relatively much lower (US$ 35-40/100kg) than Western European countries because the climate and other natural conditions for dairying were much better (IFCN, 2010).

Interestingly, the costs in Eastern Europe, Asia, South America and Oceania were similar (US$ 25 to 30 per 100 kg milk). The cost of milk production is lower in South America and Oceania because they have a predominantly grazing system of dairying. Additionally, farms in Oceania have very high labour productivity and benefit from economies of scale due to large farm sizes (IFCN, 2010). The costs are low in Asia because of a predominantly subsistence type of farming with cheaper land and labour. In China the cost of milk production was relatively higher (US$ 30-35/100kg). This is because most dairy farmers in China are market oriented and not subsistence farmers. With substantial increases in farm productivity, the labour costs have increased as well. Additionally, most Chinese farmers have feed related costs because they purchase feed instead of growing them at home (IFCN, 2010).

The years 2007 and 2008 saw an increase in production costs as a result of rise in feed and other input costs. This suggests that high cost farming systems, such as those in USA and Western Europe will be most significantly impacted. Whereas, the Grazing and subsistence farming systems will stand to benefit. This situation might make it more attractive to source milk for small scale dairy farmers in developing countries provided they are able produce milk that meets international quality standards and specifications.

In 2009, the cost of milk production in all regions decreased when compared to 2008 (Figure A-1.3) (IFCN, 2010). This indicates that farmers all over the world were sensitive to the rising input costs and decreasing milk prices and responded by reducing their production costs. However, some countries like Australia, Brazil, China, India, Indonesia, Netherlands, Norway, Russia, South Africa and Switzerland showed an increase in production costs. Based on production system, the highest decrease in cost were seen in free stall barns (-6 US$/ 100 kg milk) and the lowest decrease in costs were in grazing systems (-3 US$/ 100kg milk) (IFCN, 2010).

Figure A-1.3 Change in Production Costs from 2008 to 2009 in US$/100 kg Milk



Source: IFCN (2010)

A-1.3.5 Total Costs and Returns of Dairy Enterprise

To analyse the economics of a dairy farm, we need to first understand the total farm costs and all farm returns. The earnings of a dairy enterprise can be from milk returns (milk price) and non- milk returns (sale of dairy cattle/calves/surplus feed, direct payments, subsidies). In general, dairy farms in South Africa, Canada, Mexico, Argentina, Uruguay, Paraguay, Chile, India, Pakistan, Australia and New Zeeland have very low non-milk returns (IFCN, 2010). The low-non milk returns could be due to low cattle and beef prices and also the absence of direct payments in some of these countries (IFCN, 2010). In some countries (Norway, Switzerland, Ukraine, Egypt, Uganda, Nigeria, Cameroon, Brazil and Indonesia), the contribution of non-milk returns is high because of cattle sales (IFCN, 2010).

The analysis of dairy enterprise costs and returns by IFCN (2010) compared the cost of milk production with four different levels of return. The 4 levels of returns for a dairy enterprise were – 1) milk price , 2) Milk price + Non milk returns, 3) Milk price + Non milk returns + Coupled direct payments, and 4) Milk price + Non-milk returns + all Direct payments (IFCN, 2010). This analysis revealed that the most profitable dairy farms are from Africa, mainly Egypt, Uganda, Nigeria and Cameroon. The farms in these countries use the grazing system with low inputs and also make high returns from beef. However, since most of these farms are located in rural areas, milk marketing is a huge challenge. Moreover, low milk yields/ cow (< 3000 kg/year) and small farm sizes (< 30 cows) make the total farm income per year quite low.

Another interesting finding of the analysis was that if direct payments are not paid or completely decoupled, then most farms in Switzerland, Germany, Netherlands, Luxembourg, Denmark, Sweden, Poland and Finland as well as a few farms in France, Norway, Czech republic and Ukraine will not be cover their costs and will generate a negative farm income (IFCN, 2010). A significant implication of this is that if the negotiations of the Doha round of the WTO are successful, then it's quite likely that dairy farms in these countries will be forced to re-structure. This will present a good opportunity for dairy exporting countries like New Zealand. Even with decoupled payments, farms in Poland and Czech Republic may not have a positive farm income (IFCN, 2010). Generally, direct income payments in the EU play a vital role in preventing farmers from going out of business (IFCN, 2010).

When analysing the returns of a dairy enterprise, it's important to study the return to labour as well because it reflects how much profit an employee or the farmer generates per hours work on the farm. Most developed countries have a return to labour of US$ 15 ± 3/ hour whereas developing countries have a relatively much lower return to labour of < US$ 5/hour (IFCN, 2010). When comparing the return to labour of the top performing dairy farms in different regions, the lowest return to labour was seen in Asia (China- inner Mongolia [150 cows] US$ 3/hour) and the highest was seen in Oceania (Australia- West [840 cows] US$ 56/hour) (IFCN, 2010).

A-1.3.6 Asset Structure and Return on Investment of Dairy Enterprise

The asset structure and return on investment analysis aids in evaluating the profitability of investing in dairy farming ventures. The assets of a dairy farm usually include land, livestock, cooperative shares and quota by market value, and machinery and buildings by book value (IFCN, 2010). Land assets are the most important class of assets in almost all regions accounting for more than 40% of total assets in Oceania, USA, and most farms in Western Europe, Latin America and Asia (IFCN, 2010). In countries (Cameroon, Indonesia, China) were land assets are low (because farmer operate without any land or rent land), the share of livestock in total assets is higher. The share of quotas in total assets is relatively high in Canada, Israel, Norway, Netherlands and Luxemburg (IFCN, 2010). The share of other assets like circulating capital and shares in cooperatives comprises a small but significant part of the total asset base of farms in New Zealand.

The capital intensity which is the level of investments required for producing 100 kg of milk varies considerably between countries. In Austria, more than US$ 700 needs to be invested to produce 100 kg of milk. In contrast, less than US$ 30 needs to be invested to produce 100 kg of milk in Belarus. An investment of US$ 100 is needed for producing 100 kg of milk in Eastern Germany, France, UK, Sweden, the CEEC, the Middle East, USA, Latin America, Australia and parts of Asia (IFCN, 2010). In the case of India, a huge difference (nearly US$ 400) in investment required to produce 100 kg of milk is seen between large and small farms. Large farms require an investment of nearly US$ 500 to produce 100 kg milk. This is because of their larger land requirements (and high land prices) which account for over 90% of investment costs. In contrast, small farms in India require less than US$ 100 to produce 100 kg of milk because of much lesser land requirements.

The return on investment (ROI) of a dairy enterprise can be determined by adding up entrepreneurs profit without decoupled payments + estimated interests (on land, non-quota assets) + interests on quota + opportunity costs for lands (by land rents) and dividing it by total farm assets (IFCN, 2010). Based on this rationale, IFCN (2010) determined that the highest ROI (> 20%) were seen in CIS (commonwealth of Independent States), the Middle East and Africa. The lowest ROI (0 or –ve) were seen in the EU and USA. High ROI (10 to 20%) were observed in farms from Latin America and Asia. Relatively moderate ROI (5 to 15%) were seen in farms from the Oceania region.

It must be noted that output (milk) prices were quite low in 2009 while input (feed) prices were relatively high. Farms in USA and EU are very intensive and use large amounts of feed inputs. Hence their ROI was lowest in 2009. When milk price to feed price ratio is high (a high milk price and relatively low feed price), farms in these countries tend to have much better ROI. Also, if all sources of payments (both coupled and uncoupled) are included in income, the ROI of farms in EU would be higher.

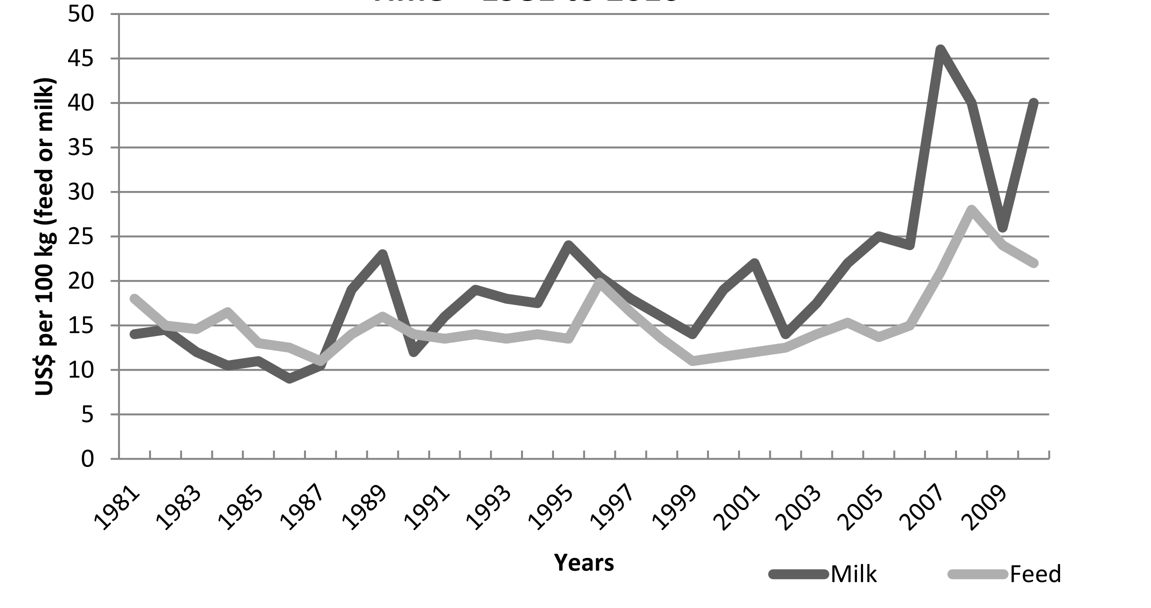
A-1.3.7 Feed Prices and Milk: Feed Price Ratio

Feed costs are an important variable cost and can significantly influence the economics of the dairy enterprise. However, the comparison of concentrate feed prices is difficult because it is impossible to compare feeds with different contents (IFCN, 2010). To estimate feed prices IFCN uses an assumption of 70% corn (energy source) and 30% soybean meal (protein source) (IFCN, 2010). This may not be an accurate estimate in countries where dairy compound feed is based on other commodities or compound feed is not part of the ration.

In general, feed prices also show considerable volatility. The coefficient of variation for feed prices from 1998 to 2009 was 35% (IFCN, 2010). From 1981 to 2006, the feed prices varied from 10.8 to 19.5 US$/100 kg feed and on an average was 14.3 US$/100 kg feed over the entire period (Figure A-1.4) (IFCN, 2010). From 2006, feed prices increased rapidly, reaching as high as US$ 35.5/100 kg feed in June 2008. Since then the price has fallen to US$ 23.8 in 2009 and US$ 22.1 in 2010 (Figure A-1.4) (IFCN, 2010).

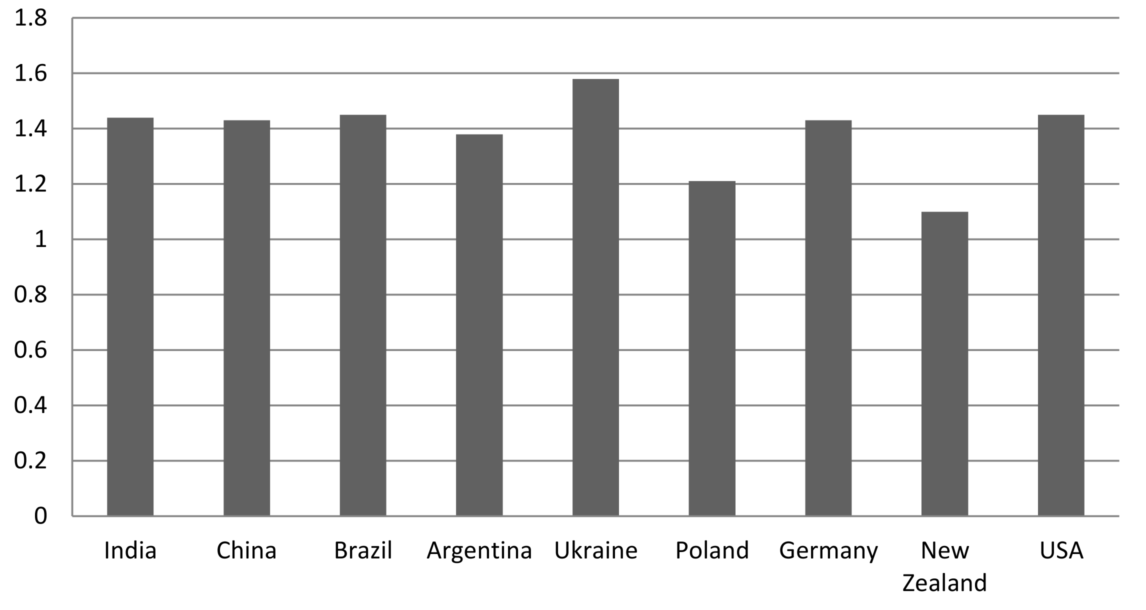
The countries with a high feed price (> US$ 50/ 100 kg) are Cameroon, Iceland, Japan and Norway; and the countries with a low feed price (< US$ 20/100 kg) are Argentina, Australia, Belarus, Canada, India, Nigeria, Pakistan, Paraguay, Russia and Ukraine. In USA, the world’s largest producer of corn and soybean, the feed prices in 2009 (US$ 20.7/100 kg) were below the world price. In Brazil, also a leader in corn and soybean production, the feed price (US$ 22.8/100 kg) was very close to the world price. The feed prices in China have increased by nearly 57% since 2006. The feed price in China, on an average is 38% higher than world market price. In 2009 the feed price in China remained quite stable (not reflecting the decline in world price) and was US$ 34.1/100 kg. The feed price in India in 2009 (US$ 18.5) was below the world market prices. The feed prices in India are usually very close to world market price but have varied from -23% to + 31% over the years 1996 to 2009 (IFCN, 2010). The feed prices in New Zealand have been traditionally above world market prices. In 2009 the feed prices in New Zealand was US$ 34.1/100 kg feed.

Figure A-1.4 Comparison of Milk and Feed Prices over Time – 1981 to 2010



Source: IFCN (2010)

Figure A-1.5 Milk:Feed Price Ratio of Select Countries in 2009



Source: IFCN (2010)

The milk: feed price ratio is calculated by dividing the milk price by the price of feed. It indicates how much feed (in Kg's) a farmer can buy if he sells 1kg of milk. A high milk: feed price ratio provides opportunities for high input-high yield farming systems such as those in USA and Canada. But once the ratio drops below 1.5 the economics clearly suggest that low input moderate yield farming systems (like in NZ) are more sustainable (IFCN, 2010). From 1981 to 2007, the ratio increased from 0.7 to 2.3. After 2007, the ratio dropped to as low as 1.1 in 2009. However, the rising milk prices combined with relatively lower feed prices in 2010 has ensured that the ratio has increased to 1.8 (IFCN, 2010). In 2010, the countries with the highest ratio (>2) were Belarus, Canada, Finland, Korea, Malaysia, Saudi Arabia, Uzbekistan and Taiwan; and the countries with the lowest ratio (<1) were Armenia, Albania, Belgium, Chile, Columbia, Ireland, Peru, Sri Lanka, Uganda and Uruguay.

A-1.4.0 MILK PROCESSING

A-1.4.1 Milk Deliveries

There is considerable variation between countries in the proportion of milk produced that is actually delivered to processing plants. On the whole only 62% of the world milk production of cow and buffalo milk was delivered to processing plants in 2009 (IFCN, 2010). But, in the specific case of developed countries all most 100% of the milk being produced is being delivered (IDF, 2009). USA and Europe contribute to 33.7% of global milk production but account for 51.3% of milk deliveries. In contrast, South Asia, which contributes to 24.6% of world milk production, accounts for only 5.1% of milk delivered to processing plants (IFCN, 2010). This indicates that much of the problem and opportunity lies in the less developed countries. In general, the proportion of milk deliveries in developing countries is very low because of less mechanisation and presence of a large informal market.

From 2000 to 2007, milk deliveries increased globally by a compounded annual growth rate of 2.1% (IFCN, 2010). However, in 2009 the milk deliveries increased by only 0.3% from 2008, mainly because of a decline in production growth. Milk deliveries decreased in EU, USA, Japan, Australia, South Africa, Korea, Norway and Ukraine (IDF, 2010). In China, despite a milk production decrease (-1%), milk deliveries increased by 0.5%. From 2000 to 2009, in China and Russia, milk deliveries have increased from 60 to 70% and 39 to 51% respectively (IFCN, 2010). This indicates that rapid structural changes are occurring in the dairy sector of these two countries.

A-1.4.2 Dairy Industry

Globally the milk processing industry is very fragmented with the top 21 processors in the world accounting for just 21% (148 million tonnes Milk Equivalents (ME)) of milk production (IDF, 2009). In terms of volume of milk being processed, Fonterra is number 1 with 2.7% (18.6 million tonnes ME) market share followed by Dairy Farmers of America (16.2 million tonnes ME) and Nestle (12.0 million tonnes ME) which have a 2.3% and 1.7% market share respectively (IDF, 2009).

Although there is a steady increase in the volume of milk being delivered to dairies, it is not as fast as the rate of increase in world milk production. Currently only 62% of total milk produced are being delivered to dairies. The top three dairy processing companies for 2009 in terms of turnover in Billion US$ were, Nestle (27.3, USA), Danone (16.0, France) and Lactalis (11.8, France) (Table A-1.4) (IDF, 2010). Two notable companies in the list of top 25 were Chinese processors Mengniu (16th), and Yili which had turnovers of 3.8 and 3.6 Billion US$ respectively in 2009. Fonterra, the New Zealand based dairy cooperative was 6th on the list with a turnover of 9.6 billion US$ (Table A-1.4).

Table A-1.5 gives an overview of the top dairy companies by region. Several of the top dairy companies in the world are European based. The sub region of Western Europe alone accounts for the top 4 dairy companies – Nestle (Switzerland), Danone (France), Lactalis (France) and Friesland Campania (Netherlands). In Oceania, Fonterra (New Zealand) - the region’s largest (US$ 9.6 bn) dairy company - is 3 times bigger than its nearest regional rival National Foods (Australia). In Asia, both the top two dairy companies are Japanese with turnovers of US$ 5.1 bn (Meiji Dairy) and US$ 4.8 bn (Moringa). In the USA, Dean Foods (US$ 9.7 bn) is the largest dairy company followed by the cooperative Dairy Farmers of America (US$ 8.1 bn). Interestingly, DFA is Dean Foods preferred supplier, with Dean Foods sourcing 100% of its supply from DFA in certain areas.

The turnover of top dairy companies in both South America and Africa are relatively low. In South America the top two dairy companies are Brazilian and had a turnover of US$ 1.3 bn (Brazil Foods) and US$ 1.0 bn (Itambe) respectively. The largest dairy companies in Africa were Centrale laitiere (Morocco) and Clover (South Africa), with both reporting a turnover of US$ 0.7 bn in 2009.

Table A-1.4 Top 25 Dairy Companies in the World Based on Turnover (2009)

Rank	Company	Turnover
1	Nestle	27.3
2	Danone	16
3	Lactalis	11.8
4	FrieslandCampina	11.4
5	Dean Foods	9.7
6	Fonterra	9.6
7	Arla Foods	8.7
8	DFA	8.1
9	Kraft Foods	6.8
10	Saputo	5.2
11	Meiji Dairy	5.1
12	Parmalat	5.1
13	Moringa	4.8
14	Bongrain	4.6
15	Lala	4 to5
16	Mengniu	3.8
17	Yili	3.6
18	Sodiaal	3.5
19	Muller	3.3
20	Land O’Lakes	3.2
21	Fromageries Bel	3.1
22	Tine	3
23	Schreiber	3 to 4
24	Agropur	2.7
25	Dairy Crest	2.6

Source: IDF, 2010

Table A-1.5 Top Dairy Companies in Different Regions of the World (2009)

Region	**Country**	**Dairy Company**	**Turnover (Billion US$)**
Oceania	Australia	National Foods	2.4
		Murray Goulburn	1.8
	New Zealand	Fonterra	9.6
Western Asia	Turkey	Sutas	0.5
	Israel	Tnuva	0.7
	Saudi Arabia	Al Marai	0.3
		Sadafco	0.2
	United Arab Emirates	Al Rawabi	0.2
Central and Southern Asia	Kazakhstan	FoodMaster	0.1
	Pakistan	Engro	0.2
	Sri Lanka	Milco	0.4
	India	GCMMF Amul	1.5
		Mother Dairy	0.7
		Hatsun	0.2
South-East Asia	Vietnam	Vinamilk	0.4
	Thailand	Thai Dairy Industry	0.1
		DPO	0.1
	Malaysia	Dutch Lady Milk	0.2
	Singapore	Fraser & Neave	0.4
	Indonesia	Ultra Jaya	0.1
	Philippines	Alaska	0.2
East-Asia	China	Mengniu	3.8
		Yili	3.6
		Bright Dairy	1.2
	Taiwan	Uni-President	0.3

Region	Country	Dairy Company	Turnover (Billion US$)
		Wei Chuan	0.3
	South Korea	Seoul Dairy	1.2
		Namyang	0.9
		Maeil Dairy	0.7
	Japan	Meiji Dairy	5.1
		Moringa	4.8
North and Central America	USA	Dean Foods	9.7
		DFA	8.1
		Kraft Foods	6.8
		Land O'Lakes	3.2
		Schreiber	3 to 4
	Mexico	Lala	4 to 5
	Canada	Saputo	5.2
		Agropur	2.7
		Parmalat	1.4
South America	Colombia	Alpina	0.7
		Colanta	0.6
	Peru	Gloria	0.2
	Chile	Soprole	0.5
		Colun	0.3
	Brazil	Brazil Foods	1.3
		Itambe	1.0
		Bom Gosto	0.8
	Urugay	Conaprole	0.4
	Argentina	Mastellone Hermanos	0.9
		Sancor	0.8

Region	Country	Dairy Company	Turnover (Billion US$)
Africa	Morocco	Centrale laitiere	0.7
	South Africa	Clover	0.7
		Parmalat	0.4
	Egypt	Juhayna	0.1
	Kenya	NKCC	0.1
		Brookside Dairy	0.1
Northern Europe	Sweden	Skanemejerier	0.4
		Milko	0.3
	Norway	Tine	3.0
	Finland	Valio	2.5
	Estonia	Tere	0.1
		Valio Eesti	0.1
	Latvia	RPK	0.1
	Lithuania	Pieno Zvaigzdes	0.3
		Rokiskio suris	0.2
	Denmark	Arla Foods	8.7
	United Kingdom	Dairy Crest	2.6
		Arla Foods UK	2.2
		Robert Wiseman	1.4
	Ireland	Glanbia	2.6
		Dairy Gold	0.8
		Lakeland Dairies	0.4
	Iceland	Mjolkkursamsalan	0.1
Western Europe	Netherlands	FrieslandCampina	11.4
		Bel Leerdammer	0.5
		Vreugdenhil	0.5
		DOC Kaas	0.4

Region	**Country**	**Dairy Company**	**Turnover (Billion US$)**
	Germany	Muller	3.3
		Nordmilch	2.6
		Humana	2.4
		Hochland	1.5
		Hochwald	1.5
	Austria	Berglandmilch	0.9
		Nom	0.5
	Switzerland	Nestle	27.3
		Emmi	2.4
		Elsa	0.6
		Cremo	0.5
	France	Danone	16.0
		Lactalis	11.8
		Bongrain	4.6
		Sodiaal	3.5
		Fromageries Bel	3.1
	Belgium	Milcobel	1.1
		Walhorn	0.3
	Luxemburg	Luxlait	0.1
Eastern Europe	Russia	Wimm Bill Dann	2.2
		Unimilk	1.3
	Ukraine	Milkiland	0.3
	Romania	Danone	0.1
	Hungary	Sole Mizo	0.3
	Slovakia	Rajo	0.2
	Czech Republic	Madeta	0.4

Region	Country	Dairy Company	Turnover (Billion US$)
		Olma	0.3
	Poland	Mlekpol	0.8
		Mlekovita	0.6
Southern Europe	Croatia	Vindija	0.5
		Dukat	0.3
	Serbia	Imlek	0.3
	Greece	Vivartia	0.6
		Fage	0.4
	Italy	Parmalat	5.1
		Lactalis Italia	1.9
		Granarolo	1.2
	Spain	Danone Espana	1.6
		Capsa	1.2
		Nueva Rumasa	1.1
	Portugal	Lactogal	1.6
	Slovenia	Ljubljanske Melkarne	0.2

Source: International Dairy Federation (2010)

An interesting trend within the dairy industry has been the growing number of mergers, cross continental acquisitions, and consolidations. In 2010, France based Lactatlis bought two companies in Spain – Forlasa, a leader in Manchego cheese with a turnover of over 200 million US$ and the dairy branch of Ebro Puleva, a leader in the Spanish liquid milk market with a turnover of US$ 600 million (IDF, 2010). French Danone and Russian Unimilk have decided to merge their dairy business in CIS area. This merger is expected to generate annual sales revenue of over 2 billion US$. The French dairy cooperative Sodiaal has taken over the leading French cheese maker Entremont Alliance. In Germany, Nordmilch and Humanta have merged together to from Nordcontor. Outside of Europe, major reorganization was seen in Brazil. The top 5 dairy cooperatives in Brazil have announced a planned merger. This would result in the formation of the largest Dairy Cooperative in South America with a turnover exceeding 2bn US$ (IDF, 2010). In China, the third largest dairy processor Bright Dairy has bought a 51% stake in the New Zealand based Synlait Milk for US$ 60 million. The New Zealand dairy industry is also experiencing reorganization with five new entrants into the industry. As a result, there will be 10 dairy companies operating in New Zealand in 2011-12 as compared to just 3 in 2002.

A-1.5.0 MARKET OUTLOOK

A-1.5.1 Global Food Market

The global food market is extremely dynamic and the process of transporting food from the farm to the table has become more complex, and involves diverse local, national, and global agents and networks (Regmi, 2003). The key to understanding the global food industry lies with understanding changing consumer preferences and the food industry’s efforts to meet these demands (Gehlhar, 2006). Additionally, it’s important to remember that the evolving Food markets are driven not only by changes in consumer preferences, but also by technology, linkages between members of the food supply chains, and prevailing policies and business environments (Regmi and Gehlhar, 2005).

Population growth is one of the most important drivers for market growth. According to the IMF, the world population increases by about 78 million a year and this trend is expected to continue till 2015. In 2009, China (1.3 billion) and India (1.2 billion) alone accounted for 37.5% of the world’s population. Other countries with reasonably large populations were - the EU-27 (498 million), followed by USA (307 mill), Indonesia (232 mill), and Brazil (191 mill) (IFCN, 2010). The population of Africa was less than a billion (972 million), with Nigeria (152 mill) being the most populated country. On the whole, population growth trends in the world can be classified as – 1) declining – Germany, Netherlands and CEEC countries, 2) stable or slowly increasing – Asia, Oceania, Americas and parts of Western Europe, and 3) strongly increasing – most African and some Latin American Countries.

Developing countries are expected to largely account for future increases in food demand, resulting from both increases in population as well as increases in per capita food consumption (United States Department of Agriculture (USDA), 2009). Annual growth rates of retail sales of packaged food products in developing countries range from 7 per cent in upper middle-income countries to 28 per cent in lower-middle-income countries, much higher than annual growth rates of 2-3 per cent in developed countries (USDA, 2009). Across all countries, modern food markets are responding to consumer preferences at a local level, even as the food industry becomes more global (Regmi, 2005). In mature developed-country markets, product differentiation, value added, and consumer trust are important considerations for food retailers seeking to retain market share (Senauer, 2006). In rapidly growing developing-country markets, multinational food companies are expanding and changing regional food industry landscapes (USDA, 2009). While supermarkets accounted for 15-30 per cent of the national food retail sales before the 1980s, they currently account for 50-70 per cent of the retail sales in many countries (USDA, 2009).

In all markets, market forces are expected to push the evolutionary process toward increased efficiency, higher quality products, and more integrated food supply chains (Regmi, 2005). Expansion in foreign markets is contributing to the growth of large multinational food manufacturers. But, although significant concentration may exist in certain individual product markets at the local level, at the global level, even the largest food company accounts for less than 3 per cent of total world food sales (USDA, 2009). This situation creates opportunities for smaller firms to successfully compete in the market place.

Although the food budget is expected to grow at a relatively slow rate among high-income consumers, global food consumption patterns are rapidly changing—with growing demands for quality, variety, and convenience (Regmi, 2003). Globalization, improved transportation, and increased purchasing power have generally increased the demand for higher value food products—such as dairy, fruit and vegetables, meats, and processed food products—across all countries (USDA, 2009). An understanding of food demand and consumer trends across countries and the ability to predict potential shifts in demand for different food products will be important for all players involved in the food sector.

A-1.5.2 Dairy Market

Demand for dairy products is expected to increase in the developing countries because of increase in consumption due to changes in incomes, population growth, dietary preferences and further urbanization and economic growth (IDF, 2009). These changes will result in growth in dairy marketing, product availability and retailing channels. It is therefore expected that dairy products would remain among the agricultural commodities that exhibit the highest growth rate in consumption.

In future the overall dairy sector is expected to become much more competitive and more responsive to market changes. Amongst world markets, the domestic markets in developing countries will probably show remarkable progress. Strong investment and restructuring initiatives in these countries are expected to stimulate production growth and improve domestic marketing linkages. This would place these countries in a stronger competitive position in both regional and global markets. Therefore, much of the future growth of dairy production will occur in the non –OECD countries (mainly India, Pakistan, Brazil and China), which are expected to contribute almost 81% of the gains in milk production (IDF, 2009).

Although the world export of dairy products is expected to grow, the developing countries are not expected to eat into the shares of the traditional OECD exporters (NZ, Australia, EU and USA) (IDF, 2009). This is because of increasing demand from domestic markets in these developing countries and their in-ability to produce milk that meets international standards. A significant challenge for developing countries would be to build an image of being able to produce milk that is of highest quality and safety. This would require much better regulation, stronger laws and excellent testing systems at producer, processor and distributor levels (IDF, 2009).

On the import side, markets will continue to remain fragmented with 6 of the largest importing nations accounting for less than half of the world market (IDF, 2009). However, in future, it’s expected that developing nations will play a major role in imports; absorbing 96% of WMP deliveries, 92% of SMP shipments, 57% of traded butter and 44% of cheese exports (IDF, 2009).

A-1.5.3 Dairy Consumption

Over the past decade consumption has been increasing significantly in developing countries as compared to the mature markets of developed countries. Most of the increases in global milk consumption are due to population growth and per capita income growth in developing countries in Southeast Asia, Latin America and Central and Eastern Europe (Knips, 2004). Furthermore, increasing preferences for new value-added products in many of these economies will generate additional dairy market growth.

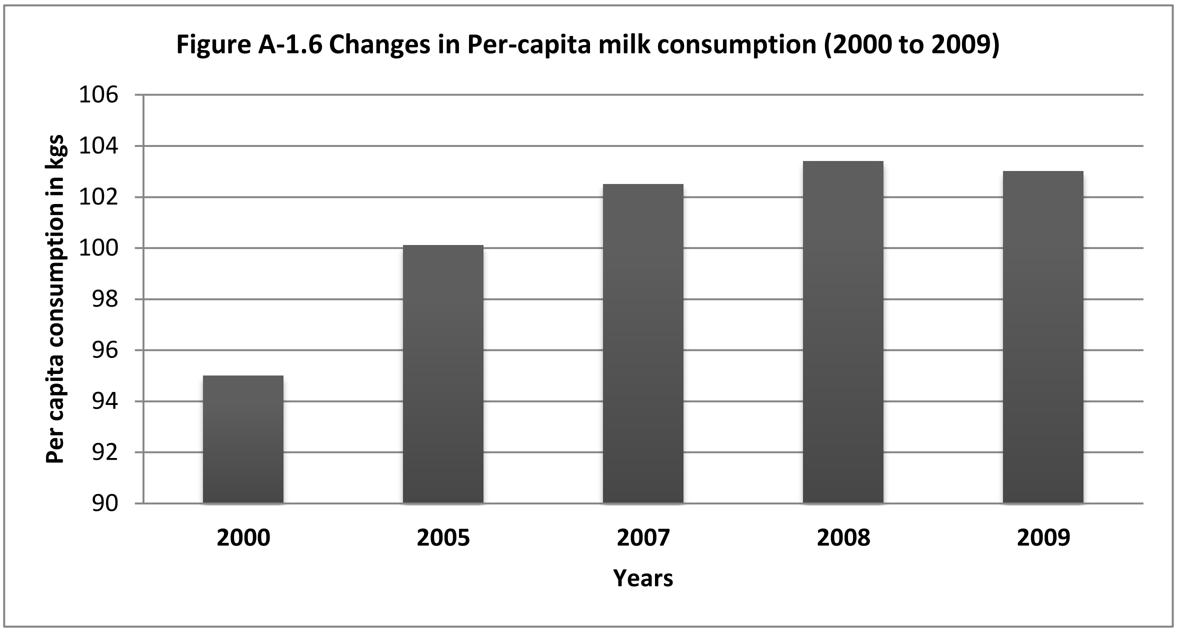
In 2009, Asia had the highest share in consumption (38.4%) followed by Europe (29.6%) and North America (13.3%) (Table A-1.6). The corresponding share of these three regions in world production is 36%, 30.8%, and 13.4% respectively (Table A-1.6). This indicates that 100% of production in these regions in consumed domestically, leaving very limited scope for exports to other regions. Another notable feature is that Africa, with a population of nearly 972 million accounts for just 6.1% of consumption and 5.2% production. In contrast, Oceania with a population of fewer than 36 million accounts for 1.5% of consumption and 3.7% of production, making it a highly dairy surplus region (Table A-1.6).

Table A-1.6 Global Dairy Consumption by Region (2009)

Region	Consumption (Million tonnes)	Share (%) of World Consumption	Share (%) of World Production
Asia	268.3	38.4	36.0
Europe	206.8	29.6	30.8
North America	93.0	13.3	13.4
South America	58.3	8.3	8.5
Africa	42.6	6.1	5.2
Central America	19.7	2.8	2.3
Oceania	10.6	1.5	3.7

Source: FAO, 2009

The per capita consumption has been growing consistently over the years mainly driven by a continuous increase in incomes. From 2000 to 2009, the growth in per capita consumption was 8% (Figure A-1.6). In 2008, for the first time in several decades milk production grew more than consumption. In 2009, the world average per capita milk consumption was 103.4 kg/year (IDF, 2010). This was a decline by 0.4% from 2008, mainly because of the global economic crisis and partly because of the melamine crises that affected the Chinese dairy industry. In general, per capita consumption is higher in developed countries (100 to >300 kg) and lower in most developing countries (10 to 100 kg) (IFCN, 2010). There are also huge differences in per capita consumption between the traditional dairy regions (some countries in Europe) and upcoming dairy countries (mainly in Asia). Interestingly, the number of countries with increasing, stable or decreasing per capita milk consumption was more or less the same in 2009.



Source: IDF (2010)

The composition of dairy product consumption varies across different regions with liquid milk being the most important product in terms of volume. However, processed dairy products have become more important with increasing incomes and living standards. In developed countries the consumption trend is more towards high value functional foods that require considerable research investments and sophisticated processing.

Liquid Milk – The growth in consumption of liquid milk has stagnated in established markets like USA, Europe and Japan. Most of the growth is seen in the emerging markets of the developing world. However, since 2008, the growth in consumption in these developing markets has reduced as well. This is mainly attributed to the high prices and worsened general economic environment. For countries from which data is available, the average per capita consumption of liquid milk in 2009 ranged from 43.9 kg (Argentina) to 130.7 kg (Ireland) (IDF, 2010).

Butter – In 2010, the highest per capita consumption of butter was seen in France (7.9kg) followed by Germany (5.8kg) and Switzerland (5.3kg) (IDF, 2010). Among Asian countries, India had a high per capita consumption. The butter consumption in India is reported to be around 3.5kg which is higher than that in developed countries like Canada (2.8kg) and USA (2.3kg) (IDF, 2010).

Cheese – The highest per capita consumption of Cheese in 2010 was seen in Greece (30.5kg) followed by France (27kg) and Iceland (25kg). The per capita consumption in Italy (a traditional cheese country) was 21 kg. In Asia, the west Asian countries Turkey (20kg) and Israel (17kg) have higher per-capita consumption probably because of a significant European influence. The per capita consumption in USA is around 15 kg.

Milk Powders – In 2008 the consumption of whole milk powders increased in line with the rise in milk production. This is because the decline in prices caused an increase in demand from importing countries. In addition, as a response to the lack of availability of powders in 2007, distributors focused on bringing their inventories to normal levels again (IDF, 2009). The increased international trade is a clear indicator of significant buyer interest in the importing countries. However, the consumption of Skim milk powders (SMP) did not grow in line with production. This is probably because demand was not sufficient to absorb the additional volumes. In the EU in particular, the manufacturing of calf feeds account for 33% of SMP usage (IDF, 2009). However, with increased usage of whey products and vegetable ingredients in calf feeds, the consumption of SMP by this sector has reduced by half. Other outlets have not been able to absorb these additional volumes of SMP (IDF, 2009).

A-1.6.0 WORLD TRADE IN DAIRY

Trade in dairy products is very volatile, as dairy trade flows can be affected by (a) overall economic situation in a country, (b) fluctuations in supply and demand, (c) changing exchange rates and (d) political measures (Griffin, 1994). In addition volatility is introduced by the fact that the global dairy market is extremely concentrated in terms of buyers and sellers; hence, supply or demand shocks are not easily absorbed. Moreover, the dairy sector trade is highly region centric, because milk is a bulky and perishable product, and dairy products are mostly consumed in the country or region where they are produced. Excluding the intra

EU trade only 7 per cent (50 million tonnes) of the milk produced is traded internationally (IDF, 2010).

From 2005 to 2009, there was no change in degree of milk self-sufficiency in 41% of the countries (IFCN, 2010). In 2009, 23% of the countries had self-sufficiency level of 100% or higher. The major exporters like Oceania, Argentina, Belarus and parts of the EU-27 had more than 120% self-sufficiency in milk (IFCN, 2010). Simultaneously, the degree of self- sufficiency had decreased in 23 countries (IFCN, 2010). As demand for dairy products is rapidly rising in regions that are not self-sufficient in milk production, volumes of dairy trade are also growing. The volume of global dairy trade is increasing at about 3% /year, whereas milk production is increasing at only 2% /year, resulting in supply-demand gaps (IDF, 2009). Developed countries account for 62 per cent of the world's dairy imports (in terms of milk equivalents) and 93 per cent of the exports, indicating that the major part of the global dairy trade takes place among developed countries (IDF, 2009).

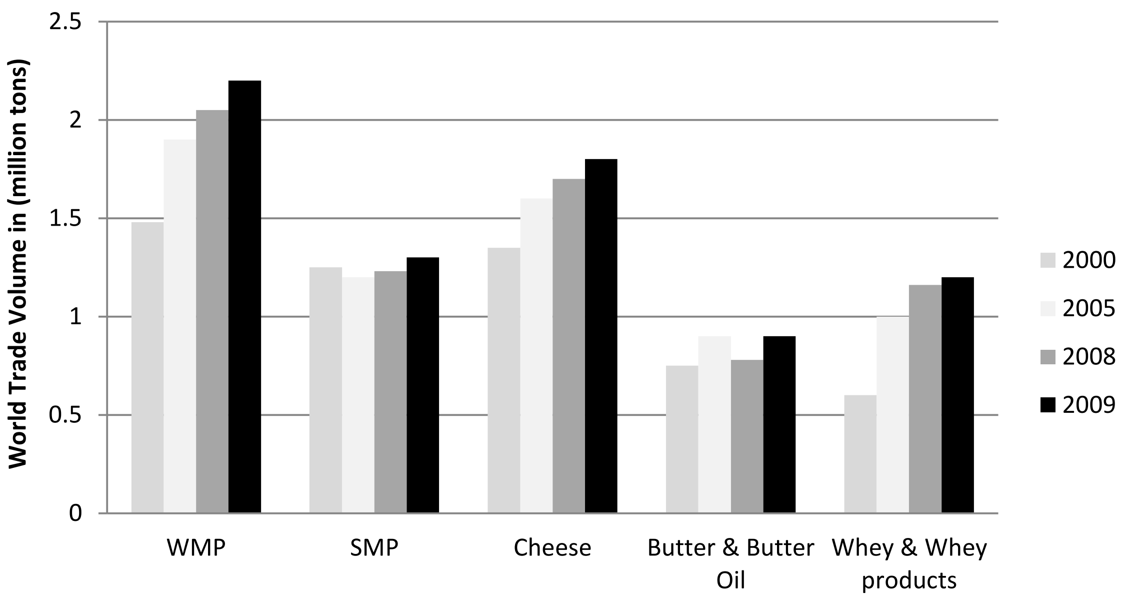
In 2009, all product categories showed volume growth in global trade. The strongest growth were seen in butter and butter oil (16%) and SMP (12%) (IDF, 2010). After few years of decline, the volume of butter and butter oil trade are now similar to levels (912 thousand tonnes) in 2005, with New Zealand (49%) and EU27 (16%) having the largest share in exports (Figure A-1.7). On the import side, the largest importers in 2009 were Russia (140 million tons), EU (65 million tons) and Iran (50 million tons).

In 2009, trade in SMP increased by almost 140 thousand tonnes to reach 1.3 million tonnes. The increase in volumes was mainly due to rising demand in Asian markets. The major exporters were New Zealand (30%), USA (19%) and EU 27 (17%). The largest importers in 2008 were, Mexico (152 million tons), Algeria (105 million tons) and Philippines (80 million tons)

The global cheese trade increased by 5% in 2009, to reach a volume of 1.8 million tonnes (IDF, 2010). The largest exporter is the EU 27 (31%), followed by New Zealand (15%) and Australia (9%). In 2008, the major importers of Cheese were Russia (350 million tons) and Japan (187 million tons).

Trade in Whole Milk Powders (WMP) increased by 5% in 2009 to reach a volume of 2.1 million tonnes. The increase was mainly a result of rising demand in China (IDF, 2010). The major exporters were New Zealand (37%) and EU 27 (22%). The largest importers in 2009 were Algeria (170 million tons) and Indonesia (84 million tons).

Figure A-1.7 Change in World Trade by Product

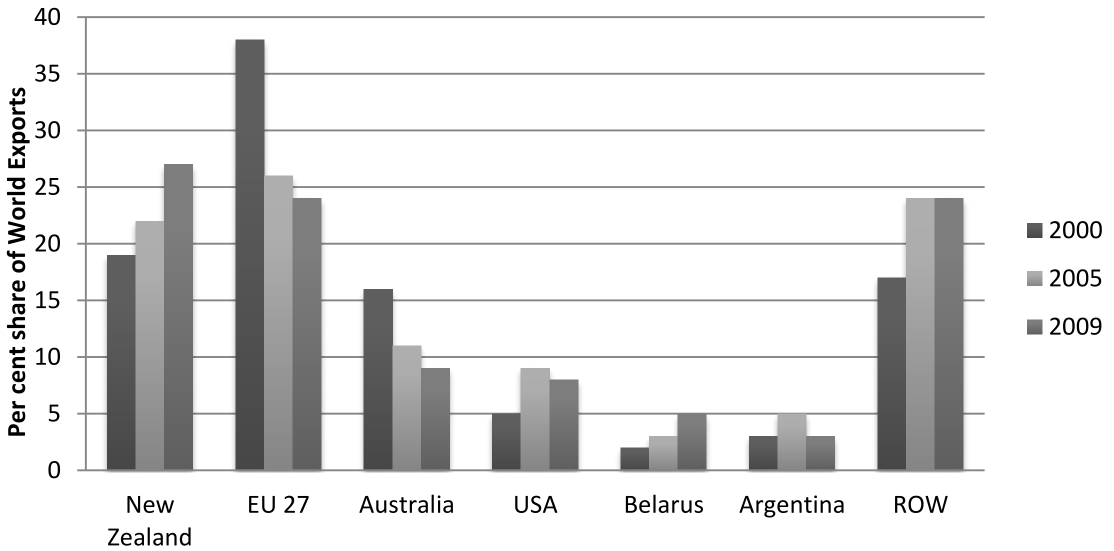


Source : IDF (2010)

Steady investments in the whey production sector has resulted in consistent increases in world trade of whey and whey products reaching a level of 1.2 million tonnes in 2009 (IDF, 2010). The increase is driven by strong demand from specific markets for whey powder as a substitute for SMP in feed and also from growing demand from global food and ingredient businesses, which use whey as a functional and cost-effective input for food and non-food applications (IDF, 2010). In 2009, the largest exporters were EU 27 (37%) and USA (30%).

Since 1990, there has been a steady shift in world dairy exports from high export subsidizing countries, e.g. EU towards non-subsidizing countries such as New Zealand. In 2009, the 3 biggest dairy exporting countries New Zealand (27%), EU-27 (24%) and Australia (9%) accounted for 60% of exports (Figure A-1.8). New Zealand reported robust growth in exports of all main dairy products. The EU reported increases in exports of SMP and Cheese while export growth in Australia was driven mainly by increases in exports of butter, butter oil and SMP (IDF, 2010). The position of USA decreased from a share of 13% in 2008 to 9% in 2009, mainly because of reduced supply and decreased competitiveness in Asian markets (IDF, 2010). On the whole, the top 10 exporting countries accounted for nearly 98% of world milk surplus volumes (IFCN, 2010).

Figure A-1.8 Export Share of Important Dairy Exporters - 2000 to 2009



Source: IDF (2010)

A-1.6.1 Policies for Regulating Dairy Trade

The dairy market is one of the most heavily regulated agricultural markets (Camerlo, 1998). These regulations are more predominant in developed countries. The purpose of government interventions is to control quantities of production, establish minimum prices and guarantee farmers' an assured income. Governments also intervene through public purchases, storage of oversupply and by applying policies to support dairy consumption.

In some countries government support has ensured that domestic prices for dairy products are well above world market prices. As a consequence, the domestic market has to be protected against foreign competition by using trade barriers. If not, domestic farmers would have difficulties to sell their overpriced products.

The major policies that countries put in place to limit imports are tariffs, tariff rate quotas (TRQs) and other non-tariff barriers. Globally dairy products are among the agricultural commodities with the highest tariff protection with an average protection level of over 80 per cent (the average over all agricultural commodities being 62 per cent) (Knips, 2004).

The most important regulatory measure promoting exports are export subsidies. The largest user of export subsidies on dairy is the European Union, accounting for over 80 per cent of the total value of export subsidies on dairy granted during the period 1995-2001 (Berry, 2009). However, over the same period, values of export subsidies have been reduced considerably, and in the case of the EU, subsidies for dairy exports in 2001 were around more 40 per cent of those in 1995.

A-1.6.2 Direct Payments and Subsidies in Dairy Farming

The cash income for dairy farmers in EU and certain other regions of the world are strongly influenced by direct payments (IFCN, 2010). The direct payments include cash transfers from the government to the dairy farms such as acreage payments, payments per kg milk, and payments per cow; fuel subsidy, social payments and special regional programmes (IFCN, 2010). Additionally interest aid and interest subsidy is also considered to be a form of direct payment- in several countries the government supports the dairy sector with investment aid or subsidised interest rates (IFCN, 2010). There is considerable variation in the level and type of such support across countries.

The payments supports made to dairy farmers can be either coupled or decoupled. Payments which are tied to milk production are considered coupled payments and these tend to promote over-production. Decoupled payments on the other hand are paid per ha of land as a direct aid to the farmer and not linked to the product which is produced. Among countries in the world, the EU makes considerable use of direct payments. In the EU farmers receive two types of payments 1) direct payments and 2) special payments (IFCN, 2010). As a part of the special payments, farmers receive money for special operations on their fields which protect the environment. The direct payments include both coupled and decoupled. The EU has promised to completely transform all forms of coupled payment into decoupled by 2013. As of 2009, 87% of direct support in the EU was decoupled and only 13% was coupled (IFCN, 2010). But the strategy of transformation varies between countries in the EU.

The levels of coupled direct payments were highest (US$ 15-40/100kg milk) in Norway, Switzerland and Finland. Coupled payments ranging from US$ 5-10/100kg milk were present in Austria, Luxembourg and larger farms in Ukraine. Coupled payment of less than US$ 5/100kg milk are provided to farmers in most European countries, Russia, USA, Mexico, Argentina and Australia.

In the USA there is a national program (Milk Income Loss Contract [MILC]) by which framers receive direct payments when milk prices fall below a target price. The target price is in reference to the class I milk price in Boston. Milk production that is eligible for MILC payments is capped at 1,340,000 kg of milk per year (IFCN, 2010).

A-1.7.0 SUMMARY & CONCLUSIONS

Over the last three decades the livestock sector in general and dairy sector in particular has witnessed rapid global expansion in both production and consumption. The main driver of this livestock revolution has been population and income growth, coupled with increased urbanization and change in consumer preferences to livestock products- mainly in the developing world. The dairy sector is an integral part of the global food market. The global food market is extremely dynamic and the process of transporting food from the farm to the table has become more complex, and involves diverse local, national, and global agents and networks (Regmi, 2003). The key to understanding the global food industry lies with understanding changing consumer preferences and the food industry's efforts to meet these demands (Gehlhar, 2006). Additionally, it's important to remember that the evolving Food markets are driven not only by changes in consumer preferences, but also by technology, linkages between members of the food supply chains, and prevailing policies and business environments (Regmi, 2005).

World milk production has increased by nearly 40% over the last three decades and was 699 million tonnes (MT) in 2009. The largest milk producing countries/regions were EU-27 (150 MT), India (110 MT) and USA (86 MT) (International Dairy Federation, 2009). However, the per capita production has decreased by 9% indicating that production is not keeping pace with population growth. In general, milk production growth in developed countries has remained more or less stagnant, whereas in developing countries milk production has grown considerably. From 2005 to 2008, India, China and Pakistan alone contributed to 55% of the global annual growth in milk volume. Much of the growth in India and Pakistan has been due to greater contribution from buffaloes. Buffalo milk currently accounts for 13% of world milk production. In both these countries Buffaloes are playing an increasingly important role in Milk production. Buffaloes accounted for more than half of the milk produced in both India (56 MT) and Pakistan (21 MT).

Milk production worldwide is characterised by a distinct dichotomy of two disparate but coexisting systems – the smallholder production systems that are dominant models of production in the developing world and the large scale production systems which are dominant models in the developed world. Globally, the average herd size is 2.4 cows per farm (Hemme and Otte, 2010). In developing countries of Africa, Asia and Latin America, most farms have less than 15 dairy animals. In contrast, the average farm size in developed countries is around 50 cows /farm; with NZ having the highest statistically average farm size (200 cows/ farm).

The milk production growth in developing countries has been mainly due to increase in numbers of dairy animals and farms. In contrast, developing countries have been focused on increasing yields and intensification of milk production. As a result milk yields per cow (dairy anima) vary considerably between developing and developed counties –<500kg/year (in Uganda) to > 10,000kg/year (in Israel, Western Europe, USA). Although dairy animals in New Zealand have moderate yields (4400 kg/year), the large farm size has ensured that they have the highest average milk volumes per farm.

Milk is an extremely volatile agricultural commodity and small fluctuations in supply or demand can have a significant influence on prices. The coefficient of variation of milk prices from 1998 to 2009 was the highest among all agricultural commodities (IFCN, 2010). For nearly two decades, the milk prices fluctuated between 10 and 25 US$/100kg of milk. This situation changed drastically in 2007, when milk prices reached as high as US$ 58/100 kg- mainly due to a small supply demand gap. However, with supply catching up and consequently overtaking demand, the prices crashed and fell to as low as US$ 20/100 kg in early 2009. Milk prices vary considerably form one region (country) to another, and ranged from US$ 16/100 kg (in Uganda) to US$ 91.4/100 kg (in Japan). The regions that had market milk prices that were consistently lower than world price were parts of– Latin America, South and South East Asia and Africa. Similarly countries that had prices which were consistently higher than the world price were – Norway, Iceland, Switzerland, Canada, Japan, Korea and Taiwan.

The cost of milk production too varies considerably between regions and is primarily a function of the type of farming system being practiced. The lowest average cost of milk production was seen in Africa (US$ 18/100 kg) and the highest in Western Europe (US$ 58/100kg). This is reflection of the low cost subsistence type of farming in Africa where the cost of land, labour and feed is quite low compare to the relatively intense systems in Western Europe. Interestingly the cost of milk production in many parts of - Eastern Europe, Asia, South America and Oceania were similar (around US$ 25 to 30/100 kg). The capital intensity (level of investment required to produce 100 kg milk) also varies between countries – US$ 30 in Belarus to US$ 700 in Austria. In the specific case of India, capital intensity varies significantly depending on farm type – US$ 100 for small farms to US$ 500 for large farms (due to their larger land requirements).

The returns of a dairy farm are form 3 main sources – milk price, non-milk returns, and direct payments (couple and uncoupled). Due to the subsistence type farming systems in Africa and Asia most dairy farms are profitable; however the total farm income is quite low. The large farm sizes and low input grazing system ensures that total farm income is quite high for dairy farms in NZ. Direct payment supports form a significant part of total farm income for dairy farms in Western Europe. The magnitude of coupled direct payments ranged from – US$5/100 kg (in most European countries and USA) to US$ 40/ 100 kg (in Norway, Switzerland and Finland). If these payments were stopped, a number of dairy farms in these regions will be put out of business or forced to restructure. On the whole, the highest ROI was (> 20%) were seen in CIS (Common Wealth of Independent States), the Middle East and Africa. Moderate to high ROI (5 to 20%) were seen in farms from Oceania, Latin America and Asia. The lowest (0 or negative) ROI were seen on farms in USA and EU. But it must be noted that output (milk) prices were quite low in 2009 while input (feed) prices were relatively high. Farms in USA and EU are very intensive and use large amounts of feed inputs. Hence their ROI was lowest in 2009. When milk price to feed price ratio is high (a high milk price and relatively low feed price), farms in these countries tend to have much better ROI. Also, if all sources of payments (both coupled and uncoupled) are included in income, the ROI of farms in EU would be higher.

On the processing side, only 62% of milk produced is actually delivered to processing plants. In USA and Europe 100% of the milk produced is delivered and they account for 51.3% of total deliveries. In contrast South Asia accounts for only 5.1% of world deliveries. In general, the proportion of milk delivered to processing plants is lower in developing countries due to lower levels of mechanization and the presence of a large informal sector.

Globally the dairy industry is extremely fragmented with the top 21 processors accounting for just 21% of world milk production. In terms of volume the top three dairy companies are Fonterra (18.6 MT), Dairy Farmers of America (16.2 MT) and Nestle (12.0 MT). In terms of revenue (in Billion US$ from dairy alone) the top three dairy processors were Nestle (27.3), Danone (16.0) and Lactalis

(11.8). The leading customer's for dairy products are food retailers, food service industry and the food processing industry. These companies tend to be larger than the players in the dairy industry and they hence have significant market power. Due to which, the concentration process in the dairy industry by means of mergers, acquisitions and strategic alliances has been very pronounced.

In 2009, Asia had the highest share in consumption (38.4%) followed by Europe (29.6%) and North America (13.3%); and the world average per capita milk consumption was 103.4 kg/year. The per capita consumption was higher in developed countries (100 to > 300kg) and lower in developing countries (10 to 100 kg). The demand for dairy products has remained stagnant in the developed nations. As a result dairy companies operating in the big and mature markets such as Europe and USA face limited market growth opportunities in terms of volumes per capita and growth can only occur by increasing market shares or switching to higher value-added products. In contrast the demand for dairy products has been quite robust in the developing countries and multi-national dairy companies are increasingly looking towards these markets for ensuring growth in sales and revenue.

Trade in dairy is region centric, because milk is bulky and perishable, dairy products are mostly consumed in the region that they are produced. Moreover, dairy is a sensitive industry is highly protected in many countries by trade and non-trade barriers. As a result, only 7% of milk produced is traded internationally. In 2009, the three largest exporting nations were New Zealand (27%), EU-27 (24%) and Australia (9%). The top 10 exporting countries account for nearly 98% of world milk production. On the import side, markets continue to remain fragmented with 6 of the largest importing nations accounting for less than half of the world market (IDF, 2009). However, in future, it's expected that developing nations will play a major role in imports; absorbing 96% of WMP deliveries, 92% of SMP shipments, 57% of traded butter and 44% of cheese exports (IDF, 2009).

Although the dairy sector today is far more liberalized than it was a decade ago, it still remains as one of the most distorted agricultural sectors (Beghin & Aksoy, 2003). Production subsidies as well as export subsidies are prevalent in many developed countries. These policies not only stimulate over production but also aids in the dumping of excess production in world markets. Furthermore, tariff and non-tariff barriers are used by both developed and developing countries to protect their domestic dairy industries. These market and trade distortions have significant but different impacts in the developed (food secure) and developing (food insecure) countries.

As mentioned earlier, much of the future growth in consumption of dairy products is expected to happen in the developing world. Most of these countries view food security as integral part of their nations overall security. The agricultural policies in these countries are therefore highly focused on promoting domestic production and keeping imports out. This situation poses a major challenge for agriculture export oriented countries such as New Zealand, for whom entry into these fast growing markets is strategically essential.

One tactical option for export oriented firms is to support the growth and development of the domestic dairy industry of countries they want to export to. In the long term, this will help them understand local markets as well as build trade relationships and trust, which in turn could pave the way for acceptance of exports from the foreign firm at some point in the future. This tactic will have several positive spill over benefits because local companies will be forced to raise product quality and efficiency to be able withstands foreign competition.

APPENDIX II

Overview of the Indian Dairy Sector

TABLE OF CONTENTS – APPENDIX II

OVERVIEW OF THE INDIAN DAIRY SECTOR

List of Tables	**Pg No.**

List of Figures **Pg. No.**

A-2.1 Introduction: An overview of Agriculture in India

India has considerable heterogeneity in topography, soils, rain fall, irrigation, temperature, crops and livestock production systems. The National Bureau of Soil Survey and Land Use Planning (NBSS&LUP) — an offshoot of the Indian Council of Agricultural Research, has mapped India's territorial space into 20 agro-ecological zones with their further sub-classification into 60 sub-zones. It is therefore quite evident that agriculture in India is characterised by tremendous diversity.

Indian agriculture has grown tremendously in the years after independence from British colonial rule. Food grain production has increased from 52 million tonnes (Mt) in 1951-52 to 230 Mt in 2006-07, and production of oilseeds increased from 5 Mt to 25 Mt. During the same period, livestock production has increased rapidly as well. Milk production has increased from 19 Mt to 110 Mt and egg production from 1.9 billion to 47 billion (GOI, 2011). Agriculture continues to play a vital role in India with 68% of the Indian work force still relying on farming for employment, despite the agriculture contribution to GDP having diminished from 38% in 1975 to less than 19% now (GOI, 2011).

The total operational area under agriculture in India was estimated to be around 159.4 million HA in 2001, which is a decrease of -2.4% from 1996 (Table A-2.1). The number of operational farm holdings in 2001 was estimated to be 119.9 million, which was an increase by 3.8% from 1996 (Table A-2.1). Agriculture in India continues to be dominated by marginal and small farmers. These marginal and small farmers with holdings of less than 2 HA accounted for 82 % of all operational holdings but only 39% of the total area in 2001 (Table A-2.1). While medium and large farmers with holdings of more than 4 HA accounted for 6.5% of the operational holdings and 37% of the total area (Table A-2.1). The semi-medium farmers, with holdings between 2 and 4 HA, accounted for 12% of holdings and 24% of area operated. The average land holding size in 2000/01 was 1.33HA, with the average size of marginal holdings being 0.4 HA while that of small holdings being 1.42 HA (Table A-2.1). The average size of semi-medium, medium and large farms were 2.72 HA, 5.81 HA and 17.12 HA respectively. As a result of further fragmentation and subdivision of land holdings the share of small and marginal farmers is increasing, while that of semi-medium, medium and large farms is decreasing (Table A-2.1). This indicates that marginal and small farmers will play an increasingly important role in Indian agriculture.

Table A-2.1 Distribution of Agricultural Holdings and Area operated by Farm Class in 2001

Farm Class	Avg. Holding Size in HA	Number of Holdings (in '000)	Per cent Change from 1995-96	Area Operated '000 HA	Per cent Change form 1995-96
Marginal Farm	0.40	75, 408 (62.9 %)	5.8	29,814 (18.7 %)	6.0
Small Farm	1.42	22, 695 (18.9 %)	4.9	32,139 (20.2 %)	4.6
Semi-Medium Farm	2.72	14,021 (11.7 %)	-1.7	38,193 (24%)	-2.0
Medium Farm	5.81	6,577 (5.5 %)	-7.3	38,217 (24%)	-7.7
Large Farm	17.12	1,230 (1 %)	-12.4	21,072 (13.2)	-12.8
All Classes	1.33	119,931 (100 %)	3.8	159,436 (100%)	-2.4

Source : GOI (2011)

Although the GDP growth of Agriculture in India remains more or less unchanged for two decades, the composition of the product mix has shifted in favour of high value commodities (Gulati and Mullen, 2003). A majority of small and marginal farmers mainly cultivate cereals. But cultivating high value agricultural commodities such as fruits, vegetables, livestock and fisheries (and local agro-processing) can significantly increase their income (Sen and Raju, 2006). Hence the New Agricultural Policy in India is focused on supporting these farmers to diversity towards such high value commodities.

The perception of farming risks and its impact on decision making differs between large and small farmers in India. Generally, in addition to the natural phenomena that are the intrinsic risks of farming everywhere, commercial risks associated with farming are also important (Tomek and Peterson, 2001). The production risks in farming are a mainly a function of weather, pest and disease attacks, low yields, or increased costs, while marketing risks are associated with market demand, price volatility, seasonality and quality standards. Risks in agriculture can also be institutional, legal or financial (availability of credit, rise in interest rate, unexpected demand to repay or inadequate credit). The risk reduction option available to farmers in India include – crop/weather insurance against yield/production risk; state supported tools such as Minimum Support Price (MSP) for 24 crops, with Market Intervention Systems (MIS) for other crops; futures markets and warehouse receipt systems; and diversification of crops and use of risk reducing inputs (Acharya, 2006). However most of these risk reduction tools have significant limitation or drawbacks. For example, the liberalization of the agricultural sector is resulting in a steady decrease in state supported interventions such as MSP and MIS.

Based on their assessment of these risks, large farmers in India generally cultivate a diverse range of crops. They usually prefer highly remunerative crops involving higher costs and more risks due to - thin markets, relatively uncertain yields and high perishability (Simmons *et al.*, 2005). Smaller farmers on the other hand are much more cautious and stick to growing fewer and lower-risk traditional crops that are essential to their survival (Sengupta and Kundu, 2006). For example, large farmers prefer high value commodities like onions, tomatoes, etc. which show a high degree of price variability whereas small farmers prefer the staple commodities like rice and wheat which show low degree of variation.

Globalisation has had a profound impact on the agricultural sector. The rapidly changing economic scenario and increase in individual and household incomes in several developing countries is resulting in changes in dietary preferences and tastes of an average consumer (Regmi and Dyck, 2001). Growing populations, gains in real per capita income and progressive urbanization have fuelled the demand for high(er)-value agricultural products, including fruit, vegetables, fish, meat and dairy products, thereby expanding the business opportunities for many livestock farmers (Delgado *et al.*, 1999; FAO, 2006). In India too, sustained economic growth, increasing population and changing lifestyles have caused significant changes in Indian food basket, away from staple food grains towards high-value horticultural and animal products (Kumar *et al.*, 2007; Mittal, 2007).

A-2.2 Challenges before India's Agricultural Sector

The Indian agricultural sector faces numerous challenges. One of the major challenges is balancing supply and demand for agricultural land. As India's population continues to grow, it is exerting immense pressure on land supply. With the growth in population, cities towns and villages expand in area, and consequently reduce the area under agriculture. Additionally, government policies such as the rapid expansion of special economic zones where agricultural land in converted for industrial purposes is further increasing the pressure on agricultural land. Currently, the area under agriculture is estimated to be around 159 million ha, which is a decrease of -2.4% from 1995-96 (GOI, 2011).

Indian agriculture is generally characterised by low productivity. One reason for this is due to a large role played by the informal sector which results in inefficient institutions, especially distribution, marketing and financial institutions. The inefficient distribution and marketing systems result in tremendous wastage of produce and resources and often the agricultural produce does not reach the targeted population. The inefficient financial institutions are often exploitative and also make credit availability in the form of loans to farmers very difficult. On the whole, India's large population coupled by low productivity has resulted in low per capita output. Thus increasing productivity (and reducing wastage) is a huge challenge for India.

Another significant challenge facing the agricultural sector is the overall power scarcity situation in India. India does not produce enough electricity to sustain agriculture productivity; it generates 129,000MW of power annually but the demand is close to 200,000MW—a shortfall of nearly 35% (Agoramoorthy, 2008). Power is often diverted from the rural farming areas to the urban industrialised areas. For example, farmers in the state of Rajasthan get only 6–8 hours of electric supply per day while in the neighbouring Madhya Pradesh only 2–4 hours of electricity is available for agriculture. Realizing the dire power situation, the Prime Minister called the electricity shortage a national emergency and he admitted- *'the crisis clearly stems from the lack of foresight on the part of policymakers'*. To address this problem India plans to build 30 nuclear reactors and generate at least 25% of its power requirements from nuclear sources. A recent bilateral nuclear agreement with USA may therefore help to improve the power situation in future. However, the recent disaster at a nuclear power plant in Japan has resulted in a strong civil rights movement that is opposing this project. Most supporters of the nuclear policy suggest that in the absence of nuclear power, it would be nearly impossible for India to meet its power demands.

Other challenges that the agricultural sector faces are – destruction and submersion of land due to the construction of mega dams and rampant (often illegal) mining, lack of adequate water to grow high-water demanding crops, government encouragement to cultivate medicinal and aromatic plants resulting in reduced area for staple food crops, lack of adequate investment in research and technology to increase productivity, improper recommendations for crops based on old data, lack of crop insurance for poor farmers, poor governance and politicians without a proper vision, bureaucratic obstacles, technological deficiencies, poor strategic planning, and sudden increase in farmers committing suicide (Agoramoorthy, 2008). Furthermore, the current rate of inflation (10%) if left unchecked may lead to price hikes that could further complicate life for poor rural farmers.

On the bright side, for centuries India has been developing simple innovative technologies (ex. water harvesting) to boost agriculture. Hence using available technology to transform the vast dry and unproductive lands into productive agricultural land and in the process achieve a new sustainable green revolution is a possibility. Additionally, a transformation of Indian agriculture is hoped to be achieved by public-private partnerships. The state hopes to attract private partners by providing several incentives such as tax concessions and subsidies, including land to corporations to enter the agribusiness sector (Singh, 2008).

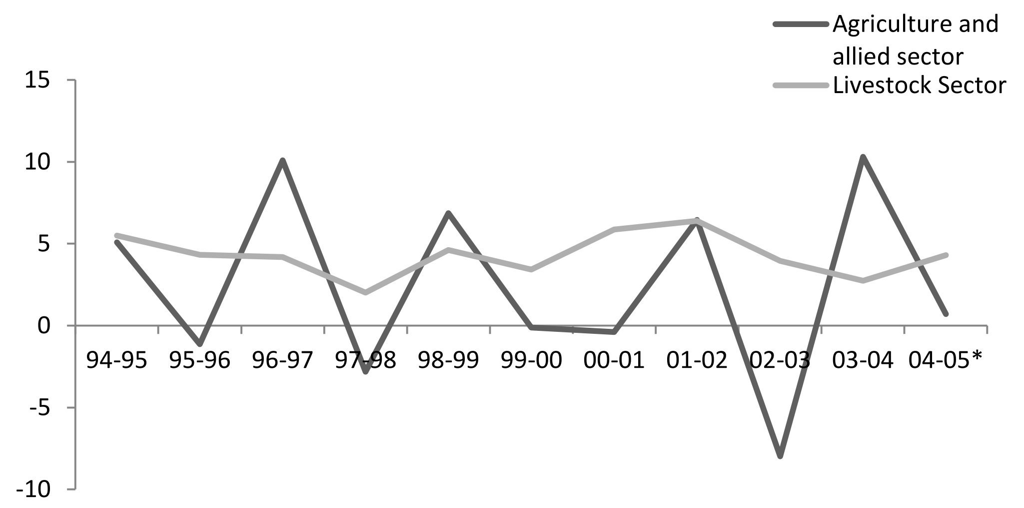
A-2.3 Overview of Livestock Sector

When incomes begin to rise in traditional low income societies, one of the first things people do is diversify their diets, consuming more livestock products (Brown *et al.,* 1999). With the increased incomes and urbanization, a demand driven livestock revolution is underway in developing world with profound implications for global agriculture, health, livelihoods, and the environment (Pinstup-Andersen *et al.,* 1999). Today the main question for India is whether the country will actively participate in the global livestock revolution, or if it will become only a receiver of changes in the international food market which arrive from the revolution (Khan and Bidabadi, 2004).

The contribution of livestock farming in general and dairying in particular to the Indian economy is very significant. According to FAO estimates, India in 2007 had 16.6 per cent of world's large ruminants (277 million), 9.9 per cent small ruminants (190 million), 3.0 per cent poultry (560 million) and 1.5 per cent pigs (14 million). The livestock industry alone accounts for 5% of India's GDP and 32% of the GDP contribution resulting from the agricultural sector as a whole. Moreover, the GDP growth of the livestock has been relatively stable when compared to the agricultural sector as a whole (Figure A-2.1). Thus livestock farming provides a steady source of income to farmers and is a significant complimentary activity to agriculture.

In India 80% of livestock products still come from small farmers with 3–5 animals and less than two hectares of land (Rangnekar, 2001). Furthermore, small farmers (including landless farmers) account for nearly 60-80% of the total livestock population (Jha, 2001). For millions of farmers' in India, livestock farming is a major source of livelihood and offers a potential pathway out of poverty (Birthal and Singh, 1995; Birthal *et al.*, 2002). Amongst the various livestock based operations, dairying is the most significant income generating activity for these small and landless farmers. It accounts for nearly 50% of income for landless and 30% of income for marginal and small holding farmers (Jha, 2001).

Figure A-2.1 GDP growth of Agriculture and Livestock Sectors



Source: GOI (2011)

A-2.4 Overview of the Dairy Sector

Excluding poultry, dairy animals (cattle and buffalo) form the single largest group of livestock animals in India. Dairy farming is considered a traditional occupation and is deeply linked with India's culture and traditions. Milk and milk products account for nearly 71% of the total output value of livestock products and are the largest agricultural commodity category by value (Staal *et al.*, 2008). The contribution of milk to the India's GDP is greater than that of rice and wheat. Since 1970's India output of milk and milk products has grown at a faster rate than crop output (Sharma and Gulati, 2003). The increases of dairy output were met by a significant increase in consumption of milk and dairy products through the 1990's. India accounts for nearly 31% of milk consumption in the developing world and 13% of the world's milk consumption (Delgado, 2003).

Milk production in India is based on a smallholder system. On the whole about 72 per cent of households that have dairy animals have only one or two animals. This varies across regions, from about 90% in the east to 60% in the north (Shukla and Bramhankar, 1999). Yet, production support for the dairy sector (which is included in GOI's expenditures for "dairying and animal husbandry") is not much and constitutes less than 1% of total GOI subsidies (Rakotoarisoa and Gulati 2006).

Throughout the developed and rapidly developing countries, there is a continuing tendency for production scales to grow (Steinfeld *et al.*, 2006). For dairy production in particular, farm level production costs at smallholder level are often comparable with those of large scale enterprises, usually resulting from cost advantages emanating from the availability of low cost family labour (FAO, 2006). However, the expansion of smallholder production beyond a semi subsistence level is constrained by a number of barriers including lack of competitiveness and risk factors (Steinfeld and Gao, 2003). Hence the rapid expansion by smallholders in India is not expected and it is highly likely that they will continue to dominate the Indian dairy scenario. Moreover, the cooperative sector (specifically operation flood) which has played a vital part in India's dairy revolution is expected to focus its efforts on keeping smallholder farmers involved in the dairy sector to a larger extent.

The Indian dairy industry at large is characterised by a distinct dichotomy – with unorganised (informal) and organised (formal) elements. Although the share of the organised sector has increased considerably due to the critical role played by operation flood ((OF), a massive dairy development project in India) and the cooperative movement, the informal sector comprising of – milk vendors, middlemen, private milk traders and direct sale from producer to consumer continue to handle a very large proportion of milk marketed in India. Of 3700 cities and towns in India, only 778 are served by the organised milk distribution network (Anonymous, 2004). This clearly indicates both the size and importance of the informal sector, because in most parts of India it is the only milk distribution channel available. The dominance of informal market agents in marketing of milk and milk products in India is likely to continue into the foreseeable future.

Before 1990, domestic dairy production/industry was heavily protected from low price imports as a result of domestic export subsidies and import barriers in many countries. These protections were administered mostly in the form of tariff rate quotas and canalization through the control of all imports of dairy products by the Indian dairy Corporation (IDC) (Rakotoarisoa and Gulati 2006). Additionally competition from private dairy processors was controlled by prohibiting new entrants into the milk processing sector using the provision of Industrial licensing under the Industrial Development and Regulation Act of 1951 (Rakotoarisoa and Gulati 2006).

As a part of major economic reforms and liberalization in the early 1990's, the dairy industry was de-licensed in 1991 and progressively de-canalized soon after. Private sectors including multi-national companies were allowed to enter the dairy sector and establish milk processing and dairy product manufacturing plants. The rationale behind this move was to encourage competition in the procurement and processing of milk so that both producers as well as consumers benefit (Rakotoarisoa and Gulati 2006). However, the rapid flood of dairy companies entering the sector resulted in partial regulations being reintroduced in 1992 through the Milk and Milk products Order, which aimed to bring in "orderly" growth of the dairy Industry in India (Rakotoarisoa and Gulati 2006).

Being a founding member of the General Agreement on Tariffs and Trade, India signed the Uruguay round Agreement on Agriculture of GATT in April 1994 and became a member of the World Trade Organisation (WTO). As a part of its commitments under WTO, all non-tariff barriers on the import and export of dairy products were removed and dairy products were put under the "open general licence" policy (WTO, 1997, 2004) (Rakotoarisoa and Gulati 2006). As a result the imports of milk, butter and butter oil increased in the late 1990's. India's bound rates of duty on major dairy products (milk powders, butter and butter oil) are modest (15 to 40%) by international standards. Based on measuring Nominal Protection Coefficients (NPC), India's dairy products, especially SMP's during the 1990's, have become increasingly more competitive (Rakotoarisoa and Gulati 2006).

Besides its large production and consumption of raw milk, India produces and consumes butter and skim milk powder (SMP), and is a marginal trader (imports and exports) of SMP, butter, and whole milk powder (WMP). The latter products are used by India's food manufacturing/ processing industries.

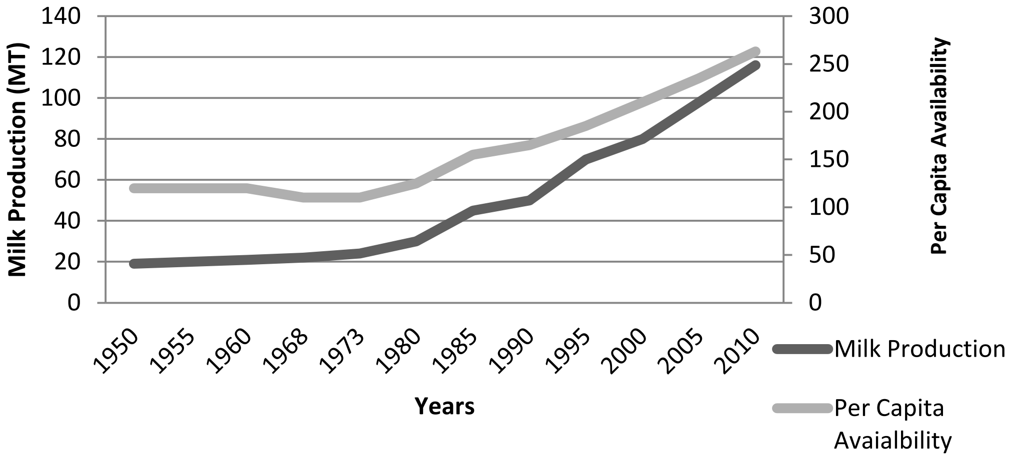
India's dairy sector faces rising domestic demand and lacks access to export markets (Rakotoarisoa and Gulati 2006). A key barrier to dairy exports is complying with Sanitary and Phyto-sanitary (SPS) measures. Tackling SPS barriers is a monumental task and requires large improvements in animal health, milking hygiene, infrastructure (collection and storage) and many institutional changes that would facilitate thorough inspections and controls along the dairy production and processing chain (Rakotoarisoa and Gulati 2006).

Also, both organized and unorganized sectors in the dairy industry of the country face a lot of challenges — infrastructural, technical, socio-psychological, economic and marketing. These challenges act as significant constraints to the expansion of milk production in the country.

A-2.5 Milk Production India

In 1998 India surpassed USA to become the world's largest milk producer. Over the last 60 years, the total milk production of India has increased from 17 million tonnes (1950–51) to 112 million tonnes (2009–10) (GOI, 2011). During this period, the per capita availability of milk too has increased from 124 g/day to 255 g/day (Figure. A-2.2). However, during the first two decades of India's independence (1947-1967), the growth in the milk production was lower (1%) than the population growth rate (2%). As a result, the per capita availability dropped to as low as 110g/day in 1968 (Figure A2.2).

Figure A-2.2 Growth in Production and Per Capita Availability of Milk in India (1950-2007)



To increase per capita availability and bridge this growing gap between supply and demand, substantial increases in milk production was required. To achieve this, a nationwide dairy development programme called "Operation Flood" (OF) was launched in the year 1970. Due to this initiative, growth of milk production in India ranged from 2.80 per cent per year in the 1970s to as high as 6.72 per cent per year during the 1980s. An overview of Operation Flood is presented in the box below.

Overview of Operation Flood

Operation flood (OF) was a dairy development programme often credited for having brought about the Milk Revolution ("White Revolution") in India. The programme is responsible for turning around the Indian dairy sector from a situation of scarcity to that of sufficiency and in the process making India the largest producer of milk in the world. The programme was initiated in the backdrop of dairy commodity surpluses in Europe in the 1970s. The threat of cheap imports finding their way into the country and adversely affecting the nascent dairy industry was converted into an opportunity to build a strong dairy industry. This was achieved by utilizing food aid (from the European Economic Community) to finance the building of modern dairying infrastructure. The programme was implemented in three phases starting in 1970 and ending in 1996 (Kurien, 2004).

Salient features of operation flood and achievements, 1970–96.

Features	Operation Flood (OF) phases		
	OF-I	OF-II	OF-III
Date when started	July 1970	October 1979	April 1985
Date when concluded	March 1981	March 1985	March 1996
Investment (Rs Million)	1160.5	2770.2	13030.1
Number of federations/apex milk unions set up	10	18	22
Number of milk sheds covered	39	136	170
Number of district coop societies set up (’000)	13.3	34.5	72.5
Number of members (million)	1.75	3.63	9.26
Average milk procured (mkgpd)	2.56	5.78	10.99
Liquid milk marketing (mlpd)	2.79	5.01	10.02
Processing capacity			
Rural dairies (llpd)	35.9	87.8	180.9
Metro dairies(llpd)	29	35	38.8
Milk drying capacity (MTPD)	261	507.5	842
Technical inputs			
Number of AI centres	4.9	7.5	16.8
Number of AIs done (million/year)	0.82	1.33	3.94
Cattle feed capacity (□’000 MTPD)	1.7	3.3	4.9

Mkgpd: million kg per day; mlpd: million litre per day; MTPD: metric tonne per day

Source: Kurien (2004).

The major activities of the programme included establishment of a unique rural milk procurement system, marketing system, development of milk animals, increasing milk production, utilization of food aid for market stabilization, manpower training and development (Kurien, 2004). Through the establishment of institutional linkages and creation of dairy cooperatives that were professionally managed yet farmer (producer) controlled, the program ensured efficiencies were developed in the highly inefficient areas of milk procurement and marketing (Kurien, 2004). Furthermore, it provided for the integration of production, processing and marketing functions thus achieving economy of scale. The program identified the AMUL (Anand Milk Union Limited) model of dairy development as being most successful and replicated it all across India. This model allows for establishment of three tier dairy cooperatives (village, district and state level) which formulated and implemented their own policies and programmes for dairy development in their area.

Since the initiation of the operation flood, India's milk output has grown on an average by roughly 4% per year. The programme is often considered the largest, longest and most successful dairy development programme run anywhere in the world. Apart from bridging the crucial gap between demand and supply of milk, the programme is also credited for delivering significant benefits to poor and marginal farmers, women and other vulnerable sections of Indian society. It has thus established a reputation of being an empowerment tool and an example of the successful use of foreign aid. The third and last phase of the programme concluded in the year 1996.

Currently, milk production is estimated to be growing at 4.04% per year (IFCN, 2010). The current (2010) milk production of India was estimated to be around 116 million tonnes, which is an increase of around 20 million tonnes from what it was in 2005. This increase is mainly attributed towards productivity improvements in dairy animals.

A-2.5.1 Milk Production by Farm Type

In India, milk is mostly produced by marginal (< 1 ha) and small farmers (1 to 1.9 ha). In 2001, there were 107.7 million dairy farms in India. Of these, marginal farms (61%) and small farms (20%) combined accounted for 81% of all dairy holdings (Table A-2.2). Medium (5%) and large (1%) farms combined accounted for just 6% of all dairy holdings, while semi-medium farms accounted for 12% (Table A-2.2).The average number of animals in marginal and small farms was 2.9/holding and 4.4/holding respectively (GOI, 2011). While the average number of animals per holding in semi-medium, medium and large farms were 5.7, 7.1 and 8.9 respectively. The marginal (46.5%) and small farms (22.5%) accounted for 69% of the total livestock population. While semi-medium (17.5%), medium (10.6%) and large (2.9%) made up the remaining 31% of the livestock population.

Table A-2.2 Overview of Livestock Distribution in India by Farm Class

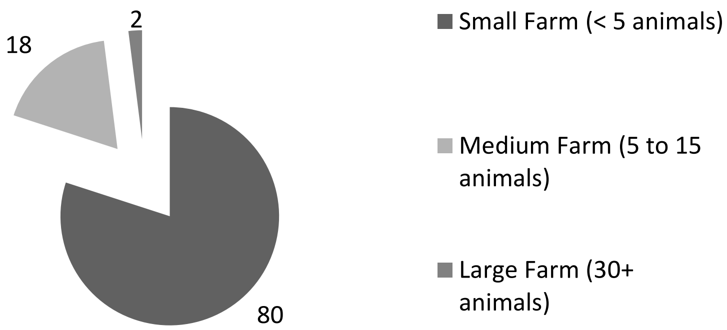
Farm Class	Distribution of Livestock (%)	Number of Holdings	Avg. No. Of Cattle & Buffalo/Holding
Marginal	46.5	65, 285	2.9
(< 1.0 ha)		(61%)	
Small	22.5	21, 498	4.4
(1 to 1.9 ha)		(20%)	
Semi-Medium	17.5	13,349	5.7
(2 to 3.9 ha)		(12%)	
Medium	10.6	6,374	7.1
(4 to 9.9 ha)		(5%)	
Large	2.9	1197	8.9
(10+ ha)		(1%)	
All Classes	100	107,706	3.9

Source: GOI (2011).

Over the last 30 years there has been a substantial increase in the percentage share of the marginal and small farm-size category in the *in-milk* bovine population. In 2003, marginal and small farmers constituted 58 per cent of all the holdings and accounted for as much as 71 per cent of the in milk bovine stock in 2002-03 (NSSO, 2003). While in 1971, they accounted for just 20 per cent of the in-milk bovine population (NSSO, 2003).

In 2007 farmers with less than 5 animals accounted for 80% of the milk production and farmers with 5 to 15 animals accounted for 18% (Dairy India, 2007). Large commercial dairy farms with more than 30 animals accounted for only 2% of the total milk produced (Figure A-2.3). Given these trends, it appears highly likely that the future growth in milk production will be considerably driven by the small and marginal holders.

Figure A-2.3 Percent share of milk production by Farm Type (2007)

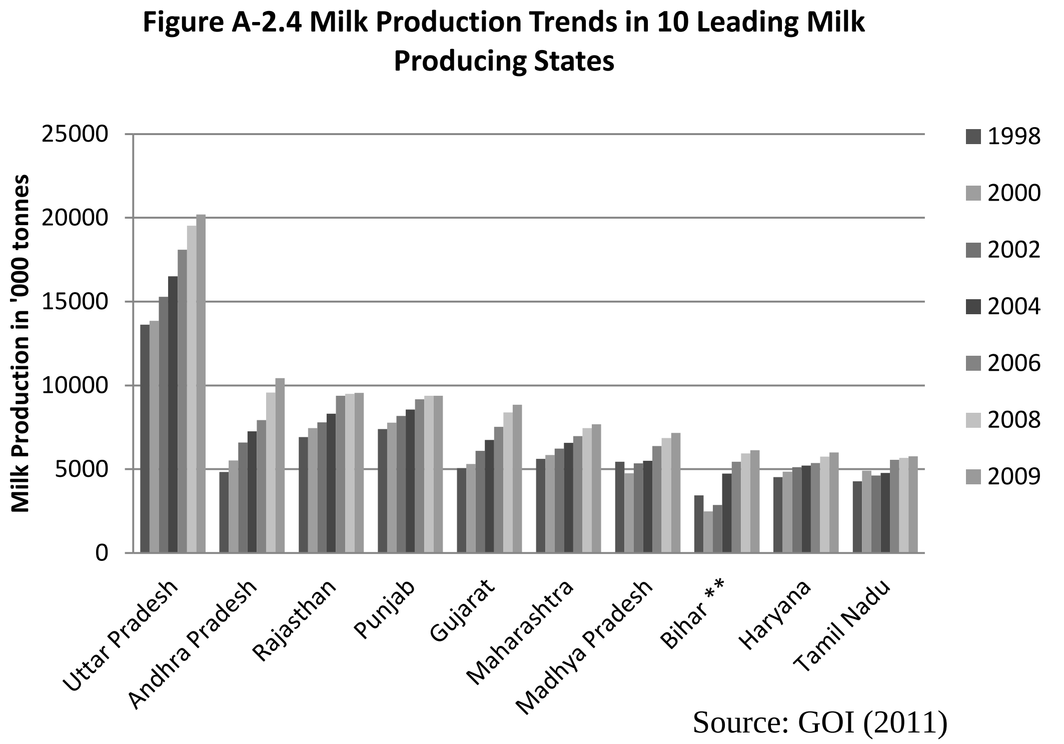


Dairy India (2007)

Dairy farms in general can also be classified based on labour input as being either family farms or business farms. Dairy farms with less than 50% share of family labour on total dairy labour are defined as business farms, while those having 50% and above are family/household farms (IFCN, 2010). Based on this definition a vast majority of dairy farms in India are family/household farms.

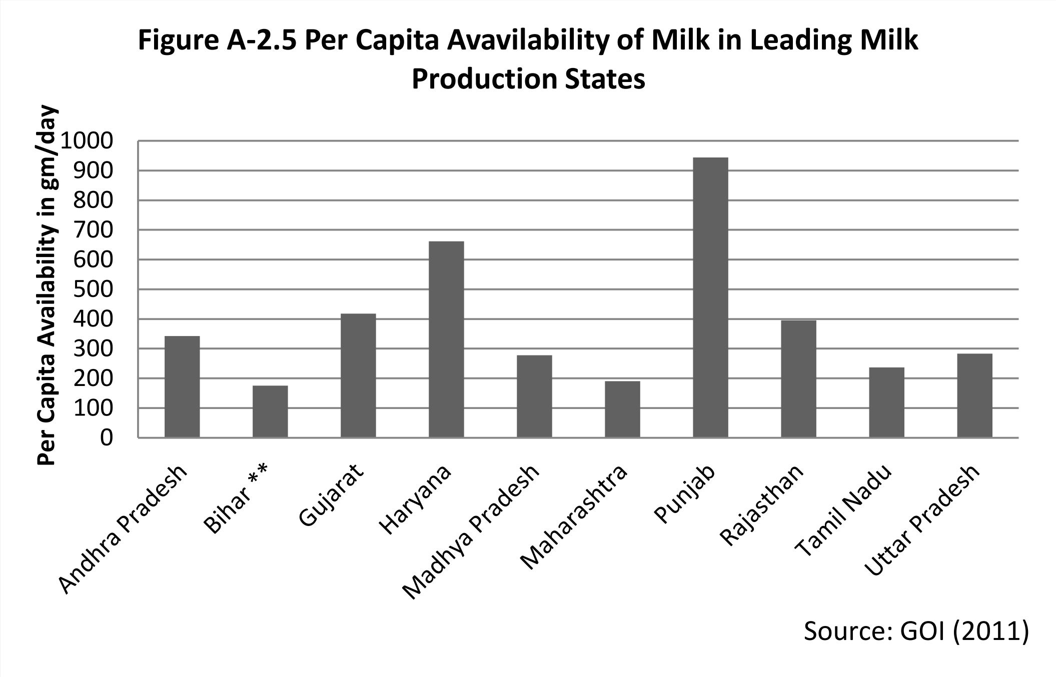
A-2.5.2 Milk Production by State

There is considerable difference between states in the volume of milk produced. Uttar Pradesh (UP) which is the most populated state in India, has always been the largest milk producing state. In 2009, the milk production of UP was estimated to be around 20.2 million tonnes. The 10 largest milk producing states account for 85% (96 million tonnes) of the milk produced. Of these 10 states, the lowest milk production was in the southern state of Tamil Nadu (5.7 million tonnes) (Figure A-2.4).



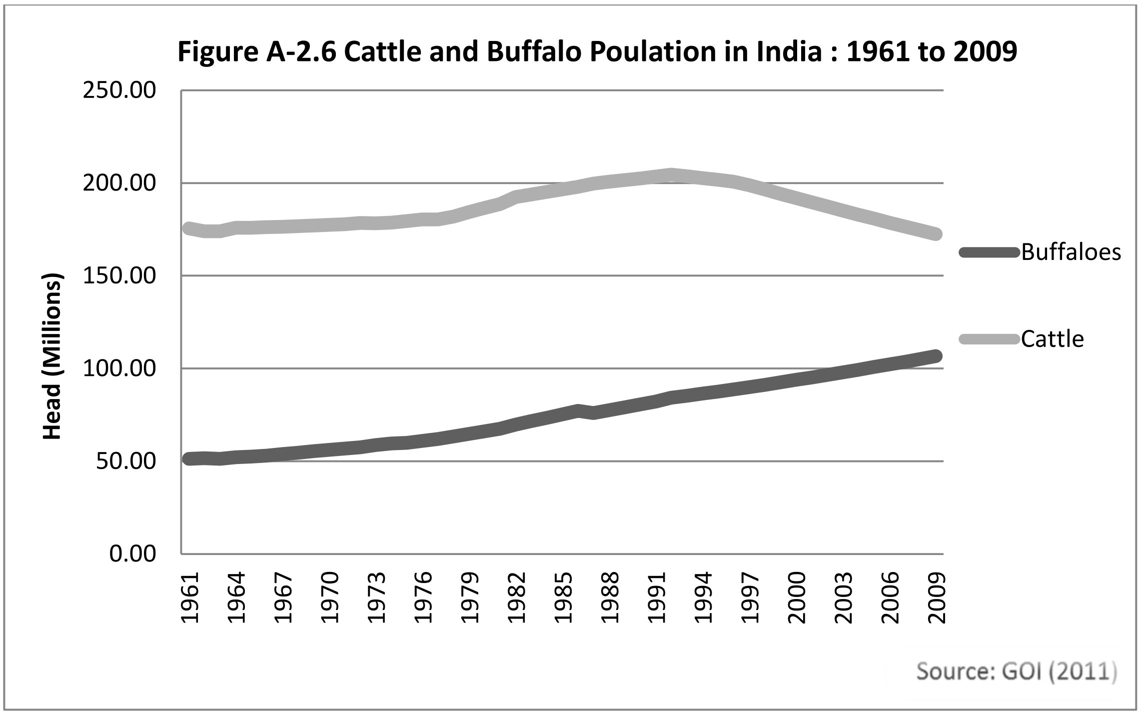
Source: GOI (2011)

In terms of pre-capita avaialbility of milk, there are wide-inter state differences as well. In general, the per capirta availabilty is highest in the northen states and lowest in the eastern states. In 2010, Punjab had the higest per-capita availability (944 gms/day) while the union territory of Daman and Diu had the lowest (15gm/day). Among the 10 leading milk producing states, the per capita availability of milk in 3 states – Bihar, Maharshtra and Tamil Nadu was below the national average of 263 gm/day (Figure A-2.5).



A-2.5.3 Milk Production by Animal type

The size of the national herd, which comprises of both cattle and buffalo was estimated to be around 279 million head in 2009 (Figure A-2.6). This is an increase by 23% from 1961 (226 million) (Figure A-2.6). The main driver of this trend has been the steady increase in buffalo numbers which have more than doubled since 1961 and are estimated to be around 107 million in 2009 (Figure A-2.6). In contrast, the cattle population after reaching a peak of 204 million in 1994, has declined rapidly and is currently 172 million, which is less than what it was in 1961 (175 million) (Figure A-2.6). As a result, the size of the national herd too has decreased from its peak in 1996 (290 million). The decline in cattle population is mainly attributed to farmers shifting from rearing less productive indigenous (zebu) breeds of cattle to more productive crossbreeds and buffalo. Additionaly, the decreased demand for bulls/bullocks for farm work due to increased mechanisation is also contributing to the decrease in numbers of ingeneous animals.



Currently, buffaloes are most important dairy animals and account for 55% of milk production (GOI, 2011). The share of indegenous cows in milk production is 21% while that of crossbreds is around 24% (Table A-2.3). The proportion of *in milk* animals too has also increased considerably which indicates that productive animals represent an increasing share of the national herd. In 2009, the proportion of *in milk* animals was 75% for crossbreds, 63% for ingenous cattle and 74% for buffaloes (GOI, 2011).

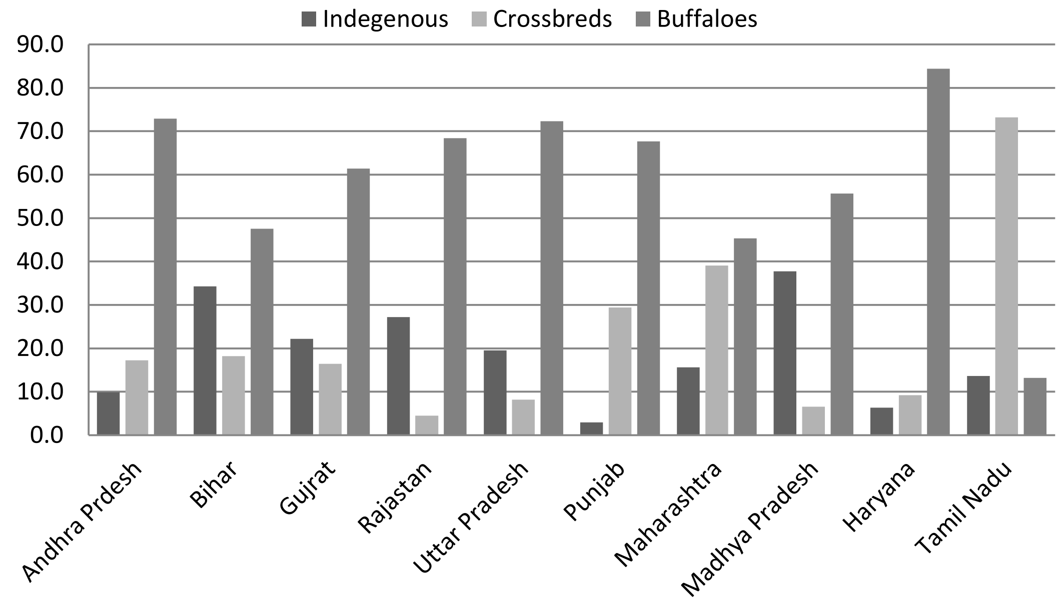
Table A-2.3 Milk production by animal type in 2009

Animal Type	**In Milk Animals (millions)**	**Milk Production (million tonnes)**	**% of Population**	**% of Milk Production**
Indigenous	10.11	25.35	13.5	23.6
Crossbreds	28.81	22.46	38.7	20.9
Buffaloes	35.47	59.20	47.6	55.3
Total	74.40	107.02	100.0	100.0

Source: GOI 2011

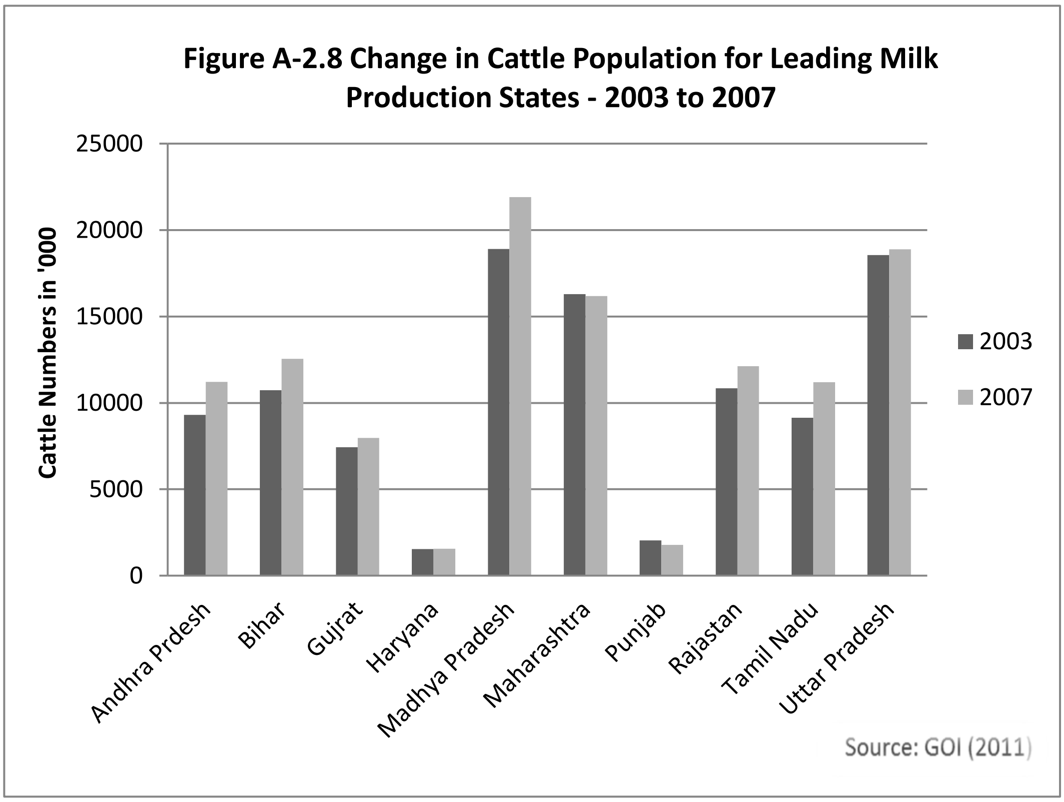
There is considerable difference in the share of milk production by animal category between states. In all of the 10 largest milk producing states except Tamil Nadu, buffaloes accounted for the highest share of milk production (Figure A-2.7). The share of buffaloes in milk production was highest in Haryana (84%) and lowest in Tamil Nadu (13%). In Tamil Nadu, the share of crossbreds is highest (73%), while in Rajastan (4%) it's the lowest (Figure A-2.7). The share of indegenous cows was highest in Madhya Pradesh (38%) and lowest in Punjab (3%).

Figure A-2.7 Share of Milk Production by Animal Type for 10 Leading Milk Producing States (2009)



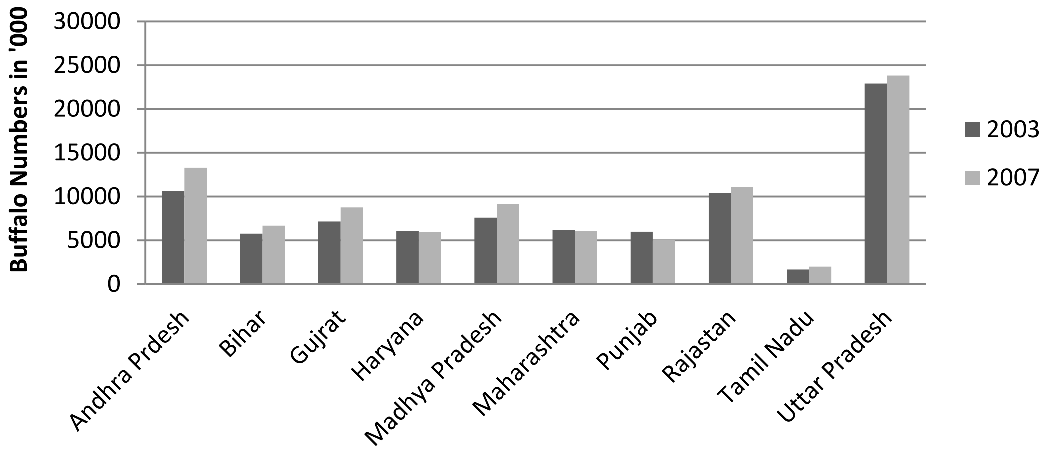
Source: GOI (2011)

The distribution of cattle and buffalo also shows considerable variation between states. Excluding Union Territories, Madhaya Pradesh had the highest (21 million) cattle population, while Mizoram had lowest (0.035 million) in 2007. Among the 10 large milk producing states, the total cattle population increased from 2003 to 2007 in all states execpt Maharashtra and Punjab (Figure A-2.8). The highest growth in cattle populations were seen in Tamil Nadu (22%) and Andhra Pradesh (21%).



As mentioned earlier, buffaloes account for a signifcant share of milk productin in India. In 2007, Uttar Pradesh had the highest (23.8 million) buffalo population, while Mizoram (0.006 million) had the lowest. Among the 10 leading milk producing states, from 2003 to 2007 the buffalo population increased in seven states and decreased in three states (Figure A-2.9). The higest growth rates were seen in Andhra Pradesh (25%) and Gujarat (23%). In 2007, Tamil Nadu had the lowest (2 million) buffalo poulation (Figure A-2.9).

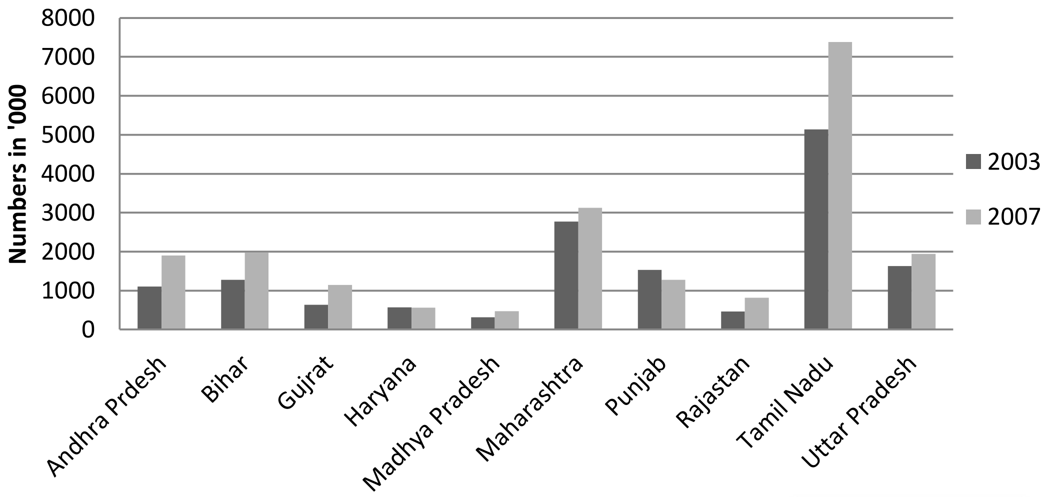
Figure A 2.9 Change in Buffalo Population for leading Milk Producing States - 2003 to 2007



Source: GOI (2011)

The number of crossbred cows (CB) have increased from 2003 to 2007 in all of the 10 leading milk producing states, execpt for Punjab and Haryana (Figure A-2.10). The highest growth was seen in Gujrat (78%) and the lowest in Punjab (-16%). Of these states, Tamil Nadu had the highest (7.3 million) number of CB cows and Madhya Pradesh had the lowest (0.47 million) number in 2007 (Figure A-2.10).

Figure A-2.10 Number of Crossbred Cattle in the Leading Milk Production States - 2003 and 2007



Source: GOI (2011)

A-2.5.4 Milk Yields

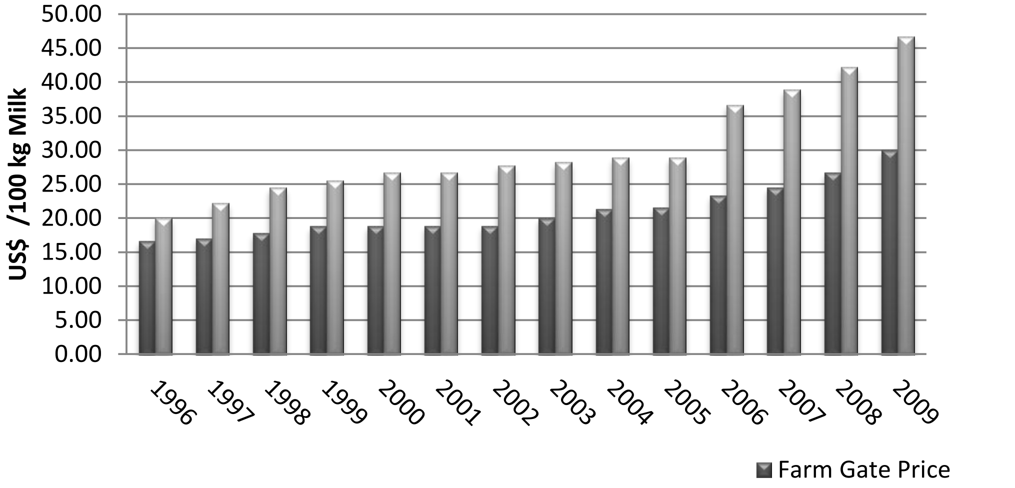
There is considerable difference in milk yield for the different dairy animal categories (indigenous, crossbred and buffalo). In general milk yield per animal is quite low and has shown only marginal increases over the years. Between animal types, the milk yields of indigenous cows is much lower (2.1 kg/day) than that of crossbreds (6.8 kg/day) and buffaloes (4.6 kg/day) (GOI, 2011). There is also considerable variation in milk yields of dairy animals between states. For all three categories of dairy animals, the highest milk yields were seen in the state of Punjab, with reported milk yields of 5.8 kg/day, 10.8 kg/day and 8.8 kg/day for indigenous, crossbreds and buffaloes respectively. The lowest milk yields were seen in the states of Meghalaya (0.8 kg/day), Assam (3.3 kg/day) and Nagaland (1.6 kg/day) for indigenous, crossbred and buffalo respectively (GOI, 2011). This situation clearly indicates that India needs to drastically improve the productivity of its dairy animals. If this does not happen it will be highly unlikely that India can meet the projected demand for milk and milk products.

A-2.6 Prices and Costs

A-2.6.1 Farm-gate and Consumer Prices

From 1996 to 2009 both farm gate as well as consumer prices of milk have increased significantly in India (Figure A-2.11). But increase was not uniform as farm gate prices increased from 16.6 to 28.8 US$/100 kg milk (73%) and the consumer prices increased from 20 to 46.6 US$/100 kg milk (133%) (Figure A-2.11). As a result, the margins for the processor and retailers increased considerably, while the farmers share in consumer’s price decreased. In 1996 the farmer’s share of consumer price was 80% and in 2009 this had decreased to 62%. Consequently, the margins for the processors/retailers increased from US$ 4.6/100 kg milk in 1996 to US$ 18/100 kg milk in 2009 (Figure A-2.11).

Figure A-2.11 Farm Gate and Consumer Milk Prices in India – 1996 to 2009

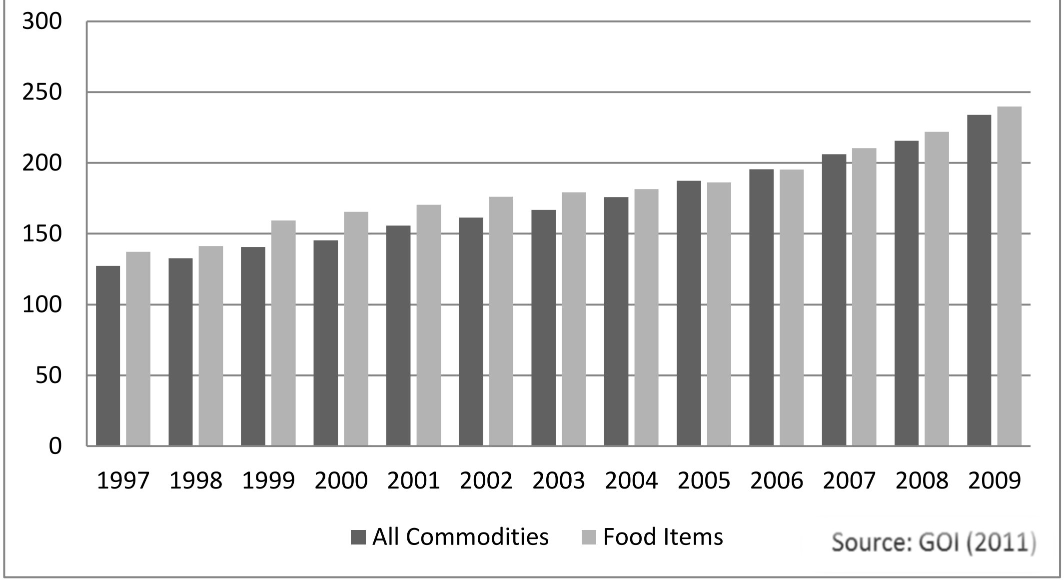


Source : IFCN, 2010

A-2.6.2 Whole Sale Price Index

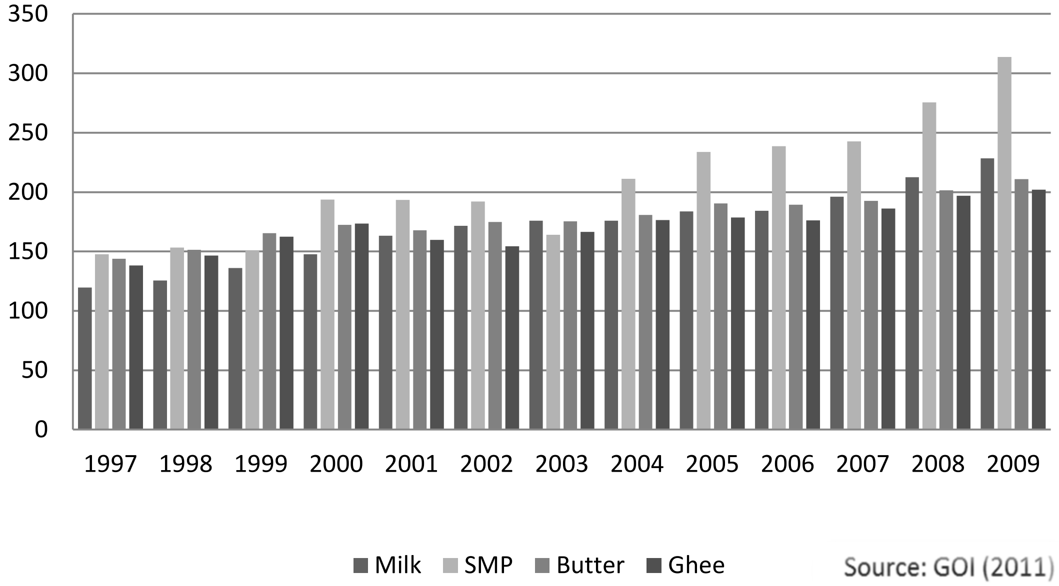
The whole sale price index of both all commodities and food items has shown consistent year on year increase from 1997 to 2009 (Figure A-2.12). The whole sale price index of food items in specific has traditionally been slightly higher than that of all commodities in general (Figure A-2.12). In 2009, the whole sale price index of all commodities and food items were 233.9 and 239.8 respectively (Base year 1993/94 = 100).

Figure A-2.12 Change in Whole Sale Prices Index of All Commodities and Food Items (base 1993-94=100)



The whole sale price indexes of all four significant dairy commodities (Milk, SMP, Butter and Ghee) too have increased from 1997 to 2009 (Figure A-2.13). While Milk and SMP demonstrated steady year on year increases in whole sale prices, the increase of Butter and Ghee prices was not quite as consistent (Figure A-2.13). Among dairy commodities, SMP showed the highest growth (112%) in whole sale price index from 1997 (147.6) to 2009 (313.9), followed by milk (108%), Butter (67%) and Ghee (63%) (Figure A-2.13).

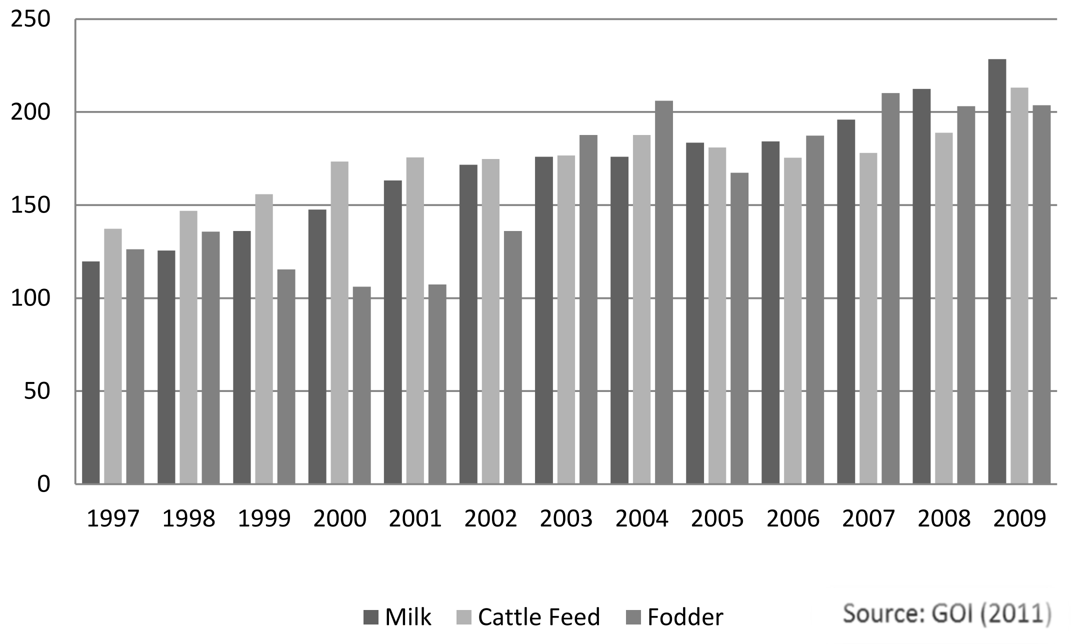
Figure A 2.13 Change in Whole Sale Prices of Dairy Commodities (base 1993-94=100)



Source: GOI (2011)

A comparison of the changes in whole sale price index of dairying outputs (milk) with that of major dairying inputs (cattle feed and fodder) gives a good picture of the sustainability of medium to high input farming systems. In 2009, the whole sale price index of milk, cattle feed and fodder was 212.5, 188.9 and 203.1 respectively (Figure A-2.14). From 1997 to 2009, the whole sae price index of milk showed consistent year on year increase, while that of cattle feed and fodder showed fluctuations. The fluctuations were higher for fodder and lesser for cattle feed (Figure A-2.14). During the period analysed (1997 to 2007), the whole sale price index of cattle feed was higher than that of milk for 8 years (1997 to 2004). But more recently, from 2005 to 2009, the whole sale price index of milk has been higher than that of cattle feed. The whole sale price index of fodder was higher than that of milk for 6 years (1997, 1998, 2003, 2004, 2006, 2007), with highest difference seen in the year 2004 (Figure A-2.14). More recently, in 2008 and 2009, the whole price index of milk was higher than that of fodder.

Figure A-2.14 Change in Whole Sale Price Index of Milk, Cattle Feed and Fodder Commodities (base 1993-94=100)



A-2.6.3 Production and Transaction Costs of Dairy farming in India

The unit cost of milk production includes expenses incurred on production of milk as well as associated transaction costs (Birthal *et al.*, 2008). The production costs mainly include expenses on variable inputs: feeds and fodders (such as dry fodder, green fodder and concentrate feeds); feed additives like mineral mixtures; as well as medicines, vaccines and human labour (owned and hired labour). The transaction costs mainly include the cost of search, acquisition and processing of information, cost of negotiating the terms and conditions of trade and the costs of monitoring and enforcement of the exchange.

Recently, Birthal *et al.*, (2008) compared the cost of milk production in India for three groups of producers – 1) independent producers selling milk in the open market, 2) independent producers selling milk to vendors and 3) contract producers (who have a milk supply contract with an agent/dairy company). They found that the cost of production of milk was lowest (Rs 8.6/litre) for contract producers but not significantly different from the independent producers. The labour costs associated with milk production were lower for contract producers than producers selling to vendors (by 6%) and producers selling on the open market (12%). The transaction costs associated with the acquisition of inputs and disposal of milk were Rupees 0.8, 1.1 and 2.4/litre of milk for contract producers, independent producers selling to vendors and independent vendors selling on the open market respectively. Thus the unit cost of milk production was found to be highest for independent producers selling to the open market (Rs 11.3/litre), followed by independent producers selling to vendors (Rs 9.8/litre) and least for contract producers (Rs 9.4/litre) (Birthal *et al.,* 2008).

On the procurement price side, the highest price was offered by the open market (Rs. 12.9/litre) and the lowest price by vendors (Rs.11.8/litre). The price offered under contract was Rs. 12.10. The open market offers a higher a price because its costs associated with procurement and transportation of milk will be lowest. Since vendors and contractors are able offer a similar price, it indicates that the local milk market is quite competitive. On the whole the net revenue per unit of milk was found to be highest for contracted producers (Rs. 2.7) and lowest for independent sellers selling in the open market (Rs. 1.60). Contract farming can thus significantly increase profit margins by reducing transaction costs. Another major effect of contract farming is that it has induced competition in the rural markets which were otherwise being dominated by vendors who often exploited producers by paying less than market price (Birthal *et al.,* 2008).

A-2.7 Agri-Food Systems in India

The agricultural markets in India, are highly inefficient and imperfect, and are characterised by temporal and spatial price variations (Singh, 2008). The producers share in the consumers’ rupee is usually very low, with the exception of few commodities (Singh, 2008). In many instances the producer makes losses while the processor/retailer ends up making huge profits (Mitra and Sarkar, 2003). On the other side, the processors and marketers of agricultural products are always challenged by the difficulty in obtaining timely, cost-effective and adequate supplies of quality raw materials (Singh, 2008).

With the onset of globalization, the role of the state in agricultural marketing and input supply is decreasing, thus increasing the space available for the private sector to bring about more efficiency in these markets (Singh, 2008).

The procurement practices of supermarkets and large food processors have a significant impact on farming. Through their coordinating institutions and mechanisms such as contracts, private standards, sourcing networks and distribution centres they are reformulating the rules of the game for farmers and first stage processors (Reardon and Berdegue, 2002). An important issue to be considered is whether small producers can participate and benefit from these new age supply chains and markets especially if traditional marketing channels weaken or disappear (Pingali and Khwaja, 2004). Small farmers in India face numerous challenges and can address them only if supported by good policies and institutions. The net effect of these integrated supply chains and markets on small farmers depends upon the nature of the commodity and its market, as well as the ability of farmers to coordinate marketing activities (Barghouti *et al.*, 2004).

Food and beverage retailing in India is very fragmented, with the non-organised segment accounting for significant shares in revenue (Datamonitor, 2009). Organized food retailing is at nascent stage in India and accounts for about 2% of food retailing. This segment is mainly made up of individual retailers and small supermarket chains. Market regulations make it quite difficult for large foreign retailers such as Wal-Mart to enter Indian markets (Datamonitor, 2009). In such a situation where the market is composed of many small potential buyers of agricultural/food products, the buyer power is considerably weakened.

However, the retail food sector is expected to grow at nearly 20% per year. Much of this growth will take place in the organized food retailing sector thus increasing its share considerably. Food is the largest retail sector in India and accounts for nearly 48% of consumer expenditure. The number of retail outlets has grown at 26% per year from 1996-2001. Food retail alone accounts for 33% of all retail outlets and 63% of total retail sales (Chengappa *et al.*, 2005). Yet, most retail stores are still very small, family owned operations. More recently, several big name corporate players with diversified business interests (conglomerates) such as the Tata group and Reliance group have entered the organised food retail sector.

In November 2011, The Government of India approved the proposal of the Department of Industrial Policy & Promotion and permitted FDI (Foreign Direct Investment), up to 100%, in single brand product retail trading. More recently (September 2012), the Government increased the cap on FDI in multi-brand retail trading to 51%. These policies significantly ease the entry of multinational food retailers such as Starbuck’s (single brand) and Wal-Mart (multi-brand) into the Indian market.

On the demand side, significant drivers of the retail food sector in India have been – the changing age structure of the Indian population, rising family incomes, increased number of employed women, changing food habits (increasing popularity of convenience and western foods), and growing health and food quality consciousness among food buyers and consumers (Singh, 2008). On the supply side significant changes are being caused by the large food retailers and agribusiness corporations. For example, the entry of McCain foods, which produces frozen western-style potato based products such as French fries, wedges and bite-sized nuggets for the Indian market, has caused changes in the supply chains of not only food retailing operations but also the larger food industry. McCain products serve a wide range of customers including fast food restaurants, hotels and catering companies, while its branded retail products for home consumption are sold in modern grocery stores and supermarkets across India (Singh, 2008). By establishing its own sourcing and processing operations in India, McCain has by passed the need to import from Holland, Canada and New Zealand (Singh, 2008).

In the domestic retail food sector, very few retailers source even a small part of their supplies directly from farmers. Recently, European supermarket chains such as Sainsbury’s, Safeway and Tesco have begun procurement in India as per the standards set by GLOBALGAP (good agricultural practices specified by the European Retailers Association) (Singh, 2008). Tesco sources greens in India through its Indian partners Mahindra Ltd and Field Fresh Foods, and has its own global standards for food. It has a network of more than 400 farmers in India supplying the chain with products that include lychees, mangoes, grapes, potatoes, and gherkins (Srinivas, 2005). Additionally several specialized wholesalers are present, who provide valuable supply chain support to retail chains and fast food outlets.

List of Important Retail Food Stores in India	
Group name	**Store brand**
Hyper Markets (< 1524m^2)	
Tata trent	Star India bazar
Shoprite Checkers	Shoprite
RPG	Spencer’s
Reliance	Reliance Mart
Supermarkets (< 610m^2)	
Pantaloons	Food bazar
Nilgiris	Nilgiris
RPG	Spencers
Apna bazar	Apna bazar
Zakaria Shahid group	Sabka bazar
Birla’s	More
Fab mall	
Valdel retail	
Reliance Fresh	Reliance Fresh
ITC Choupal Fresh	Choupal Fresh
Pyramid Retail	True mart
Namdhari Seeds	Namdhari Fresh
Heritage Foods	Fresh
Wadhwan Group	Spinach
Discount Stores	
Viswapiya	Subhiksha
Margin Free Markets	Margin Free

A-2.7.1 Agri Food Supply Chain and Marketing Channels

India's agricultural and agri-food marketing system has undergone significant changes in the last two decades mainly due to India's economic reforms and rapid economic growth. The most important of these changes are - 1) a shift in food consumption pattern away from staples like food grains to high value agricultural products such as fruits, vegetables and animal products, resulting in an increase in their demand (Kumar *et al.,* 2007), 2) diversification of agricultural production towards high-value commodities to meet the rising demand (Birthal and Taneja, 2006), and 3) a change in the food marketing system from the traditional ad hoc transactions dominated by intermediaries to institution driven coordinated supply chains such as cooperatives, growers associations and contract farming, which besides coordinating supply and demand, also address rising consumer concerns related to food safety and quality (Delgado *et al.,* 2008; Roy and Thorat, 2008).

With increasing globalization, India will find it difficult to maintain a closed economy. The emergence of multinational food chains and a dramatic rise in the share of supermarkets and modern retail sector is certain. If the current trends in expanding urban populations continue, the share of supermarkets in the urban food retail sector in the developing world will increase to levels that they are now in the industrialized economies (Sere *et al.,* 2008). In such markets there is increasing demand for products meeting high standards of quality and safety. In order to meet these requirements (in India) modernization of supply chains starting from producer to end consumer is required (Sharma, 2004).

These changing market structures and growth of modern retail are likely to shape the future of dairy farming in developing countries. Domestic markets, including the informal livestock products markets, usually handle the largest share of the livestock products consumed in developing countries. However, in urban areas, the modern food retail sector is growing rapidly, and imposing specific requirements in terms of quality assurances and homogeneity of the products (of national and international origin).

These two marketing systems require markedly different food safety and quality standards, affecting livestock production systems supplying these markets (Sere *et al.,* 2008). With the majority of dairy farmers (smallholders) having limited capacity (in the absence of sufficient knowledge and resources) to comply with required quality standards, there is every likelihood that such corporations will turn to preferred supplier systems (even across borders) who meet specific quality and safety standards and lower transaction costs. It is likely that smallholders will not find adequate market opportunities with such retail corporations (Sere *et al.,* 2008).

A-2.7.2 Dairy Supply Chain

In many dairy markets, the key input is milk, which food manufacturers must buy from farmers. The dairy farmers in India often face market failures such as inability to access- market outlets, good quality inputs, improved technologies, essential information, and animal health and breeding services (Birthal *et al.,* 2008). Institutions such as cooperatives, producers' organizations, and contract farming have emerged as a possible solution to these market failures.

In India, the marketing of milk in India is quite complex. It is constrained by perishability, seasonal production variation, inadequate processing facilities, production and consumption inequalities, absence of competitive markets, cooperative protectionism, missing value addition at farm level, and challenges associated with the production system (smallholders with limited marketable surplus) (Gautam *et al.,* 2010). Moreover, the lack of market access is considered a critical constraint because it limits the incentives needed to produce high risk high value food commodities such as dairy (Halloway and Ehui, 2002).

An efficient milk collection and distribution system to bring milk from the farmer to the consumer is a vital condition for dairy development. The existing milk marketing channels in India are in-efficient and hence act as a disincentive to the rural producers. The milk market in India is fragmented, having both formal and informal segments. But the bulk of milk trade flows through a number of informal supply chains and marketing of raw milk is largely through the informal/unorganised sector.

These informal milk markets are often unstable and exploitative. Yet producers prefer to sell to the informal sector for several reasons- some of which are location specific and may not hold true for all regions in the country. The main reasons for producers shifting or supplying milk to informal channels (i.e. milk vendors instead of private dairies or cooperatives) are better prices, uniform pricing system throughout the year (irrespective of fat content), prompt/timely payment, collection of milk from farmers doorstep, and providing farmers with access to credit (Dairy India, 2007).

Similarly consumers prefer to buy milk form informal sources for important reasons. In a survey conducted in Andhra Pradesh by Sharma (1996) a majority of consumers reported they purchased milk from milk vendors (informal sector) because of non-availability of milk from private dairies/cooperatives within a reasonable distance from their residence. Another reason for preference of milk vendors (especially for small families), was the non-availability of milk in small packaging (volume) of less than half litre from private dairies/cooperatives (Sharma, 1996).

The overall market share of formal/organized sector (including cooperatives) is around 25% (Kurup, 2002). In the formal milk market, the co-operatives and private processors are the two most important players. In general farmers prefer to supply milk to the formal sector due to the following reasons – 1) ensures regular collection in all seasons, 2) provides a number of support services including extension services, and 3) having collection centres close to farms (Anonymous, 2004).

The development of a formal sector has transformed the milk supply chain from a traditional ad hoc vendor dominated system towards a more organised and coordinated supply chain. These coordinated supply chains first developed in the form of cooperatives due to the initiatives of National Dairy Development Board (NDDB). The liberalization of the dairy industry in 1991, and the subsequent phasing out of the Milk and Milk Products Order (MMPO) in 2002, has resulted in the entry of private processors into the milk market in large numbers. The entry of the private processors has infused greater economic competition, resulting in a disciplining of the informal traders/vendors who until then had exploited the dairy farmers (Birthal *et al.*, 2008).

A-2.7.3 Dairy Marketing Channels

A-2.7.3.1 Informal Channels

Milk producers in India might directly sell milk to urban and/or rural consumers. Such direct transactions are more common among small scale farmers located in urban and peri-urban areas. Few large producers in rural areas also supply milk directly to urban customers such as sweet shops, restaurants, hotels and in urban milk markets (the *Mandi*). In these direct transactions, producers are able to retain a much larger share of the price paid by consumers/customers. However, since the cost associated with finding buyers and milk delivery is quite high direct transactions are not common. Depending on region, such direct sale of producers to consumers can account for 7 to 74% of marketable surplus (Anonymous, 2004).

The marketing of raw milk is therefore dominated by local vendors who collect milk directly from producers and sell it to urban consumers/customers. These vendors are known to take considerable advantage of the farmer's lack of market intelligence and perishable nature of milk. In the flush season most vendors pay a much lower price and may not buy the entire marketable surplus from farmers. To lock in famers and ensure regular milk supply, the vendors often provide credit (at extremely high interest) to producers.

Sub-contracting through village level commission agents is also a common feature of the informal market. Small scale processors, who cannot invest in the elaborate milk procurement infrastructure, source their milk supplies through contractors (who collect milk from farmers) on a commission basis. The contractors also use credit lending as a means to lock in farmers.

A-2.7.3.2 Formal Channels

The contract farming model (through private agribusiness firms or cooperatives) of risk reduction and agricultural coordination is being increasingly used by agribusiness corporations. In practice it involves a commitment to provide a specified quantity of an agricultural commodity at a specified time, price and place to a known buyer; it may involve some or all of these aspects (Singh, 2002). For farmers, contracting gives access to additional sources of capital, inputs and technology, and shifts part of the risk of adverse price movements to the buyer (Glover, 1987). For the processors, contracts are more flexible and reliable when faced with price and supply uncertainties, makes smaller demands on scarce capital resources and imposes fewer burdens on the management in terms of labour relations; and ownership and production activities (Singh, 2008). But the lack of respect for honouring contractual obligations makes this model of farming quite difficult to implement.

i. Private Dairy Companies

Most large private dairy companies source milk through direct or indirect contracts. These contracts are representative of either a market specification or resource-providing contract or a combination of the two (Birthal *et al.,* 2009). It is very expensive for dairy companies to contract directly with a large number of small producers because of huge costs associated with information search and negotiation and enforcement of contracts (Birthal *et al.,* 2009). To avoid this, dairy companies usually negotiate a contract with a milk collection agent in the village. This agent acts as an intermediary between the farmers and dairy company. The agent is responsible for procuring milk from farmers, transferring information from the company to farmers, providing inputs and services, and making (negotiating) payments to the farmers. The agreement is usually informal but might contain specific terms and conditions related to quantity, quality and price of milk; contract duration; mode of payments; sharing of cost and risks; moral hazards; dispute settlement and so on (Birthal *et al.*, 2009). The agent usually provides the space for milk collection and the dairy company supplies the necessary equipment such as weighing scales, milk cans, milk analysers, milk cooling/storage tanks etc. at no cost. The operational expenses of the collection centre are borne by the agent and the transportation costs of moving milk from collection centre to the processing plant are borne by the dairy company (Birthal *et al.*, 2009).

The agent in turn has an informal understanding with producers. The producer can sell any amount of milk to the agent provided the supply is regular and the milk if of acceptable quality. The price of the milk is usually determined based on the fat and solid non-fat (SNF) content of the milk. The price paid by other competitors is often used as a yardstick for comparison. The agent usually pays the producers at intervals of 10-15 days. In return for the assured supply of milk, the agent often in collaboration with the dairy company provides inputs such as feed, medicines, vaccines, mineral supplements etc. to producers at low prices.

ii. Cooperatives

Dairy cooperatives, which typically integrate dairy farming, milk collection, processing, packaging, and marketing are present in developed-economy markets (e.g. Fonterra in NZ, Dairy Farmers of America in USA, Campina in Europe, etc.). In India dairy cooperatives play an important role in dairy development (Sharma, 2004; Datamonitor, 2009). A review by Frankel (1982) of dairy development projects in India financed by the World Bank, reported that in areas where cooperative milk collection and cooling centres had been established, smallholder participation in dairy development had flourished (Frankel, 1982). The success of low cost market access by using a cooperative model has been reasonably demonstrated by operation flood.

There are around 100,000 primary (village level) dairy cooperative societies, spread all over the country with a membership of nearly 10 million producers. These dairy cooperatives are organised into 170 producer unions, which are combined at the state level into 15 cooperative milk marketing federations. It is well accepted that the cooperative milk marketing system has the potential to serve as a powerful low cost market access solution for a large majority of smallholder dairy farmers scattered throughout the length and breadth of the country. The growth of cooperative dairying in some states like Gujarat, Maharashtra, Tamil Nadu and Karnataka has brought significant economic betterment and wellbeing of the rural population, as compared with other states (Benni, 2005). Some cooperative milk marketing federations like GCMMF have strong consumer brands (Amul) for their milk and other dairy products.

But all cooperatives cannot be treated as being same, hence success rates varied. The success of the cooperative often has been based on how effectively the cooperative serves the main needs of its members (Shah, 1995). On the whole the performance of milk cooperatives in India has not been very encouraging. A majority of dairy cooperatives are running at a loss. A 1994 World Bank review of 117 cooperatives receiving assistance under the World Bank National Dairy Project II found that 52% incurred losses. During the two year period 1993 & 94, the 117 cooperatives incurred combined losses of Rs 1.1 billion ($37 million), which had to be covered by budgetary transfers from the centre and state budgets. Thus any increase in number of dairy cooperatives is unlikely unless major reforms in their management are undertaken. It is suggested that the main challenges faced by cooperatives included weak management, overstaffing, poor market orientation, lack of flexibility in responding to changes in market conditions, poor governance and political interference (World Bank, 1996).

It is often argued that opening of dairy markets to private players will favourably improve the capacity and performance of organized dairy sector in the country. Unfortunately, the “success effect” of AMUL/GCMMF (whereby majority of the decision makers and political leaders perceive milk cooperatives as a great success and a potent instrument for socio-economic change) is a barrier to adoption of market oriented policies in this sector. Complete liberalization of this sector will face severe criticism and sustained resistance. Moreover, the creation of adequate logistics and infrastructure will take a long time to establish large scale competitive dairy enterprise in the country. It is therefore unlikely that rural producers will have adequate market access. As a result, farmers will not have the necessary incentives to improve productivity or increase milk production at the farm level.

A-2.8 Dairy Market in India

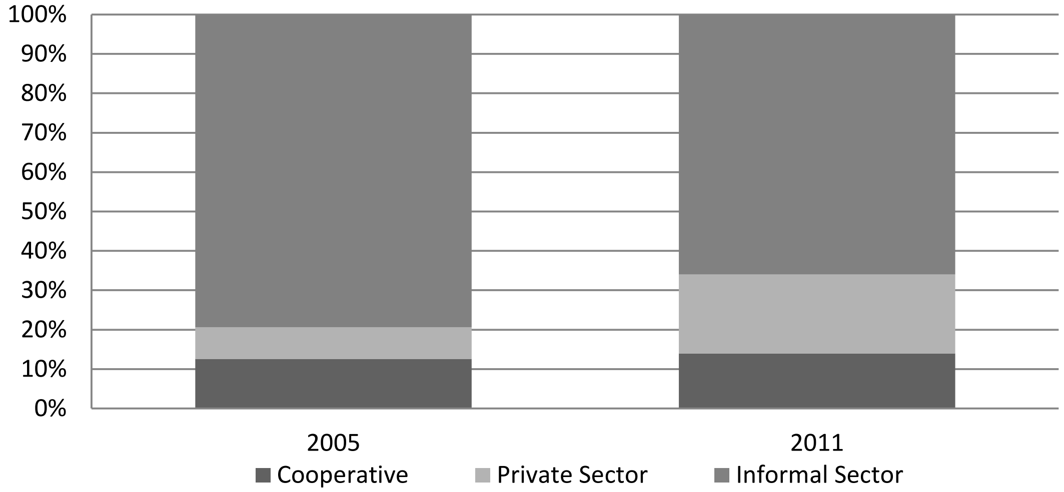
Like any business enterprise, the profitability and sustainability of dairy production depends upon its cost structure and a remunerative milk price, for which a good marketing outlet is vital. The dairy market in India is quite complex and is influenced by 2 major elements – the informal (un-organised) sector, and the formal (organised) sector. Broadly, village milk vendors/middlemen, local *halwais, bhattawhalas*, coffee and tea shops, milk contractors, direct milk sale by farmers to consumers and small scale private dairies are classified as "informal" sector ; while the dairy cooperatives, government run milk producing units, large private dairies like Nestle and Heritage Foods are classified as the "Formal /Organised" sector (Anonymous, 2004).

Of these two elements, the informal sector plays a much larger role than the organised sector. In 2005, the informal sector accounted for 79% of the milk produced in India (Figure A-2.15). The informal sector thrives on the fact that consumers in India are very price sensitive and have a poor willingness to pay extra costs of formal processing and packaging. Informal sector does not incur these costs they can afford to offer higher prices to farmers and lower retail prices to consumers (Anonymous, 2004).

The organised sector accounted for just 21% milk produced (Figure A-2.15). Of the 21% represented by the organised sector, cooperatives accounted for 13% and private dairies accounted for 8% (Figure A-2.15). The low share of the organised sector is often attributed to unimaginative and staid procurement policies and the inflexible practices of the milk cooperatives (Kurup and Mittal, 1999).

However, this situation is expected to change in future. It is predicted that that share of the informal sector will reduce to 66% and the share of the organised sector will increase to 34% (Figure A-2.15). Within the organised sector, dairy cooperatives will account for 14% (an increase of just 1%) while private dairy companies will grow substantially and are expected to account for 20% of the milk production (Dairy India, 2007).

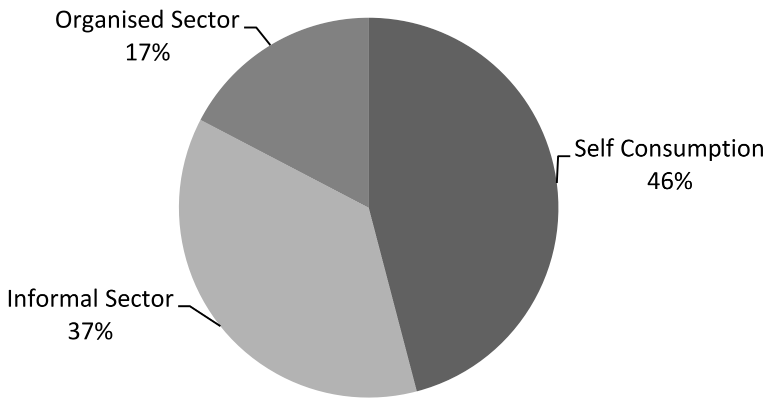
Figure A-2.15 Share of Milk Production by 3 Major Sectors



Source: Dairy India (2007)

A vast amount (46%) of milk produced by the country is consumed by farm household that produces it (Figure A-2.16). Consequently, only 54% of the milk produced in India enters the markets. Of this marketable surplus of milk, the organised sector handles just 30%, while the un-organised (informal) sector handles the remaining 70%.

Figure A-2.16 Dairy Value Chain: Percent share of Milk production by Market system



Source: Dairy India, 2007

The total value of the Indian dairy market is estimated to be around 42.2 billion US$ (Dairy India, 2007). The un-organised sector contributes 85% (US$ 36.1 billion), while the organized sector contributes the remaining 15% (US$ 6.4

billion) of the Indian dairy markets value (Table A-2.4). On the whole, the dairy market in India can be broadly classified into four categories - liquid milk, unbranded Indian products, branded Indian products and western dairy products (Dairy India, 2007). The liquid milk market alone accounts for 51% (US$ 21.8 billion) and the unbranded Indian products market accounts for 41% (US$ 17.3 billion) of total market (Table A-2.4). Western products accounted for 5% (US$ 2.1 billion) and branded Indian products 3% (US$ 1.2 billion) (Table A-2.4).

In the liquid milk market, unpacked liquid milk supplied mainly by the un-organized sector, accounts for 86% (US$ 18.8 billion) while packaged liquid milk supplied by the organized sector accounts for the remaining 14% (US $ 3.1 billion). The total value of the Indian dairy products market (both unbranded and branded) is estimated to be around US$ 18 billion (Table A-2.4). Of which un-branded Indian products supplied mainly by the un-organized sector accounts for 93% while branded Indian products accounts for only 7% (Table A-2.4).

Table A-2.4 Indian Dairy Market by Product Market Value

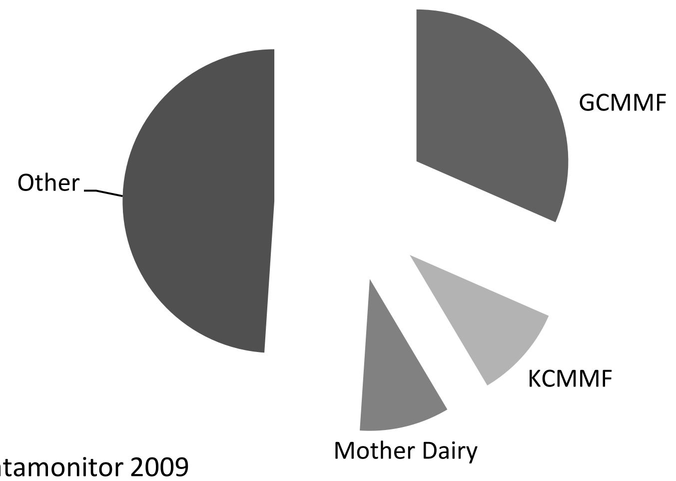
Product Category	Type	Share of Total Markets (US$ Million)	% of Total Market
Basic Liquid Milk	Unpackaged liquid milk	18,760	51
	Packaged liquid milk	3,050	
Unbranded - Indian Products	Ghee/Makkan	7,100	41
	Paneer/Khoa/Channa	6,020	
	Curd + Curd Products	4,200	
Branded - Indian Products	Packaged Ghee	800	3
	Packaged Paneer	300	
	Packaged Curd + Curd Products	170	
Western Products	Milk Powder	1,200	5
	Cheese	250	
	Table Butter	210	
	Ice Cream	210	
	Condensed Milk	44	
	Others	150	
	Total	42,450	100%

Source: Dairy India, 2007

An analysis by Datamonitor (2009) reported that the Indian dairy market (organised*) generated total revenues of US$ 4.6 billion in 2008, and grew at a compounded annual growth rate of 10.1% from 2004. Milk sales alone represented 90% (US$ 4.1 billion) of the overall markets value while the sales of spreadable fats accounted for 3.9% (US$ 176.4 million). The top three dairy companies in India – GCMMF (Gujarat Co-operative Milk Marketing federation Ltd), KCMMF (Kerala Cooperative Milk Marketing Federation) and Mother

Dairy Fruits and Vegetables limited account for 51% of the market share by value, indicating that the organised dairy market is quite concentrated (Figure A-2.17) (Datamonitor, 2009).

Figure A-2.17 Indian Dairy Market : % Share by Value 2008



Source: Datamonitor 2009

A-2.8.1 Consumer Behaviour

The perception of milk quality and factors influencing milk purchase decisions in India are quite different from that in Western (developed) nations. Studies by Sharma (1996) and Raju (1992) have reported that a majority of consumers, irrespective of income group consider – high fat content, richness (indicated by cream formation on milk), thickness, flavour of raw milk, taste and degree of curd formation to be most important factors in judging the quality of milk. Most consumers perceive fresh milk to be of superior quality and hence prefer to buy fresh (loose or un-packaged) milk.

Quality and safety concerns such as bacterial load in fresh milk and primary processed items like dairy sweets and curd (yogurt) are not given high priority and it is suggested that consumers themselves are not much worried about it. The key determinants of buying (purchasing) behaviour at the consumer level were identified to be – price, home delivery (convenience), and regular and timely supply of good quality fresh milk (Grover *et al.*, 1990; NDDB-ORG, 2001).

A-2.8.2 Competitive Environment

The liberalization of the Indian economy has resulted in a rethinking of public policy strategies on food security and food self-sufficiency. The dairy industry has been de-regulated and consequently there is greater private participation. With steady but continuous reduction of barriers to market entry, India offers excellent to medium-term opportunities for international dairy marketers (Bhaskaran, 1996).

New entrants are likely to be attracted by the strong growth levels that the Indian food market has been experiencing over the past few years (Datamonitor, 2009). In general, the Indian dairy market is fairly easy to enter for small enterprises like a producer/manufacturer of premium/niche market dairy products that does not require large amounts of capital (Datamonitor, 2009). However to be successful in the long term, dairy companies need to be able to supply to the mass consumer market for which companies need to be large and have some level of integration (Datamonitor, 2009).

Industrial production of dairy products requires substantial, specialized assets, and the need to sell these off when leaving the market translates to high exits costs (Datamonitor, 2009). Since most dairy products are perishable, developing reliable supply, storage and distribution cold chains is vital but also difficult. Furthermore, leading dairy product manufactures have strong brands aimed at retaining end-user loyalty, which means that new players will find quite difficult to differentiate their own brand. Moreover, rivalry is intense at the local level as there are numerous players present that are generally similar to one another despite most operating diverse dairy portfolios (Datamonitor, 2009).

Overall the end-consumer buyer power in Indian dairy markets is quite strong. The dairy market, especially for milk is highly price sensitive and buyers will tend to opt for cheaper options. Since a wide range of food and drink can be used in similar ways to dairy products it is easy for consumers to replace dairy products with such alternatives when the prices are too high. This reduces the pricing freedom of retailers and market players (Datamonitor, 2009). It is also very difficult to differentiate the market for staples such as milk and butter, although, cheese and yogurt markets are relatively more differentiated (Datamonitor, 2009). On the positive side, dairy products have traditionally been an important part of people's diet in India. Additionally, with the benefits of dairy products being well publicised, it is unlikely that it can be replaced to a large extant. It is however recommended that manufactures target end users with specialized branding strategies, or develop more individualised premium products (e.g. organic yogurt) to counter balance the power of the buyer (Datamonitor, 2009).

When analysing the competitive environment of the dairy industry, it is also important to consider upstream suppliers of products and services such as cattle feed, milking machines, packaging, farm inputs, veterinary care and artificial insemination. These products and services are fairly commoditized with reasonable number of suppliers (Datamonitor, 2009). The ability of large dairy companies, especially cooperatives to purchase on behalf of their customers means that the power of these suppliers is considerably decreased.

A-2.8.3 Food Processing In India

The processed food industry in India was estimated to be worth US$ 126.5 Billion in the years 2004-05 and is expected to grow at 10% per year (Cygnus, 2007). But, the level of processing as a proportion of total production is still very low and varies between commodities. It is highest for milk (37%), followed by meat (21%), sea food (10.7%), poultry (6%), fruits and vegetables (1.7%) and shrimp (1%) (Cygnus, 2007).

The food processing sector is dominated by the un-organized sector (42%), while the small scale sector (33%) and organised sector (25%) play a smaller role (CII and McKinsey & CO. Inc., 1997). Between 1991 and 2005, the food processing sector accounted for only 3.3% of FDI's (Foreign Direct Investments) into India. Currently, a 100% FDI is permitted in the food processing. Central and state governments have taken several policy level measures to attract FDI into this sector. Such measures include –removal of licensing requirements for stocking and movement of various grains and oilseeds, removal of plant scale restrictions and licensing requirements for most food processing activities, removal of restrictions on futures trading in 54 commodities, setting up of new commodity exchanges, amendments to the APMC Act (Agriculture Produce Marketing Committee Act) in some states to facilitate direct procurement from farmers by the agro-processing companies and development of private markets (Landes and Gulati, 2004).

A-2.8.3.1 Milk Processing and Value Addition

As world's largest milk producer, the Indian dairy industry has the potential to play a major role in the food processing/manufacturing sector. In the food processing industry, the level of value addition by the dairy sector is considerably higher (37%), when compared to value addition that takes place in agriculture as a whole (2%) (Cygnus, 2007). In processing, a slow transformation from a traditional to a more advanced form is taking place. As a result more technology driven solutions are being used to full fill the increasing market demand. This transformation has empowered dairy food manufacturers to supply the market with a diverse range of dairy products in different value-added forms like condensed milk, flavoured milk, health drinks, ice cream, milk powder, homogenized milk, pasteurized milk, etc. besides other milk products including a variety of sweet meats.

However as discussed earlier, only 37% of the milk produced in India is further processed. The organized dairy sector has registered capacity to process around 65 per cent of the country's rural marketable surplus and about one-third of national milk production. The organized dairy sector uses 80 per cent of the liquid milk for pasteurization and the rest (20%) for butter, cheese, and milk powder.

In 2010, there were a total of 841 milk processing plants India (Table A-2.5). These plants processed a total of 98.3 million litres of milk per day. Given that India's milk production is 306.8 million litres per day, this translates to 32% of milk production. Of these, the cooperative sector had 243 milk plants and handled 37.2 million litres of milk per day (12% of milk production). The private sector accounted for 562 milk processing plants and handled 57.1 million litres of milk per day (19% of milk production) (Table A-2.5).

Table A-2.5 Number of Milk Processing Plants and Volume of Milk Processed

Registered By	Cooperatives		Private Companies		Other		Total	
	No.	Capacity (‘000 L/day)	No.	Capacity (‘000 L/day)	No.	Capacity (‘000 L/day)	No.	Capacity (‘000 L/day)
Central Authority	124	31807	94	35344	16	3200	234	70351
State Authority	119	5432	468	21719	20	813	607	27964
Total	**243**	**37239**	**562**	**57063**	**36**	**4013**	**841**	**98315**

Source: GOI (2011)

The 10 largest milk producing states account for 89% (752) of the milk processing plants and 87% (85.62 million litres/day) of the volume of milk processed in the country (Table A-2.6). Among the leading milk producing states, Maharashtra had the highest number of milk plants (297) and handled the largest volume (22.8 million litres) of milk per day (Table A-2.6). Interestingly, this is nearly 100% of Maharashtra’s milk production.

Table A-2.6 Milk Processing Plants and Volume of Milk Processed in 10 Leading Milk Production States

State	No.	Capacity (‘000 L/day)
Andhra Pradesh	34	6,870
Bihar	11	780
Gujarat	31	11,010
Haryana	31	2,440
Madhya Pradesh	39	4,900
Maharashtra	297	22,280
Punjab	58	5,650
Rajasthan	36	3,820
Tamil Nadu	33	8,040
Uttar Pradesh	182	19.79
Total	**752**	**85,620**

Source: GOI (2011)

A-2.8.4 Multinational Dairy Ventures in India

Several multinational dairy companies are seeking market entry into India. A common approach used by multinational companies to gain market access in India is through joint-ventures of partnerships with local companies. A notable case in point is that of the USA based food company Schreiber Foods which gained market access through a joint-venture with local dairy company Dynamix dairies. The joint-venture is called Schreiber Dynamix Dairies Limited and is located in Baramati, Maharashtra. Schreiber foods currently own a majority stake (51%) in the venture and the company is a major supplier to leading food manufacturers such as Britannia, Hindustan Unilever, Nestle and Pepsi. A recent news article in Times of India reported that the two of the world's largest manufacturers of dairy products, the Lactalis group of France and Dutch co-operative giant Friesland Campania are among a number of multinationals trying to enter the Indian dairy market through the acquisition of a majority stake in Sterling Agro, a privately-held Indian dairy company. Sterling Agro has a substantial presence in North and Central India. Its sales revenue in 2012 was close to 288 million USD

Amongst multinational dairy companies operating in India, Switzerland based Nestle is the most significant. Nestlé began its operations in India in 1912 as a trading company importing and selling finished products in the Indian market. But this model was not viable post-independence due to domestic support policies and import regulations imposed by the government. Nestle responded to this challenge by developing local milk sourcing operations and building a processing plant in Monga (Punjab state) in 1959. Since then Nestlé's supplier base has grown from 4,600 farmers providing 2,000 tonnes of milk to 100,000 farmers in 2,600 villages producing more than 300,000 tonnes. Apart from the plant at Monga, Nestle currently operates 7 dairy food manufacturing factories in India. In order to capture the opportunities presented by the Indian dairy industry, Helio Waszyk, the chairman of Nestlé India plans to invest $450m to double Nestlé's capacity by expanding existing dairy plants and building a new one in Himachal Pradesh (The Economist, 2011).

Apart from multinational companies, several domestic business houses/corporations that do not have a presence in dairy are also keen on venturing into the Indian dairy market. The US$ 66 billion Reliance Group, which has diverse business interests, launched a subsidiary company called Reliance Dairy Foods limited and entered the Indian dairy market. The Noida based infrastructure conglomerate Jaypee group (US$ 3 billion) has indicated that it will be venturing into the dairy market and announced that it would be establishing a processing plant (1 million LPD) at Mathura in Uttar Pradesh. Very recently, IDFC limited, one of India's leading integrated infrastructure finance providers has ventured into the dairy sector by making an investment of US$ 28 million and purchasing a minority stake in Parag Milk Food Limited.

Although both local and multinational dairy companies appear to be keen on investing in dairy ventures in India, these investments are almost always focused on downstream processes such as processing, manufacturing, distribution and retail. Very few companies have made investments in upstream processes such as dairying farming and milk production. Even these investments have mostly been focused on providing auxiliary/support services. In 2009, Elbit India Agricultural Ventures (a subsidiary of the Israel based Elbit Group), had proposed to start a dairy farm with 10,000 cattle at Palamaner in Chittoor district in Andhra Pradesh with an estimated investment of about 133 million USD. However no progress has been made on the project so far. A few domestic dairy companies have made direct investments in dairy farming and milk production. The most notable of these is the 2500 cow farm that is owned and operated by Parag Milk Foods limited.

A-2.9 Consumption and Expenditure

Although India's per capita GDP is substantially lower than that of more developed countries in Asia like Singapore, Taiwan, South Korea, its per capita consumption of dairy products is among the highest in Asia (Bhaskaran, 1996). It is suggested that consumption in these richer Asian countries is affected by high levels of lactose intolerance, dietary preferences, and extensive use of dairy substitutes by the predominant Chinese population (Bhaskaran, 1996). In contrast, milk and dairy products are an important source of protein for a significantly large segment of the Indian population.

Approximately 82% of India's population are Hindus and dairy products have substantial symbolic value in Hindu religious and social life (Bhaskaran, 1996). Hindus offer dairy sweets (*metals*) at weddings, birthdays and all religious occasions. Offerings of milk are very symbolic and important in all Hindu temples. In addition, apart from the 250 million Indians who are lacto-vegetarians by choice, a further 300 million Indians cannot afford meat products and therefore depend upon milk and milk products for their dietary protein requirements (Bhaskaran, 1996). Indians consume a variety of different dairy products, and approximately 48% of milk output is used to produce indigenous dairy products such as- ghee, curd, makkan, panneer and khoa (Bhaskaran, 1996).

These dietary habits and cultural significance of milk and dairy products in the diets of the predominantly Hindu population suggests that the demand for milk and dairy products in India would increase as incomes increase (Bhaskaran, 1996). On the basis of the traditional significance of dairy and a high propensity to consume dairy products, Bhaskaran (1996) suggests that per-capita consumption of dairy products in future (in similarly tiered higher income households) could be greater in India than that in the west.

The consumer demand for milk in India has been strongly positive for a sustained period of time, indicating that a high potential for growth exists. In India, dairy products are consumed in various forms, such as milk, butter, ghee, curd, cheese, ice cream, besides fresh milk. In recent years, there has been a shift in taste and preferences of consumers. They have become more health conscious and quality conscious (Dairy India, 2007). Moreover, the changing demand patterns of ethnically diversified groups are also impacting dairy product production and consumption trends. As a result of these demand shifts, the output of dairy products like cream, WMP and SMP has decreased over the past three years, whereas that of cheese, butter and ghee has increased (Table A-2.7).

A big challenge for the dairy industry will be to meet the changing expectations/demands of the market and consumers. The producers/processors will also have to make a concerted effort to understand the customer’s needs. They will also need to develop and deliver new, innovative and more customer-friendly products at reasonable costs and improved quality. To meet these challenges, the dairy sector would require substantial investments in the areas of productivity enhancement, milk collection, milk chilling, processing, R&D and marketing. For dairy processors who cannot achieve the scale of successful commodity processing, finding a market niche may be an alternative. Another significant challenge is to produce quality products that conform to international standards and are competitive in both national and international markets.

Table A-2.7 Dairy Products Output in India: 2005-06 to 2007-08 ('000 tonnes)

Products	2005-06	2006-07	2007-08
Cream	45.8	38.9	36.9
Table butter	35.9	37.8	41.7
Ghee	69.59	70.3	72.2
Cheese	4.4	4.7	6.02
Whole Milk powder (WMP)	178.8	171.7	167.1
Skimmed milk powder (SMP)	105.2	98.4	92.7

Source: IDF (2009)

A-2.9.1 Expenditure

According to the National Sample Survey Organisation (NSSO) (2008), the average monthly expenditure per household on milk and milk products for the year 2006-07 was US$ 6 in rural areas and US$ 9.3 in urban areas. On an average, an urban consumer in India spends 18.85% of his food expenditure on milk and milk products, while for a rural consumer this expenditure is around 15.47% (NSSO, 2007). Thus, with sustained economic growth and resulting increase in per –capita incomes and expenditures, the expenditure on milk and milk products (in dollar terms) is expected to rise further.

From 1986 to 2007, the expenditure on milk and milk products has been growing in both rural and urban areas (Table A-2.8). During the same period the total annual expenditure on food and non-food items has also been growing (Table A-2.8). In rural areas, the growth in expenditure on milk and milk products was always higher than the growth in expenditure on food items (Table A-2.8). Whereas in urban areas the growth in expenditure on milk and milk products was similar to the growth in expenditure on food items. Moreover, growth in expenditures in milk and milk products were always higher in rural areas than urban areas.

From 2003-07, the Indian economy witnessed one of its highest growth rates (8%). During this period of high economic growth, the growth in expenditure on milk and milk products was higher in the rural (5.4%) than urban (4.3%) areas. This indicates that overall economic growth has significantly influenced rural growth, which in turn increased consumption expenditure. This implies that a huge market for milk and milk products exists in the rural areas as well.

Table A-2.8 Growth of expenditure on milk and milk products in rural and urban areas (in %)

Period	Rural areas			Urban areas		
	Milk & milk products	Food items	Food & non-food items	Milk & milk products	Food items	Food & non-food items
1986-1990	11.2	9.8	10.4	8.6	8.7	9.9
1990-2007	6.3	5.8	7.2	6.2	6.0	8.7
2003-2007	5.4	4.9	5.7	4.3	4.4	6.2

Source: National Sample Survey Organization (NSSO), 2008

A-2.10 Milk Supply & Demand

The estimation of supply and demand elasticity of specific dairy products in India is difficult because a majority of milk trade in India happens in informal markets and milk is mostly consumed raw. Hence supply and demand elasticity estimations (studies) are restricted to just fresh milk.

Rakotoarisoa and Gulati (2006) assumed that supply of fresh milk was a function of whole sale price of fresh milk and input prices (wage as a proxy). They found that a 1% increase in whole sale price will result in an increase of supply of 0.15%, while a 1% increase in wage (proxy for input cost) will result in a decrease in supply by 0.16%. In their study they also found that the milk supply elasticity to an increase in price remains low (0.15%) in the short term, but in the long term milk supply can be relatively high price elastic (3.75%), if all barriers such as fixed costs in milk production are reduced, and when implementable ways to improve the capacity to store milk and dairy products are found (Rakotoarisoa and Gulati, 2006).

The total demand for fresh milk is considered to be a sum of consumers demand and processors demand (for making WMP) for fresh milk. Based on this Rakotoarisoa and Gulati (2006) considered the demand for fresh milk to be a function of whole sale price of fresh milk, consumers' income and the price of WMP. They found that a 1% increase in milk price results in 0.5% decline in demand, 1% increase in income results in a 2.01% increase in demand, and a 1% increase in WMP prices results in a 0.31% increase in demand (Rakotoarisoa and Gulati, 2006).

A-2.10.1 The Supply Demand Gap

The high income elasticity of demand for milk and milk products (1.96 in rural and 1.32 urban areas) coupled with growing urban population and changing food habits has resulted in rapid growth in demand (Saxena, 2000). The per capita consumption of milk and milk products in India has increased by over 25kg in the last 15 years. It was 80kgs/capita in 1996 and has increased to around 107 kg/capita now (IFCN, 2010).

This growth in demand is expected to increase further in the near future. Total milk consumption in India is estimated to have grown by 4.2% over the last 5 years, whereas during the same period milk production increased by 3.5%, indicating that production in not keeping pace with consumption (IFCN, 2010).This situation presents the Indian dairy sector with one of its biggest challenges.

According to a study by Jain *et al.*, (1998), expenditure elasticity for most milk and milk products is positive. This suggests that most milk and milk products behave as normal goods and their consumption will increase with the increase in total expenditure. However, the expenditure elasticises are different in rural (1.47) and urban (1.01) areas (Bhalla and Hazell, 1998). This suggests that increase in rural incomes will have a larger impact on the demand for milk and milk products.

In general, given India's sustained economic growth, it is quite likely that the demand for milk and milk products will increase in the near future.

A study by Parthasarathy *et al.,* (2004) estimated that the demand of milk will rise to 156 million tonnes by 2020. Another analysis by the Planning Commission of India estimated that the demand would be around 182 million tonnes by the year 2021– 22 (Gautam *et al.*, 2010). Most recently, a report by NDDB estimated that India's demand could reach 200-210 million tonnes in 2021-22 (NDDB, 2011).

To meet the projected demand, it is necessary to increase milk production by around of 6 to 8 million tonnes per year over the next 10 years. However, during the past 12 years (1998 to 2009), the annual increases in milk production has been around 3.64 million tonnes per year (GOI, 2011). Moreover, given the import sensitivity of dairying in India (dairy animal rearing is a major source of income and employment in India besides being a crucial component of mixed farming system) the increased demand of milk and milk products will have to be met by increasing domestic production.

However the prospect of India becoming an efficient milk producer and meeting the needs (demand) of an increasingly affluent market is remote (Bhaskaran, 1996). According to Bhaskaran (1996) the main barriers to India developing an efficient dairy industry are –

- Capital investment constraints – efficient dairy farming can only be practiced when agriculture is sufficiently well developed to provide income and investment capital for the dairy enterprise (Nair and Dhas, 1990). In India dairying is a secondary activity and most farms are small and generally operate at subsistence levels
- Difficulty in increasing the number of high producing milk animals – due to limitations of feed and fodder, investment in high yielding exotic breeds and cross breeds is difficult. India has significant feed and fodder constraints because it has 15% of the world's population but only 2.5% of worlds land

mass and 0.5% of global pasture land (Parisot, 1990; Doornbos & Gertsch, 1994).

- Difficultly in increasing the total population of milk animals- India has 17% of the worlds' cattle and 50% of the worlds' buffalo population. This substantial number of dairy animals is putting immense pressure on the limitedly available land and feed resource. Further increase in animal numbers (overstocking) would therefore be counterproductive – diminishing land quality and fodder availability.
- Inability to cull non-productive milk animals – the cow is a scared animal and is worshiped by the majority Hindu population of India. Hence the culling of cows is banned in India. The increase in cattle population (especially non-productive animals) would result in the demand for scarce feed outstripping supply.

A-2.11 Factors Affecting Milk Production in India

As mentioned earlier India is already home to the world's largest cattle (185.18 million) and buffalo (97.92 million) population (GOI, 2011), and increasing animal numbers to meet (increasing) future demand is not a viable solution. The only alternative for the domestic industry is to significantly increase the productivity of dairy animals in India.

The ability of the production systems in India to respond to the demands of productivity enhancement will depend upon addressing the issues related to - genetic improvement, feed and fodder supply, delivery of livestock support services, technology transfer, research and development, and managing the climatic conditions. An analysis of these drivers of productivity is presented next.

A-2.11.1 Genetic Improvement

The dairy cattle in India are predominantly of the zebu (*Bos indicus*) type. These animals have evolved (selected) to be adapted to the local conditions and meet the requirements of local farmers. Traditionally, farmers in India use cattle for performing a variety of work such as ploughing fields and transporting goods, in addition to milk production. Since selection was not essentially based on milk production traits, the indigenous cows are characterised by very low milk yields.

In order to increase the production of milk in the country, emphasis was laid on improving the productivity of low yielding Indian cattle by crossbreeding them with exotic breeds. This started in the early 1970s with import of exotic breeds from Europe and United States. Later, with the introduction of frozen semen and Artificial Insemination (AI) technologies, the policy of crossbreeding was extended across the country.

Since the implementation of the crossbreeding programs, the growth in the number of crossbred cows has been much higher than that of indigenous stock. The population of crossbred cows increased at the rate of 7.5% during 1982–92, compared to 0.1% for indigenous cows. However, the effects of cross breeding programmes in India are not uniform. Northern region accounts for about 40% of all crossbred cattle in the country followed by the south (34%), the west (15%) and the east (11%). Among states, Kerala, Maharashtra, Tamil Nadu, Punjab, Uttar Pradesh and West Bengal accounted for nearly 70% of the total crossbred cattle in the country. Kerala had the highest (52.3%) proportion of crossbred cattle population and Rajasthan the lowest (1.0%).

Due to the increase in numbers as well as much higher productivity of crossbred cows, their share in total milk production has also increased substantially. In 2003, out of total 86.5 mt of milk produced, cows accounted for 34.60 mt (40%). Of this, the contribution of indigenous cattle was 20.7 mt (60% of cow milk), while the contribution of crossbreds was 13.9 m (40% of cow milk). Assuming a breed able cattle population of 69 million, (62 million indigenous and 7 million crossbreds), the milk yield per animal per day was calculated to be 0.92 kg for indigenous cattle and 5.42 kg for crossbred cattle (Gandhi and Sharma, 2005).

This seems to suggest that crossbreeding policies have delivered and future pursuance of cross breeding policy for genetic improvement thus appears promising. However, it has been suggested that the cross breeding program as resulted in loss of indigenous germ-plasm, poor conception rates, increased disease proneness, and other complications (Kurup, 2002) . Further, animals with high exotic inheritance level demand high management and feeding standards which are difficult to achieve by the average dairy farmer. To address these issues, maintenance of 50– 75% cross bred inheritance has been advocated. But the lack of pedigree records makes monitoring and implementation difficult.

Moreover, in spite of the fairly large network of breeding services, the system as a whole covers less than 20% of adult female cattle and less than 10% of buffalo population (Parthasarathy, 2008). The quality of the breeding services in the government sector is generally perceived as poor. To addresses these challenges, the government has recently instituted a restructuring of the entire breeding infrastructure, institutions and breeding operations (Parthasarathy, 2008).

A-2.11.2 Availability of Animal Feed and Fodder Resources

India has one of the largest livestock populations in the world. In 2003, apart from 280 million cattle and buffaloes India had 124 million goats and 62 million sheep, besides sizeable a populations of other species (camels, horses, donkeys etc.). This extremely large population of livestock places immense pressure on India's limitedly available feed resources.

In smallholder dairying (like in India), feed is singularly the most important constraint (World Bank, 1999). Despite the rapid progress in agriculture in India, it has been reported that the country is short of dry fodder by 31%, green fodder by 23%, and concentrate feeds by 47% (Dalal and Pathak, 2010). This deficiency of feed and fodder resources for livestock is a major problem and appears to be the main limiting factor to improving livestock productivity (Birthal and Jha, 2005). With less than 3% of livestock feed coming from grains and concentrates (Tikku, 2002) fodder becomes increasingly important (National Commission on Farmers, 2004). However, land allocation to cultivation of green fodder crops used to feed livestock is limited and has hardly ever exceeded 5 per cent of the gross cropped area (GOI, 2009). Consequently, the supply of feed has always remained short of normative requirement (Singh and Mujumdar, 1992;

Ramachandra *et al.*, 2007). As a result the actual milk yield of dairy animals is reported to be 26-51per cent below their potential yield (Birthal and Jha, 2005).

There are four main categories of feed resources available for use in animal farming systems that are prevalent in India. These are pastures, crop residues, cereals (concentrates) and non-conventional feed resources. The use of cereal (concentrate/grains) feeds is not common, and a major part of livestock feed requirement is met from crop residues and non-conventional feed resources (grasses, weeds and tree leaves) gathered from cultivated and uncultivated lands. Grazing on common lands and harvested fields also forms an important source of feed. But rapid urbanization and increased pressure on land has caused a decrease both in qualitative and quantitative terms of common grazing lands (Pathak, 2002).

As mentioned earlier, the area under green fodder crops is quite low and constitutes around 5% of the gross cropped area. Moreover there is a strong competition between food and fodder crops for limited land and other resources. Consequently, the growth in area under fodder crops has been sluggish in most parts of the country. Although crop breeding research has evolved high-yielding varieties of a number of forage crops, these have not been adopted widely due to lack of awareness about new cultivars, non-availability of irrigation water throughout the year, and problems of insect pests/ diseases (Birthal and Rao, 2002). Thus although crop residues constitute a poor source of nutrition for dairy animals, they form the mainstay for livestock feeding in India, (Parthasarathy Rao *et al.*, 2004).

Non-conventional feed resources and agro-industry by products are also used as a source of feed for dairy animals. It has been suggested that there is a significant potential for more effective use of locally-produced agro industrial by-products and non-conventional feed resources, all of which are under-utilised currently (Devendra and Sevilla, 2002). However, availability, digestibility, processing and intricacies of feeding continue to hamper wider adoption of such feeds (Dalal and Pathak, 2010).

Coarse cereals are used for food as well as feed. Their demand as food, however, has declined considerably during the past two decades, reaching 13.7 Mt in 2004-05 (Kumar *et al.*, 2009). During 2003-05, India produced on an average 35.5 Mt of coarse cereals, and had a net trade surplus of 0.8 Mt. Dikshit and Birthal (2010) estimated that 21 Mt of coarse cereals were available for use as feed and other purposes in 2005. Since industrial uses of coarse cereals (except for maize), are limited it can be assumed that a sizable proportion of coarse cereals are utilized as feed in livestock and poultry production. Furthermore, other food grains and their by-products such as bran, *khuddi/chunni*, etc. are also used as animal feed.

A-2.11.2.1 Estimating Feed Availability and Demand for India

In India, livestock feed is conventionally classified into roughages and concentrates. Roughages are further sub-classified as green roughages (green fodder) and dry roughages (dry fodder). Green fodder sources include - a) cultivated fodder crops, (b) grasses, weeds and tree leaves gleaned and gathered from cultivated and uncultivated lands, and (c) grazing on common lands and harvested fields. Dry fodder sources mainly include crop residues, most of which are cereal straws. Pulses and other legume crops also contribute to dry fodder. Concentrate feed includes (i) food grains and their preparations, such as flour and bread; and by-products of milling and household processing, like husk, bran, (ii) oilseeds, oil cakes and meals, and (iii) manufactured feeds.

Due to the large population and diversity of species, estimation of livestock feed availability and requirements are quite complicated in India. For almost 6 decades (since 1951) the Ministry of Agriculture, Government of India has been using the same standard formula to derive the net availability of food grains for human consumption. Based on this formula 87.5% of gross food grain production is considered available for human consumption. Of the remaining 12.5%, only 5% is allocated towards livestock feed and remainder is allocated towards seed (5%) and wastage (2.5%). Applying a formula that was derived based on the prevailing environment in 1951 to the current situation in India appears to be fundamentally flawed.

Taking a fraction of 9.5 per cent of the production of rice, 13.5 per cent of wheat, 41 per cent of coarse cereals and 16.9 per cent of pulses, Kumar *et al.,* (2009) estimated the non-food availability for food grains at 34Mt (31.7 Mt of cereals and 2.3 Mt of pulses) in 2004-05. Chand (2007) estimated non-food availability for food grains as 45.5 Mt (41.1 Mt of cereals and 4.4 Mt of pulses) by deducting the household demand from the total supply. However both these studies estimate food grain availability for seed, feed, wastage and industrial uses and neither estimated the food grain availability for feed alone.

Dikshit and Birthal (2010) estimated the feed consumption rates for different livestock species and their composition using data from a nationally representative household survey (Table A-2.9). Based on this, the authors then estimated the demand for different types of feed (Table A-2.9). Universally, the feed requirement of an animal on dry matter (DM) basis can be estimated based on an animal’s body weight and metabolic/physiological/ production status. Typically, DM requirement of different livestock categories vary from 2.1 to 2.9 per cent of their body weights. In their study Dikshit and Birthal (2010) reported that for every livestock category in India, DM required was more than that consumed at the household premises (farm) resulting in a nutritional deficit. The authors suggest that this deficit is usually met by feed obtained from grazing (Table A-2.9).

Table A-2.9 Quantities of feed fed to different species within households:2000 -01

Animal Category	Avg Body Weight	% DM required	Kg DM Required	Feed Type (kg/animal/day)			
				Green Fodder (kg DM@ 25%)	Dry Fodder (kg DM@ 90%)	Concentrates (kg DM@ 90%)	Grazing* (kg DM @25%)
Cattle							
In Milk	280	2.5	7.01	4.75	5.5	0.64	1.18
				(1.18)	(4.95)	(0.57)	(1.18)
Dry	245	2.1	5.15	3.4	4.0	0.4	1.27
				(0.85)	(3.61)	(0.36)	(0.32)
Buffalo							
In Milk	355	2.5	8.87	5.96	6.34	10.5	2.94
				(1.49)	(5.70)	(0.95)	(0.74)
Dry	350	2.1	7.35	5.44	4.95	0.52	4.28
				(1.36)	(4.45)	(0.47)	(1.07)
Goat	21	2.9	0.61	1.04	0.2	0.06	0.46
				(0.26)	(0.18)	(0.054)	(0.12)
Sheep	23	2.7	00.61	1.01	0.2	0.04	0.65
				(0.25)	(0.18)	(0.036)	(0.16)
Others Species	385	2.7	10.40	2.35	6.72	0.49	13.27
				(0.59)	(6.05)	(0.44)	(3.32)

Source: Dikshit and Birthal (2010)

After estimating feed consumption rates for different species (reported in Table A-2.9), the authors multiplied it by their respective populations and arrived at a total consumption of 757 Mt of green fodder, 466 Mt of dry fodder and 47 Mt of concentrate feed in 2003 (Dikshit and Birthal, 2010) (Table A-2.10).

Table A-2.10 Consumption of feeds and fodders in India : 2003 in Mt /year (NOT DM)

Animal Category	Population (Million)	Green Fodder	Dry Fodder	Concentrates
Cattle				
In Milk	35.8	77.4	71.9	8.4
Dry	28.7	48.8	42.1	4.2
Adult Males & Young Stock	120.7	240.7	175.9	11
Buffalo				
In Milk	33.3	108.2	77.1	12.8
Dry	17.6	62.4	31.8	3.3
Adult Males & Young Stock	47	107.1	51	3.7
Goat	124.4	68.1	9.1	2.7
Sheep	61.5	37.0	4.3	0.9
Others	1.2	6.9	2.9	0.2
Total	470.2	756.6	466.1	47.2

Source: Dikshit and Birthal (2010)

In their study Dikshit and Birthal (2010) reported that households obtained feed supplies from different sources. Almost the entire quantity of dry fodder came from cultivated crops, mainly from cereals as straws. Gathered dry fodder comprised only 2 per cent of the total. Of the 757 Mt of green fodder consumed by livestock, about 40 per cent (302 Mt) came from grazing, 27 per cent from cultivated fodder crops and the remaining 33% from grasses, weeds and tree leaves gleaned and gathered from cultivated fields and uncultivated lands such as pastures, public lands, wastelands, fallows and forests (Dikshit and Birthal, 2010).

A shift in favour of concentrate feeding has been observed in the country since the 1980s. Dikshit and Birthal (2010) reported that, of the total 47.2 Mt of concentrate feed consumed by livestock, cereals comprised 22.8 Mt, and oilseeds, oilcakes and meals 17.6 Mt. While pulses (3.9 Mt) and manufactured feed (2.9Mt) accounted for much less (Table A-2.11).

Table A-2.11 Distribution of Concentrate Feed Consumption by animal type in 2003

Species	Cereals	Pulses	Oilseeds and oilcakes	Manufactured feed	Total
Cattle	11.6	1.7	8.7	1.55	23.64
Buffalo	7.8	2.1	8.5	1.31	19.78
Goat	2.2	0.11	0.37	0.01	2.72
Sheep	0.9	0	0	0	0.9
Others	0.19	0	0	0.02	0.21
Total	22.8	3.9	17.6	2.9	47.25

Source: Dikshit and Birthal (2010)

In the study by Dikshit and Birthal (2010), it was estimated that a total of 651 Mt of dry matter (DM) went into India's livestock production system. Of this, 64 per cent came from dry fodder, 29 per cent from green fodder and 7 per cent from concentrates (Table A-2.12). Consumption of total digestible nutrients (TDN) was estimated at 334 Mt, of which 60 per cent was derived from dry fodder, 30 per cent from green fodder and the rest from concentrate (Table A-2.12). Consumption of digestible crude protein (DCP) was 28 Mt, of which green fodder contributed 49 per cent, dry fodder 24 per cent and rest came from concentrates (Table A-2.12).

Table A-2.12 Feed demand in terms of dry matter and nutrients: 2003

Nutrient	Total (Mt)	Percentage share of		
		Green fodder	Dry fodder	Concentrates
Dry matter (DM)	651	29.1 (11.6)	64.4	6.5
Total digestible nutrients (TDN)	334	30.3 (12.1)	59.8	9.9
Digestible crude protein (DCP)	28	49.0 (19.6)	23.8	27.2

Source: Dikshit and Birthal (2010)

Dikshit and Birthal (2010), estimated the population of different categories of livestock to 2020 using their past trends for 1982-2003 (Table A-2.13). They then multiplied the projected population categories with their corresponding base year feeding rates to obtain the estimated livestock feed demand for Indian in 2020 (Table A-2.13). The estimated feed demand for green fodder, dry fodder and concentrates was 855 Mt, 526Mt and 55Mt respectively (Table A-2.13). A major weakness of this method is its underlying assumption of constant feed consumption rates and composition over time. However, the authors claim that this method is robust in projecting short-term feed demand.

Table A-2.13 Estimated India's livestock feed demand in 2020 (in Million tonnes)

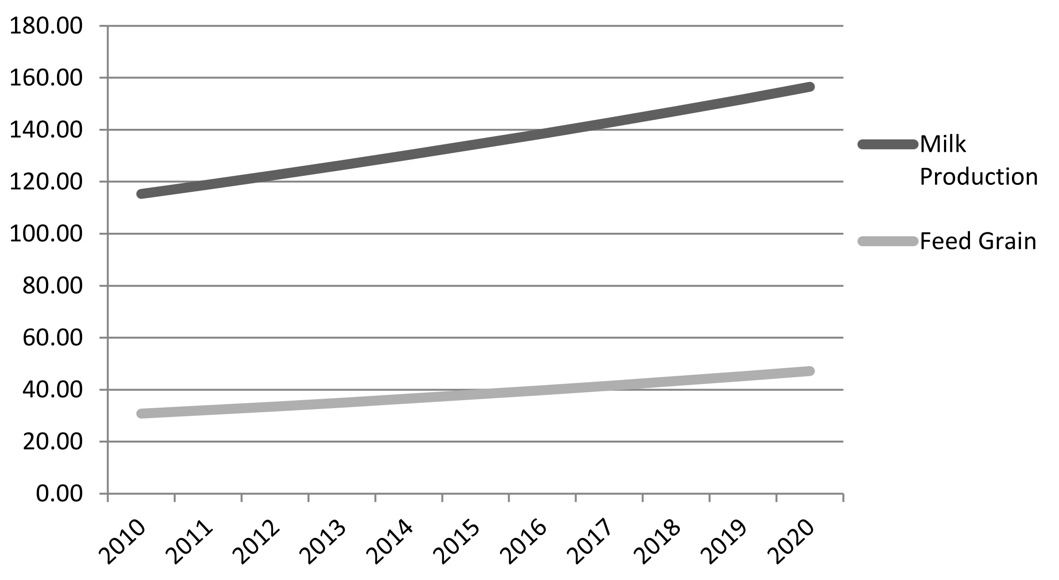
Animal category	Population (million)	Green fodder	Dry fodder	Concentrates
Cattle				
In-milk	42.9	103.4	98.1	10.7
Dry	27	46.3	39.6	3.9
Adult male	44.5	115.3	97.9	5.4
Young stock	71.2	104	55.4	4.7
Total	185.6	369	291	24.7
Buffalo				
In-milk	45	164.8	124.6	18.4
Dry	21.6	76.5	39	4.1
Adult male	6.9	17.9	18.8	0.9
Young stock	40	89.1	32.4	2.8
Total	113.5	348.2	214.8	26.2
Goat	156.6	85.7	11.4	3.4
Sheep	73.8	43.1	5.1	1.1
Others*	1.6	9.1	3.9	0.3
Total	531.2	855.1	526.3	55.7
Deficit		-29.7	-32.5	-1.8

Source: Dikshit and Birthal (2010)

In another study, Sharma and Gandhi (1990) estimated the demand for food grains (concentrates) as livestock feed using a feed conversion ratio — defined as the amount of feed required to produce one unit of livestock output. Having converted different outputs into 'livestock output units,' assuming one-tenth of the milk output as equal to one unit of meat or eggs, and a feed conversion ratio for India of 2.4:1, they projected feed demand in 2000 to range from 21.8 Mt to 34.5 Mt under different income growth assumptions. However, these estimates of feed demand have ignored the feed consumption by non-milk producing animal (the adult males and young stock) and hence total livestock feed demand cannot be made.

This method can however be used to estimate feed demand specific for dairy production. According to the authors economic growth (development) will result in an increase in this ratio by about 1.2% per year. Based on this assumption, the ratio will be 2.7: 1 in 2011. Using this ratio and an estimated milk production of 118 Mt, feed grain required for dairy production will be around 32 Mt in 2012. Using the same approach and assuming an increase in milk production of 3.1% per year, India's milk production in 2020 to be 156 Mt and its feed grain requirement for dairy production be 47 Mt (Figure A-2.18).

Figure A-2.18 Projected Feed Grain Required for Dairy Production



A 2.11.2.2 Projected Food Supply and Demand for India

Several studies have estimated the projected supply and demand of major food items for India (Table 14A and 14B). However, there are large variations in these estimations between studies. For example, the projected supply of total cereals in 2020 varied from 242.2 to 309 million tonnes while the projected demand varied from 237.3 to 374.7 million tonnes. Going by these estimates, the supply demand gap for cereals could therefore range from -132.7 to +71.7 million tonnes, depending on the study.

Table A-2.14A Projected food supply for India, by different studies (Unit: Million Metric Tonnes)

Source	Year	Rice	Wheat	Total Cereals	Pulses	Oilseed	Sugarcane
Mittal (2008)	2011	95.7	80.2	209.7	16.1	29.9	245
	2020	105.8	91.6	242.2	17.6	36.9	255.2
	2026	111.2	97.9	260.2	18.4	41.1	260.5
Kumar (1998)	2020	134	127.3	309	-	-	
Mittal (2000)	2020	149.3	128.5	-	-	-	298.1
Kumar & Mittal (2003)	2020	127	111.5	274	15.2	-	-
Hanchate & Dyson (2004)	2026	-	-	265.8	23.7	-	-

Table A-2.14B Projected food demand for India, by different studies. (Unit: Million Metric Tonnes)

Source	Year	Rice	Wheat	Total Cereals	Pulses	Edible oil	Sugar
Mittal (2008) (under scenario of 9% GDP growth)	2011	94.4	59	188.5	24.1	16.8	29.3
	2020	96.8	64.3	245.1	42.5	30.2	65.7
	2026	102.1	65.9	277.2	57.7	40.9	100.7
Rosegrant *et al.*, (1995)	2020	-	-	237.3	-	-	-
Kumar (1998)	2020	122.1	102.8	265.7	30.9	-	-
Bhalla (2001)	2020	-	-	374.7	-	-	-
Thamarajakshi (2001)	2020	-	-	274	-		
Hanchate & Dyson (2004)	2026	-	-	217.6	16		

In the more recent study (Mittal, 2008) the authors have predicted that by 2021 India will be deficient in cereals (-2.9 million tonnes), pulses (-24.9 million tonnes), edible oils (-17.6 million tonnes) and sugar (-39.67 million tonnes) (Table A-2.15). The authors also reported that this state of deficiency will worsen by 2026**. For the dairy sector, this implies that it would be less likely for India to be able meet the feed requirements of its large livestock population. If the feed requirements of the dairy animals cannot be met, it's highly unlikely that India will be able to meet its future demand for milk.**

Table A-2.15 Supply-Demand gap for selected food items (Unit: Million Metric Tonnes)

Food Items	**Gap (Supply-Demand)**		
	2011	**2021**	**2026**
Rice	1.26	8.98	9.13
Wheat	21.21	27.33	32.04
Total Cereals	21.19	-2.94	-16.97
Pulses	-8.05	-24.92	-39.31
Edible oil	-6.66	-17.68	-26.99
Sugar	-4.31	-39.67	-74.13

Source: Mittal (2008)

A-2.11.3 Livestock Support Services

There are a whole range of services that are needed to enhance the capacity of dairy farmers to exploit the full potential of livestock production and enable them to gain access to expanding markets. These support services include health and production services such as clinical care, preventive health and provision of pharmaceutical supplies, feed and fodder supply, artificial insemination, livestock research and extension, and other market services such as credit, livestock insurance, delivery of market information, output marketing and milk collection (Ahuja and Redmond, 2004). Currently, the process of delivering such services in India is extremely inefficient. Unless the government takes active steps to radically reform this sector, it would be unlikely for India to increase dairy animal productivity and meet future milk demand.

In India, the provision of livestock support services is primarily undertaken by the respective state veterinary and animal husbandry departments. The actual delivery of the services is done by veterinarians and livestock technicians employed by the state governments. In total, India has a vast network of over 50,000 veterinary dispensaries which employ over 100,000 veterinarians and livestock technicians. The primary function of these institutions is to provide clinical veterinary and breeding services. The provision of all other support services is hugely neglected. Additionally, the quality of services provided is also considered quite poor (Ahuja *et al.*, 2000). As a result, several destructive animal diseases such as Foot and Mouth Disease, Anthrax, Tuberculosis, Brucellosis etc. are still widely prevalent in India. Not only does this severely restricts the ability of the country to compete in the global markets but also results in huge productivity losses.

The failure of livestock support services to deliver has raised questions regarding the sustainability of such a poorly managed and government run system. There is a growing acceptance for need to reform these services. It has been suggested that such reforms should focus on transferring most of the services to the private sector, on the assumption that the private sector would be likely to perform better than the public sector (De Haan and Bekure, 1991).

Services such as clinical diagnosis and treatment, production support and distribution of vaccines and other veterinary supplies can most efficiently be supplied by the private sector (De Haan and Bekure, 1991). In several developing countries, this has led to a drive for the privatisation of veterinary services in the 1980s and 1990s, with the aim of improving the delivery of animal health services whilst reducing the burden on public sector budgets (Cheneau *et al.*, 2004). Even in India, private participation in the veterinary sector is gaining in importance, and its role is expected to increase substantially in the future (Sen and Chander, 2003). Due to which, the reach and quality of veterinary care services is expected to improve significantly.

However, privatization is a complex process which goes beyond simply transferring certain functions and assets from public to private agents (Ahuja, 2004). The privatization process must take into account the political, economic and institutional development contexts. These in turn, depends on available technology and skills, and the politico-economic situation including the level of corruption and transparency in organizational procedures (Ahuja, 2004). Furthermore, private markets do not function in a vacuum but require strong institutions and appropriate legislation to regulate behaviour and enforce contracts. An accountable state is considered a necessary condition for the efficient functioning of private markets. The government must therefore take active steps to establish the supporting environment before privatizing or else the privatization process might do more harm than good. In general, elimination of policies promoting unfair competition, formulating attractive sub-contracting policies, establishment of mutual insurance schemes and enabling legislation support for private practice have been suggested as policy requirement for privatization (De Haan and Umali, 1992).

A-2.11.4 Available Technology and Its Transfer

It has been suggested that technical factors have gradually become the driving force imparting dynamism to the Indian livestock sector (Kumar *et al*, 2005). Kumar *et al.*, (2005) analysed the drivers of growth of Indian livestock sector. Their study revealed that between 1950–51 and 1995–96, the livestock sector output in the country grew at 2.59% per year. While the input index increased by 1.79% per year, total factor productivity (TFP) grew at about 0.8%. Most of the increases in productivity started during the 1980s when output growth touched nearly 4% per year and TFP reached 1.8% per year. The authors (Kumar *et al.,* 2005) attributed this (rise) to the use of available technology, especially in the areas of milk marketing (along AMUL model), animal health and breed improvement.

Interestingly, in the same study it was established that there has been a marked shift in livestock feeding in favour of green fodder and concentrates during this period (Table A-2.16). It has therefore been suggested by Gautam *et al.* (2010) that a large part of TFP growth observed was due to improved nutritional availability to poorly fed dairy animals owing to high cereal output increases in the corresponding period (being a predominantly mixed farming system, majority of dairy animals in India are generally raised on crop residues which constitute a poor source of nutrition). It is therefore possible that greater availability of green fodders and concentrate feeds has fuelled the milk output growth witnessed (Gautam *et al.,* 2010) and not just available technology and its transfer.

Table A-2.16 Composition (%) of livestock feed in India

Item	1950–51	1970–71	1980–81	1995–96
Dry fodder	59.74	57.76	46.75	35.38
Green fodder	37.74	40.19	50.62	56.98
Concentrates	2.52	2.05	2.63	7.63

Source: Kumar *et al.,* (2005).

The transfer of complex livestock technologies to smallholders with sustainable transaction costs and appropriation to local conditions poses a formidable challenge (Gautam *et al.,* 2010). In India 80% of livestock products still come from small farmers with 3–5 animals and less than two hectares of land (Rangnekar, 2001). Most livestock production enhancing technologies have been developed in the western world and hence cater to the needs of industrial farming. Applying such technologies to the Indian context will not be viable. In addition, the absence of any specialized agency dealing with animal husbandry extension service hampers the spread of improved technology (Acharya, 1984).

A-2.11.5 Research and Development

The technological requirements of majority of dairy farmers can at best be partially served by modern research tools currently in use. With the available technology contributing little to the productivity improvements, future development of viable technologies that are suitable to production systems in India is crucial. Biotechnology, information technologies and systems sciences are fast becoming important research arenas in India and could offer potential solutions. However, these technologies are essentially knowledge driven whereas most of the dairy farmers are illiterate with poor access to/understanding of complex information. Thus many of the technological interventions have either failed to become adopted at farm level or their uptake has proved unsustainable.

It is therefore suggested that there is an overriding need for a farming systems perspective to the research agendas. This involves inter-disciplinary and community-based participation. Such an approach will be more complex, require concentrated effort and more efficient use of resources. But it will be associated with considerable benefits due to a greater integration of effort (Devendra, 2002).

A 2.11.6 Climatic Conditions

Livestock are part of the ecosystem which is sensitive to changes in climate. Although the level of vulnerability of the farm animals to environmental stresses varies with the genetic potential, life stage and nutritional status of the animals, studies have indicated that the performance of farm animals is directly sensitive to climate factors (Sirohi and Michaelowa, 2007). The performance (e.g., growth, milk and wool production, reproduction), health and wellbeing of the livestock is strongly affected by climate both, directly and indirectly (Sirohi and Michaelowa, 2007).

Livestock are homeotherms and regulate their body temperature within a relatively narrow range to remain healthy and productive. The ambient temperature below or above the thermo-neutral zone creates stress conditions in animals. The approximate thermal-comfort zone for optimum performance of adult cattle is reported to be 5–15°C (Hahn 1999). However, significant changes in feed intake or in physiological processes will not occur within the range of 5–25°C (McDowell 1972).

The rise in atmospheric temperature beyond the thermo-comfort zone causes significant changes in feed intake, heat dissipation and interferes in other physiological processes creating conditions of stress. This negatively affects the production and productivity of the animals (NRC, 2001). When the magnitudes (intensity and duration) of adverse environmental conditions exceed threshold limits with little or no opportunity for relief (recovery), animal functions can become severely impaired by the resulting stress, at least in the short term (Hahn and Becker 1984; Hahn 1999). Short-term extreme events (e.g., summer heat waves, winter storms) can result in the death of vulnerable animals (Balling 1982; Hahn and Mader 1997), which can have substantial financial impacts on livestock producers.

The average annual temperature in most parts of India is 25°C or higher. This is also the general upper limit of the thermal-comfort zone of cattle and buffaloes for milk production. But, in India, the upper temperature limit of the comfort zone for maximum milk production is 27°C (Dutt *et al.,* 1992), which is two degrees higher than that reported in temperate countries. This is perhaps because the crosses of exotic breed (e.g. Brown Swiss, Jersey and Friesian) with native Indian breeds have produced crossbred's that are better adapted to climatic conditions in the country.

However, in several parts of the country, (particularly the south-eastern region comprising of Andhra Pradesh and Tamil Nadu) the average annual temperature is higher than the upper critical level. This is an important reason for the low milk yield of dairy cows in India. Studies have shown milk yield of crossbred cows in India (e.g., Karan Fries, Karan Swiss and other Holstein and Jersey crosses) to be negatively correlated with temperature-humidity index (Shinde *et al.,* 1990; Kulkarni *et al.,* 1998; Mandal *et al.,* 2002[a]). Additionally, studies have suggested that the average daily milk yield of the crossbred animals (in the hot–humid eastern part of the country) was significantly reduced by the rise in minimum temperature and not maximum temperature, as rise in minimum temperature crossed the critical temperature of comfort while the maximum temperature was already above the comfort zone (Kale and Basu, 1993). The influence of climatic conditions on milk production is also observed for local cows which are more adapted to the tropical climate of India. The rising temperature decreased the total dry matter intake and milk yield in Haryana breed of cows (Lal *et al.,* 1987). The productivity of Sahiwal cows also showed a decline due to increase in temperature and relative humidity (Mandal *et al.,* 2002[b]).

For India, climate change projections with a doubling of carbon dioxide concentration in the atmosphere suggest temperatures are expected to increase between 2.3 and 4.8°C, along with increased precipitation (Lonergan, 1998). Further, the temperatures are expected to rise for all the months of the year. These conditions, especially the more hot–humid climatic conditions and the rise in summer (April to June) temperature (which is above 40°C maximum daily temperature in most parts of the country), would plausibly aggravate the heat stress in animals and further adversely affect their productive performance.

In general, the productivity level is lower in regions where mean annual temperature is higher. Hence an increase in temperature is likely to reduce the total optimum area where high-yielding dairy cattle can be economically reared. Further, where high temperatures are associated with decline in rainfall or increased evapo-transpiration, the possibility of economically rearing animals would be further limited as decline in rainfall shall aggravate the feed and fodder shortage in the area (Sirohi and Michaelowa, 2004).

The proactive management counter measures during heat waves (e.g. providing sprinklers or changing housing pattern, etc.) or animal nutrition strategies to reduce excessive heat loads are often expensive and beyond the means of small and marginal farmers who own most of the livestock. This may add to list of disincentives for rearing costly (although high producing) cross bred animals having poor heat tolerance capabilities (Sirohi and Michaelowa, 2007). This in turn will lead to farmers favouring indigenous animals with poor production potential.

A-2.12 Summary and Conclusion

Agriculture plays a vital role in India’s economy by contributing to 19% of GDP and providing employment for 68% of the work force. Currently the area under agriculture in India is 159 million ha, which is a decline of -2.4 % from 1995-96. Among agricultural commodities, milk and milk products are the largest category in terms of value and account for 32% of India’s agricultural GDP. The total value of the Indian dairy market is estimated to be around 42.2 billion

US$ (Dairy India, 2007). The liquid milk market alone accounts for 51% (US$ 21.8 billion), followed by unbranded Indian products market (41%, US$ 17.3 billion), Western products (5%, US$ 2.1 billion) and branded Indian products (3%, US$ 1.2 billion).

Today, India is both the largest producer (116 Million tonnes (Mt)) and consumer of milk and milk products in the world. Dairy farming is a traditional occupation and is deeply linked with India's culture and traditions. In 2000-01 there were 107.7 million dairy farms and the average landholding size was 1.33ha. Consequently, 81% of milk in India is produced by marginal (< 1ha) and small (1 to 2 ha) farmers with 3-5 animals. Large farms (> 10 ha) that have more than 30 dairy animals account for only 2% of milk production.

For most of the small farmers, dairy farming is a secondary occupation and off-farm employment or crop farming is the primary source of income and employment. In rural India it's quite common to find 1 or 2 dairy animals in almost every household. The primary purpose of these animals is to produce milk for consumption by the household and satisfy a nutritional need. Selling milk for a profit is secondary objective for these farmers. As a result nearly 35% of milk produced is retained within the producer household and only about 65% termed the marketable surplus enters the national exchange economy. Of this, nearly 85% finds its way to urban areas indicating that urban demand is the main source of cash for rural milk producers.

In the early years of India's independence, milk production was extremely low (17 Mt in 1951) and there was a growing gap between milk supply and demand. This caused per-capita availability to drop to as low as 110g/day in 1968. To address this issue a nationwide dairy development program called "operation flood" was launched in 1970. Due to this initiative (which lasted till 1996), milk production growth ranged from 2.8% in the early 70's to 6.7% in the mid 80's and India was able to substantially increase milk production. The major activities of operation flood included (through the establishment of cooperatives) - building a unique rural milk procurement system, marketing system, development of milk animals, utilization of food aid for market stabilization, and manpower training and development.

During this period of growth in milk production, there was increase as well as considerable change in composition of the national herd. The change was characterised by a shift to buffaloes and crossbred's from traditional indigenous animals. In 2009 the size of the national herd (cattle and buffalo) was estimated to be around 279 million (male & female – adult & young), comprising of 172 million cattle and 107 million buffaloes. The *in-milk* dairy animal population was 74.5 million and comprised of 35.5 million buffaloes, 28.8 million indigenous cattle and 10.2 million cross bred cattle. Buffaloes are the most important dairy animals in India and account for 55% of milk production, followed by crossbreds 24% and indigenous cattle 21%.

The milk yield per animal is quite low in India and has not increased substantially over the years. The main reasons for low productivity are poor genetics and lack of adequate feed. Also, there is considerable difference in milk yields between the three animal types and also between states. In general, milk yields of indigenous animals (2.1 kg/day) are much lower than that of buffaloes (4.6 kg/day) and crossbreds (6.8 kg/day). The northern state of Punjab has the highest milk yields for all three animal categories, while the north eastern states of Meghalaya, Assam and Nagaland had the lowest yields for indigenous, crossbreds and buffalo respectively. Milk production and degree of dairy development also varies considerably between states. In 2010, the 10 largest milk producing states accounted for 85% of milk production. Of these states, Uttar Pradesh (20.2 million tonnes) was the highest producer while Tamil Nadu (5.7 million tonnes) was the lowest.

Despite three decades of operation flood, a large proportion of milk and milk products continues to be marketed through the informal or un-organised sector. Although the share of organized sector has increased over the last three decades, the informal sector comprising of middlemen, private milk traders and direct sale from producer to consumer, still accounts for 70% of marketed milk and milk products in India. In several villages and towns, the informal sector is the only milk marketing channel available for both producers and consumers. Trends suggest that the informal sector will continue to play a dominant role in the foreseeable future. The key factor that has been driving the informal sector is the poor willingness of customers to pay the extra costs of formal processing and packaging. The informal sector does not incur these costs and has higher margins. It can therefore offer higher prices to producers and lower prices to consumers. Consumers also strongly believe that the milk supplied by the informal sector is of better quality (quality is perceived as freshness, taste and richness - degree of cream formation).

Due to the large role played by the informal sector, only 35% of India's milk production is delivered to processing plants and the processors and marketers of dairy products continue to be challenged by the difficulty in obtaining timely, cost-effective and adequate supplies of quality milk. In 2009 there were 841 milk processing plants in India – 562 were owned by private dairy companies and 243 were owned by cooperatives. These processing plants handled on an average 98.3 million litres of milk each day. The 10 largest milk producing states accounted for 89% of the processing plants and 87% of the volume of milk processed.

Based on market orientation, there are three distinct groups of milk producers in India – 1) independent producers who sell milk in the open market, 2) independent producers who sell milk to vendors and 3) contract producers who sell their milk to a dairy company/agent. Of these three groups, production costs were found to be lowest for contract producers (US$ 20.8/100 kg milk) and highest for independent producers selling in the open market (US$ 25.1/ 100 kg milk) (Birthal *et al.,* 2008). This is mainly due to transaction costs associated with the acquisition of inputs, market information and disposal of milk. The highest price was offered by the open market (US$ 28.8/100 kg milk) and the lowest by milk vendors (US$ 26.2/100 kg milk). The net revenue per unit of milk was highest for contract producers (US$ 6.0/100 kg milk). This indicates that contract farming can significantly increase the profit margins for dairy producers in India. Also, contract farming introduces a greater degree of competition in rural markets and thus lessens the possibility of exploitation of milk producers by the vendors.

From 1996 to 2009, both farm gate and consumer prices of milk have increased. In 2009, the average farm gate prices were US$ 28.8/100kg milk and average consumer prices were US$ 46.6/100kg milk (IFCN, 2010). But the increase in consumer prices (133%) was far greater than the increase in farm gate prices (73%). As a result the farmers share in consumer price decreased from 80% to 62%. At the same time, margins for processors/retailers increased from US$ 4.6/100 kg to US$ 18/100 kg. The whole sale prices indexes (base year 1993-94 =100) of the major dairy commodities have increased as well. In 2009, the whole sale price index of SMP (313) was highest followed by fluid milk (228), butter (211) and ghee (202). During the same year, the whole sale price index of major farming inputs – processed cattle feed and green fodder were 213 and 203 respectively. The low milk price to feed price ratio indicates that high input dairy farming may not be sustainable in India.

Due to a growing population and rising per-capita incomes, the demand for milk and milk products is expected to increase considerably over the next decade. A report by the planning commission of India estimated that the demand could be around 180 Mt by the year 2021-22. Given the import sensitivity of the dairy sector, the increased demand will have to be met by increasing domestic production. This would require increasing domestic milk production by 6 Mt/year over the next 10 years. But milk production has increased by an average of only 3.64 Mt/year over the past 10 years. This indicates that meeting domestic demand will be a huge (if not impossible) challenge for India. Since the country is already home to an extremely large cattle population, increasing cattle numbers is not a viable option. Thus increasing the productivity of dairy animals appears to be the only solution.

The ability of the production systems in India to respond to the demands of productivity enhancement will depend upon addressing the issues related to the six drivers of productivity- 1) genetic improvement, 2) feed and fodder supply, 3) delivery of livestock support services, 4) technology transfer, 5) R & D and 6) climatic conditions. Of these the lack of quality feed and fodder is the most important factor limiting growth of milk production in India. With increase in demand for food for human consumption, the availability of feed and fodder for livestock is expected to be reduced further. Although genetic improvement can result in the development of more productive dairy breeds such as crossbred cattle and “graded up” buffaloes – the lack of quality feeds, in adequate support services (such as health & breeding), poor technology transfer systems and un-suitable climatic conditions drastically limits the utility of this productivity enhancement tool. As a result productivity of dairy animals in India is expected to continue to remain low by world standards.

APPENDIX III

Overview of the Indian Business Environment

TABLE OF CONTENTS- APPENDIX III

List of Tables	Pg. No.

List of Figures	Pg. No.

A-3.0 Introduction

India, with a land mass of 3.16 million square kilometres and a population of 1.17 billion people, of whom approximately 250 million live below the poverty line (less than a dollar a day), is often regarded as being a large, populous and poor country offering limited trade and investment opportunities. But this image has changed dramatically over the last decade and a new India is rapidly emerging. This new India is characterised by having a large middle income population of about 300 million people, the second largest exporter of software services in the world, substantial pool of trained and skilled human resources; established and highly profit oriented businesses; thriving financial institutions; and active and relatively sophisticated capital markets (Bhaskaran, 1996).

Today India has become a major player in the world economy. India along with China has led all world economies with gross domestic product (GDP) growth rates of more than 9% in recent years (Victor, 2007). Due to this rapid growth, India is the 4th largest economy in GDP purchasing power-parity (Wold Bank, 2011). It is suggested that by 2020 India will surpass Japan and will become the third largest economy in the World, behind USA and China. This tremendous economic resurgence and future promise of India and China have made entering these markets critical to the survival and success of many firms (Wilson and Purushothaman, 2003). In 2005, of the Fortune 500 firms, 220 had operations in India (India Brand Equity Foundation, 2005). Firms in earlier years entered India primarily for reasons such as acquiring resources, securing key supplies, accessing low-cost factors, and diversifying sources of supply (Vernon *et al.*, 1996). However, the rising income of the local population is now resulting in a market-seeking behaviour by multi-national firms.

Multinational companies that are conducting business in many countries are exploiting foreign markets in which they are competitive, producing in low unit cost locations, managing cash flow in multiple currencies and developing sources of capital in international financial centres. They are also accessing advanced communications, trained personnel and customer service and distribution centres to support worldwide operations (Haner and Ewing, 1985). However, becoming international and expanding the scope of the business does not always result in more after tax profits (Haner and Ewing, 1985). For example, Unilever launched 14 joint ventures in China from 1986 to 1999 and all of these were in the red for most of the time (Dasgupta and Dutt, 2004).

The success of multinational firms in foreign countries is strongly influenced by the prevailing local business environment. On the whole, corporations tend to perform better in countries with a good business environment (Demirguc-kunt *et al.,* 2006). In general a good business environment is characterised by an efficient legal system, strong creditor and shareholder rights, small regulatory burden for conducting business, and tax system that does not discriminate against incorporated firms (Demirguc-Kunt *et al.,* 2006). Understanding the business environment is critical for a multinational firm that is planning to enter the Indian market.

A business environment analysis is closely associated with country risk assessment. According to Erb *et al.* (1995), “country risk” is a measure of uncertainty about the business environment in a country, which has three sources: political, financial, and economic. Political risk is the risk that laws and regulations in the host country will be changed to adversely affect a foreign firm. The risks could be of a regulatory nature, such as the imposition of tariffs, or of a political nature, such as unrest caused by pressure groups (Spar, 1997). In a worst case scenario, political risks may cause confiscation of assets without adequate compensation (Hawkins *et al.,* 1976).

Financial and economic risks manifest in several ways. They could take the form of (1) recessions or market downturns, (2) currency crises, or (3) sudden bursts of inflation. Most of these factors arise from imbalances in the underlying economic fundamentals of the host country, such as a balance of payment crisis. Recessions result from business cycles inherent in any economy (Lucas 1987). The origins of currency crises could be a progressively deteriorating trade imbalance (e.g., India in the late 1980s) or a loss of faith by the international financial system on the country’s ability to meet its international debt obligations (e.g., Argentina in 2001). Whatever the source of the problem, a fall in the currency rate will lead to a fall in revenues and profits (Shapiro, 1985). Differential inflationary pressures between the home and the host country could also pose a risk. Inflation directly affects the price–demand structure of a firm. It can also affect the firm indirectly through its adverse effects on exchange rates (Erb *et al.*, 1995; Frankel and Mussa 1980).

According to the "competitive diamond" described by Porter (1998) the Local Context is intricately linked to the performance of a firm in any industry. It defines the association between the four vital elements that govern the performance of a firm – Factor input conditions, Firm strategy and rivalry, Demand conditions, and Related and supporting industries. The local context can be considered to be analogous to the business environment. Moreover, the sophistication of how companies compete in a country is strongly influenced by the quality of the business environment (Porter, 1998). For example, firms cannot use advanced logistical approaches unless there is high quality transport infrastructure. If regulatory red tape is onerous, time needs to be devoted to endless dialogue with government, or if the court system does not resolve disputes quickly and fairly, firms waste money and management time without contributing to customer value (Porter, 1998). Over that last two decades the operating environment for business has changed radically in many countries. It is therefore vital for management to thoroughly analyse and understand the business environment of a country and adjust their strategies to reflect these fundamental differences.

The investment climate and policies towards competition are two import factors that influence the business environment (Porter, 1998). The investment climate is broadly defined and includes the macroeconomic and political stability, the tax system, labour market policies affecting the incentives for workforce development, and intellectual property rules and their enforcement. These influence the business environment by contributing to the willingness of companies to invest in upgrading capital equipment, skills, and technology (Porter, 1998). Policies towards competition such as antitrust policy, government ownership and licensing rules, and policy towards trade and foreign investment play a vital role in setting the intensity of local rivalry, and therefore significantly influence the business environment (Porter, 1998).

Governments also have a great influence on the business environment, because it is governments that are ultimately responsible for improving the well-being of citizens (Porter, 1998). Governments all over the world are under pressure due to competition from other nations or states to attract investments from international companies. To be successful in attracting foreign investments, governments must first ensure that they create an environment that supports productivity (Porter, 1998). This requires a minimal government intervention in some areas (e.g., trade barriers and pricing) and an activist role in others (e.g., establishing proper infrastructure, ensuring vigorous competition, providing high quality education and training etc.) (Porter, 1998). In many respects, the most important public good that the state can provide from the point of view of business is predictability in the institutional and policy environment. Unpredictable changes in government policy or regulations increase risk in the business environment and produce large disincentives for investment (Hellman *et al.*, 2000).

A-3.1 India Country Conditions

A-3.1.1 Geography and Demography

India lies to the north of the equator between 8°4' and 37°6' north latitude and 68°7' and 97°25' east longitude. India measures 3,214 km from north to south and 2,993 km from east to west. With a total land area of 3.28 million square kilometres, India is the largest country in the south Asian region and the seventh largest in the world. It has a land border of 15,200 km (9,445 miles) and a coastline of 7,517 km (4,671 miles).

Being a peninsula India is surrounded by the Bay of Bengal to the south-east, Arabian Sea to the south-west and Indian Ocean to the south (Figure A-3.1). It shares boundaries with Myanmar (Burma), Bangladesh, Pakistan, China, Nepal, and Bhutan. The Himalayan Mountains extend along the northern borders; while in the south a narrow strait (Palk Strait) separates India from Sri Lanka (Figure

A-3.1). Although the climate varies from the tropical south to the temperate north, the seasons are well-defined. A mild winter lasts from November to March, followed by a dry, hot period through June and the monsoon season from July to October.

India is dived into twenty eight states and seven union territories (Table A-3.1). The first division of states was done in 1956, 9 years after Independence on the basis of language and culture. Thus each state usually has a distinct language and culture. Hindi and English are the two most common languages spoken in India. The state with the largest population is Uttar Pradesh (199.5 million) while the state with the largest land area is Rajasthan (342,239 km^2) (Table A-3.1). Kerala has the highest literacy rate (94%), while Bihar has the lowest (63%). The proportion of people living in urban areas is highest in Goa (62%) and lowest in Himachal Pradesh (10%).

Table A-3.1 State wise demographics of India

S.No	State or union territory	Population in Millions (2011 Census)	% of Population	% Growth (2001-2011)	Rural Population. in Millions (%)		Area km²
1.	Uttar Pradesh	199.58	16.5	20.1	155.11	(78)	240,928
2.	Maharashtra	112.37	9.3	16.0	61.55	(55)	307,713
3.	Bihar	103.80	8.5	25.1	92.08	(89)	94,163
4.	West Bengal	91.35	7.5	13.9	62.21	(68)	88,752
5.	Andhra Pradesh	84.67	7.0	11.1	56.31	(67)	275,045
6.	Madhya Pradesh	72.60	6.0	20.3	52.54	(72)	308,245
7.	Tamil Nadu	72.14	5.9	15.6	37.19	(52)	130,058
8.	Rajasthan	68.62	5.6	21.4	51.54	(75)	342,239
9.	Karnataka	61.13	5.1	15.7	37.55	(61)	191,791
10.	Gujarat	60.38	4.9	19.2	34.67	(57)	196,024
11.	Orissa	41.95	3.4	14.0	34.95	(83)	155,707
12.	Kerala	33.39	2.7	4.9	17.45	(52)	38,863
13.	Jharkhand	32.97	2.7	22.3	25.04	(76)	79,714
14.	Assam	31.17	2.5	16.9	26.78	(86)	78,438
15.	Punjab	27.70	2.3	13.7	17.32	(63)	50,362
16.	Haryana	25.35	2.1	19.9	16.53	(65)	44,212
17.	Chhattisgarh	25.54	2.1	22.6	19.60	(77)	135,191
18.	Jammu & Kashmir	12.55	1.0	23.7	9.13	(73)	222,236
19.	Uttarakhand	10.12	0.8	19.2	7.03	(69)	53,483
20.	Himachal Pradesh	6.86	0.6	12.8	6.17	(90)	55,673
21.	Tripura	3.67	0.3	14.7	2.71	(74)	10,486

22.	Meghalaya	2.96	0.24	27.8	2.37	(80)	22,429
23.	Manipur	2.72	0.22	18.7	1.90	(70)	22,327
24.	Nagaland	1.98	0.16	-0.5	1.41	(71)	16,579
25.	Goa	1.46	0.12	8.2	0.55	(38)	3,702
26.	Arunachal Pradesh	1.38	0.11	25.9	1.07	(78)	83,743
27.	Mizoram	1.09	0.09	22.8	0.53	(49)	21,081
28.	Sikkim	0.61	0.05	12.4	0.46	(75)	7,096
i.	*Delhi*	16.75	1.4	21.0	0.42	(3)	11,297
ii.	*Puducherry*	1.24	0.1	27.7	0.39	(31)	479
iii.	*Chandigarh*	1.05	0.09	17.1	0.03	(3)	114
iv.	*Andaman & Nicobar Islands*	0.38	0.03	6.7	0.24	(63)	8,249
v.	*Dadra & Nagar Haveli*	0.34	0.03	55.5	0.18	(53)	491
vi.	*Daman & Diu*	0.24	0.02	53.5	0.06	(25)	112
vii.	*Lakshadweep*	0.06	0.01	6.2	0.01	(17)	32
	India Total	**1,210.19**	**100.00**	**17.6**	**833.09**	**(69)**	**3,287,240**

Source: Office of Registrar General of India, Ministry of Home Affairs (2011)

Figure A-3.1 The States and Union Territories of India

Source: ***www.mapsofindia.com*** **(2010)**

A-3.1.2 Social Conditions

India's 14 official languages and many dialects reflect the great variety of religions, ethnic groups, and castes that create the permanent basis of unrest, instability, political conflict, and violence (PRS, 2009). The nearly 5000 year old caste system in particular is extremely complex and is considered the main reason for social and political conflict. For example, riots in the Gujjar community left many people dead in Northern parts of the country in May 2008. According to Indian law, the Gujjars are classified as belonging to India's third-lowest group, known as Other Backward Classes (OBC). The Gujjars wanted to have their caste standing further lowered, thus allowing them to qualify for government jobs and reserved places in universities. As a part of the affirmative action program the government reserves about half of all seats in state colleges and universities only for the lower castes and tribal groups. While this system was designed to combat years of discrimination, it has also been criticized as accentuating the deep rooted evils of the caste system (PRS, 2009).

India is a secular nation and country of origin for three important religions Hinduism, Buddhism and Sikhism. Though the vast majority of Indian's are Hindus, there are considerable numbers of Muslims (140 million) and Christians (24 million) as well. It has the third highest population of Muslims in the world after Indonesia and Pakistan. This religious diversity is closely associated with constant and often deadly conflicts. For instance, communal riots between Hindu's and Muslims in the north western state of Gujarat in 2002 resulted in the deaths of over 1200 people.

A-3.1.3 Government and Political Conditions

According to its Constitution India is a "sovereign, socialist, secular, and democratic republic." Like the United States, India has a federal form of government, and the central government in India has greater power than its states. The parliamentary system in India has been modelled on the British parliamentary system. India's bicameral Parliament consists of the Rajya Sabha (Council of States, Upper House) and the Lok Sabha (House of the People, Lower House). The Lok Sabha consists of 545 members, who serve 5-year terms;

543 are directly elected by the citizens of India, and two are appointed (PRS, 2009). The legislatures of the states and union territories elect 238 members to the Rajya Sabha, and the president appoints another 12. The members of the Rajya Sabha serve 6-year terms, with one-third up for election every 2 years (PRS, 2009). The government exercises its broad administrative powers in the name of the president, whose duties are largely ceremonial. A special electoral college elects the president and vice president indirectly for 5-year terms.

Real national executive power is centred in the Cabinet (senior members of the Council of Ministers), led by the prime minister. The prime minister is selected by legislators of the political party or coalition group commanding a parliamentary majority in the Lok Sabha (lower house). The president appoints the prime minister first and then appoints subordinate ministers on the advice of the prime minister. The Council of Ministers is responsible to the Lok Sabha (PRS, 2009).

At the state level, some legislatures are bicameral, patterned after the two houses of the national parliament. The states' chief ministers are responsible to the legislatures in the same way the prime minister is responsible to parliament (PRS, 2009). Each state also has a presidentially appointed governor, who may assume certain broad powers when directed by the central government. The central government exerts greater control over the union territories than over the states, although some territories have gained more power to administer their own affairs. Some states are trying to revitalize the traditional village councils, or Panchayats, to promote popular democratic participation at the village level, where much of the population still lives (PRS, 2009). Over half a million Panchayats exist throughout India.

The transfers of political power are usually orderly and accepted (EIU, 2010). Although fundamental political stability is high, political efficacy is relatively low because of the decreasing influence of dominant national parties (EIU, 2010). The rise of coalition governments has given regional parties a stronger presence in government. This has led to a gradual, but significant, transfer of power from the centre to the states (EIU, 2010). Additionally, the heterogeneous interests of the members of India's coalition government have limited the speed of market reforms. The privatisation programme is particularly hindered by vested interests in the coalition whom are reluctant to cede influence over state-owned companies (EIU, 2010)

The Indian National Congress (INC) party is the oldest political party in India and has "ruled" the country for over 40 years since independence. Currently, a coalition government called the United Progressive Alliance (UPA) is in power. The INC is the single largest party in the UPA coalition and received a good mandate from the people of India in the general election that was concluded in May 2009. Although Congress fell short of winning a majority in its own right in the 543-seat lower house of parliament, the party's position has been hugely strengthened and it is expected that the government will last its full five-year term (EIU, 2010). India's current government is therefore likely to be cohesive, durable and relatively free to implement liberalising reforms (EIU, 2010).

A-3.1.4 Security Conditions

India has several geographically discrete security concerns that are mainly associated with secessionist movements. The most serious danger is the secessionist movement in the state of Kashmir (PRS, 2009). A number of militant groups (anti-Indian Islamic and Kashmiri) operate in the disputed state of Kashmir (EIU, 2010). The core dispute over Kashmir remains intractable and the region's Hindu population has fallen victim to violence by Muslim separatists (PRS, 2009). Fighting between Kashmiri separatists and Indian paramilitary forces occurs routinely. The central government has called for cease-fires and promised substantial autonomy for the state, but no terms have ever been agreed upon. The conflict is not only an internal problem for India, but has also been the major element of an on-going struggle with Pakistan that has resulted in three wars so far. A fourth war looked likely in the winter of 2001-02 when Pakistan based militants attacked the Indian Parliament. Since then the relationship between the two countries has shown improvement, but tensions once again escalated after Pakistan based terrorists attacked India's financial capital Mumbai in November 2008 (EIU, 2010). An open conflict is unlikely to materialise in the near future and armed exchanges are likely to be confined to border areas. Since both sides' have nuclear arsenal, a major war between them will have far reaching global consequences.

Another major regional conflict involves the seven north eastern states (Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, and Tripura) that are home to 200 ethnic groups and at least six separatist organizations (PRS, 2009). There have been a number of bombings across the north-eastern state of Assam since 2006, including the state capital, Guwahati. This regional conflict grows out of charges that the government exploits the tea and oil production from the region, but ignores the social welfare of the inhabitants (PRS, 2009).

The British Foreign and Commonwealth Office (FCO) consider that there is a high risk from terrorism in India, which is in the highest of its four categories (BMI, 2011). Since July 2006 there have been terrorist attacks in several major cities including Mumbai, New Delhi and Ahmadabad. Some areas are subject to terrorist attacks on effectively a daily basis. The area's most susceptible to attacks are Jammu and Kashmir (excluding Ladakh) and the north-east.

Violent left-wing extremist groups based on the teachings of Chinese political leader Mao Zedong and called the "Maoists" or "Naxalites" or Peoples War Group (PWG) has been waging a war against the Indian government for over 30 years. They are most active in the rural areas of Bihar, Jharkhand, Chhattisgarh, West Bengal, Orissa and Andhra Pradesh. In 2006, Prime Minister Dr Manmohan Singh referred to the Naxalites as the single biggest internal security challenge ever faced by India. Apart from this risk of terrorism, there also exists a moderate security risk from crime. Petty theft is common in crowded areas such as markets, airports and bus and railway stations (BMI, 2011).

A-3.1.5 Macro Economic and Financial Conditions

The macroeconomic conditions in India appear to be quite good. India is one of the best performers in the world economy in the recent years with GDP growth as high as 9.7% in 2006 and 9.0% in 2007 (TableA-3.2). Although the growth rate dropped to 6.7% in 2008 due the global economic crises, it was still one of the highest in the world. The GDP grew by 8% in 2009 and 8.6% in 2010 indicating that economy is well and truly on a growth path.

Table A-3.2 India: Growth of outputs

Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
GDP	6.4	4.4	5.8	3.8	8.5	7.5	9.5	9.7	9	6.7
Agriculture	2.7	-0.2	6.3	-7.2	10	0	5.8	4	4.9	1.6
Industry	4.6	6.4	2.7	7.1	7.4	10.3	10.2	11	8.1	3.9
Service	9.5	5.7	7.2	7.5	8.5	9.1	10.6	11.2	10.9	9.7

Source: Asian Development Bank (2009)

Several economists suggest that the key issue is whether the Indian economy can grow at 8.5 to 9 per cent-plus levels without overheating, given the structural supply constraints in infrastructure, skills and agriculture. Pursuing a strategy of moderating growth to a slightly lower trajectory so that the supply side catches up is often recommended. India’s growth rate is also threatened by the rising prices (inflation) which limit domestic consumers' spending power. Over the last 18 months inflation reached as high as 11%. To try and curb inflation, India’s central bank the Reserve Bank of India (RBI) has raised interest rates 12 times over last 18 months.

The near Future - 12th Five-Year Plan of the Government of India

Despite private sector participation falling below expectations, a downward revision in the real GDP growth rate and a downward revision in investment planned, the Prime Minister has set ambitious targets of US$1trn of investments during the 12th Five-Year Plan, which will run from 2012/13 to 2017/18 (BMI, 2011). The figure is double that of the 11th Five-Year Plan. Prime Minister Dr Singh is hoping that through doubling investment targets, an average real GDP growth of 10% per year can be achieved between 2012/13 and 2017/18 (BMI, 2011).

However, the country's strained fiscal situation is expected to be major constraint to achieving double digit growth figures (BMI, 2011). India's public debt levels are very high, around 80% of GDP and this should constrain the fiscal budget (BMI, 2011). Moreover, if spending is not reduced, interest rates on government debt will be pushed high and this will restrict access to loans (BMI, 2011).

In order to achieve the targeted double-digit growth, the participation of the private sector will be crucial. But, with deep-rooted obstacles in the business environment and financing constraints in the domestic project finance market, the ability for private sector investments to push growth this high is limited (BMI, 2011). In the 12th Five-Year Plan, the government is targeting 50% of investment to come from the private sector, equal to US$500bn. BMI (2011) notes that while India remains an attractive market for investors, driven by the strong fundamentals of economic and population growth, this target is still extremely ambitious.

On the whole, financial risks in India are moderate (EIU, 2010). Although high inflation and fiscal risks present the possibility of downward pressure on the rupee, these are likely to be offset by higher capital inflows, increased investor confidence and a reduction of investor-risk aversion as the global economy recovers (EIU, 2010).

India's banking sector is dominated by state owned banks. The level of non-performing loans has been significantly reduced, but it is likely to rise (EIU, 2010). The stock market has suffered from a number of scandals but reforms are taking place. Rising inflows of direct and portfolio investment caused the stock markets to rise significantly until early 2008. After which, the market faced a major fall and has endured significant volatility since then (EIU, 2010).

The foreign trade and payments risk is low (EIU, 2010). India faces little risk of a trade embargo. Some sanctions were imposed as a result of India's nuclear tests in 1998. These focused upon lending to India rather than trade, and the sanctions have now been lifted. India removed all quantitative restrictions in April 2001. Special import licences were also abolished. The tariff system is also being rationalised, though high import duties remain in some sectors. External commercial borrowing has been liberalised over the past decade. Capital account transactions will continue to be liberalised, making outward investment and hedging easier. However, in the event of an economic crisis these changes could be reversed.

A-3.1.6 Legal Conditions

The legal system is a crucial institution in a market economy. Firms and individuals need to know that contracts will be honoured, their private property respected, and in the event of a disagreement that the courts are capable of deciding the matter in a fair and affordable manner. India's legal framework is derived from English common law and is relatively impartial, free and fair (EIU, 2010). However, it is also complex and archaic, with a variety of often conflicting regulations still in place (BMI, 2011). It is also extremely slow and the court system is prone to lengthy delays. Several courts have numerous unsettled dispute cases from several decades back. Additionally, the regulatory system is not protected from policy reversals due to pressure from vested interests and inter-ministry rivalries (EIU, 2010). As a result of these issues, many foreign companies build in clauses allowing for international arbitration of disputes (EIU, 2010).

Most businesses (especially foreign) are of the view that India lacks effective respect for the sanctity of contract and enforcing contractual obligations is very difficult (BMI, 2011). However, there is increasing evidence that this situation might be changing. More transparent regulatory systems are being introduced in previously under-regulated sectors (EIU, 2010). In an attempt to unify its adjudication of disputes over commercial contracts with the rest of the world, India enacted the Arbitration and Conciliation Act of 1996, based on the UNCITRAL (United Nations Commission on International Trade Law) Model Law. Foreign awards are enforceable under multilateral conventions like the Geneva Convention. The International Centre for Alternative Dispute Resolution (ICADR) has been established as an autonomous organization under the Ministry of Law and Justice and Company Affairs to promote settlement of domestic and international disputes through different modes of alternate dispute resolution (BMI, 2011). India is not a member of the International Centre for the Settlement of Investment Disputes, but is a member of the New York Convention of 1958. The Permanent Court of Arbitration (PCA, Hague) and the Indian Law Ministry have agreed to establish the regional office of the PCA in New Delhi to make available an arbitration forum to match the facilities offered at The Hague at a far lower cost.

On the whole, the legal system appears to be in a state of transition, with the end goal of being more responsive to the needs of foreign businesses and the private sector. However, major shortcomings are expected to exist (BMI, 2011). Positively, the Indian judiciary, especially judges of the Supreme Court and the High Court have enormous freedom from political and other interference during their tenure (BMI, 2011). No judge has been removed by the parliament in more than 50 years of independence. However, there is some evidence of importance being given to political and sectarian considerations in the appointment of judges (BMI, 2011).

A-3.1.7 Infrastructure Conditions

Infrastructure is seen as a significant weakness for India when compared with China and other comparable nations. India faces major problems with its roads, railroads, ports, airports, education, power and telecommunications (BMI, 2011). The port and airport facilities are drastically over-stretched and both road and rail links are in a rundown state. The inadequate power system which results in severe power outages across the country is a significant hindrance to business (EIU, 2010). Politically motivated free provision of power to some sectors of the population has placed the electricity supply companies in a poor financial position. This has in turn affected electricity generation, so that power supplies are erratic and companies, offices and some private houses use their own back-up generating facilities (EIU, 2010). Despite India’s successes in information technology, computer and Internet access is not widespread. On the positive side, a strong participation by the private sector has resulted in ports and air transport facilities being upgraded (particularly the international airports) in massive effort (BMI, 2011),

These infrastructures related challenges are considered to be the main factors that are restricting India’s economy from growing to its full potential. Unless substantial improvements are made to the country's infrastructure, growth beyond India's long-term trend (at roughly 7.0%) will be difficult to achieve (BMI, 2011). Multiple governments have attempted to solve the infrastructure problems by making public infrastructure investment a key priority. The last six budgets have all allocated significantly increased funding for infrastructure (EIU, 2010). The ruling United Progressive Alliance (UPA) government announced that investment of nearly US$20bn will be made towards improving India’s road networks. But progress has often been held back by red tape and corruption among public officials as well as protests by locals which have caused severe delays and cost overruns to infrastructure projects, thus discouraging participation by private sector partners (BMI, 2011).

Moreover, the absence of a clear policy framework has hindered critical private investment in infrastructure overall (PRS, 2009). The government’s strategy to use public-private partnerships (PPPs) can be a significant positive as it will reduce the infrastructure spending burden on the government, as well as offer attractive investor opportunities (BMI, 2011).

A-3.1.8 Labour Conditions

Currently India has an extremely large working age (those aged between 15 and 64) population. The United Nations estimated India’s working age population in 2010 to be 780.44mn, representing 64% of the population. By 2020, it is forecasted that India will have the highest (992mn) working age population in the world. This is projected to peak at 69.4% of the population in 2040, although in absolute terms it is expected to keep increasing until 2050 (BMI, 2011). This condition is expected to be one of the key drivers of the Indian economy. A large working age population combined with a lower population growth rate gives

India a very good (lower) dependency ratio and puts its economy in a strong positive situation.

Most Indians are employed in agriculture and its allied sectors, accounting for approximately 60% of the total workforce (BMI, 2011). But services and manufacturing sectors are becoming larger employers. India has a large pool of scientific and technically qualified employees. Due to which several international companies have R&D facilities in India (BMI, 2011). However, illiteracy levels are high and unemployment rate is around 7%. Despite strong economic growth, employment rate has remained largely unchanged. To address this issue, the government has ensured that public policy is strongly focused on the growth of labour intensive sectors such as manufacturing (BMI, 2011). Although labour is relatively plentiful and inexpensive (around US$3.5/day for unskilled labour), wage growth in certain sectors has been in double digits as competition for jobs has intensified (BMI, 2011).

Despite unions representing a small proportion of the total work force, India is prone to sporadic outbreaks of industrial strife because the organised labour movement is very active (BMI, 2011). There are more than 7 million unionized workers, and unions represent around 14% of the workers in the organized sector (primarily in state-owned concerns) (PRS, 2009). Most unions are affiliated to political parties. The Indian National Trade Union Congress (INTUC), linked to the Congress party, generally favours settlement of disputes through arbitration. However the All-India Trade Union Congress (AITUC), linked to the Communist Party of India, has a track record of militancy and strikes. When strikes do occur, negotiation is the most common form of bringing them to a conclusion. Many foreign-owned manufacturing companies avoid strikes by employing a labour welfare officer to act as a go-between with the local labour representatives (BMI, 2011).

Labour reforms have resulted in worker-days lost to strikes and lockouts dropping by 50 per cent during the decade 1991-2000 from the previous decade (PRS, 2009). Yet, restrictive labour laws have negatively affected greater FDI inflows and stymied the development of the manufacturing sector (EIU, 2010).

The existing labour laws are confusing, frequently overlap and are increasingly extensive, with more than 45 pieces of relevant legislation covering the labour market (BMI, 2011). Most labour laws apply only to workers in the organised sector, excluding the small-scale sector, agriculture and most construction activities. However, reform is under way, with expanded contract employment and streamlined labour regulations. An amendment to the Industrial Disputes Act, if approved, will increase the threshold limit to 300 employees (from 100) for seeking government approval before laying off workers (PRS, 2009). Comprehensive draft legislation on labour reform which was introduced several years ago is pending parliamentary approval, with provisions for taking action on strikes and lockouts. The Comprehensive legislation will integrate both the Trade Unions Act and the Industrial Disputes Act in a single piece of legislation.

Additionally, in order to circumvent the tight labour regulations, and make labour issues more foreign investor friendly, the government has established a number of Chinese-style special economic zones where these regulations do not apply (although it has run into public and political opposition as well) (EIU, 2010).

A-3.1.9 Tax Structure

India’s tax system is heavily reliant on excise and customs duties. Moreover, it is quite complex, with numerous allowances. The system is susceptible to tax evasion, and the underground economy is estimated to be around half the size of the official economy (EIU, 2010). To address these issues, the government is in the process of reforming the tax structure. In 2005 a nationwide value-added tax (VAT) was introduced. The VAT aims to replace complicated state taxes and levies. The government is also committed to introducing a uniform goods and services tax at the national level. In the international arena, India has concluded tax treaties with more than 70 countries (BMI, 2011).

The tax reforms implemented by the government so far have ensured that corporate tax revenues have been good. The main corporate tax rate is relatively high at nearly 34% for domestic firms and 42% for foreign companies (BMI 2011). Local subsidiaries of foreign companies are now taxed at 34% and are entitled to incentives available to Indian companies (EIU, 2010). Resident companies – defined as those where ownership and control are in India – are taxed on worldwide income; non-resident companies are taxed on local income (BMI, 2011).

The effective top individual tax rate is 33.7%. Resident individuals are generally taxed on worldwide income, but individuals who are resident but not ordinarily resident are taxed only on Indian-source of income or foreign income of a business controlled from India (BMI 2011). Residents are defined as those present for more than 182 days in an income year or if present for a total of 365 days in the previous four years.

Short-term gains – defined as gains on assets held for less than three years, or less than one year in the case of listed securities are taxed as income as a part of the Capital gains tax. Long-term gains of companies and individuals are taxed at 20%. Additionally, there is a withholding tax of 20% on interest, and a 10% on royalties for agreements entered after June 1st 2005. However, dividends are not subject to withholding tax (BMI, 2011). Indirect taxes in the form of a standard federal Value Added Tax rate of 12.5% have been introduced. The lower rates are levied at 4% and 1%, with some products and services zero-rated. States also apply indirect taxes, but the government is looking to standardise these (BMI, 2011).

To address the various short comings in the tax system, the government has proposed a radical reform of India’s antiquated tax laws. But it is unclear whether the proposal will receive parliamentary approval (EIU, 2010). On the whole India’s Tax policy risk is estimated to be moderate (EIU, 2010).

A-3.2 Corruption and Bureaucratic Obstacles

Corruption is fundamentally a problem of poor governance. Corruption thrives where states are too weak to control their own bureaucrats, to protect property and contract rights, and to provide the institutions that underpin an effective rule of law (Aslund, 1999; Hellman et al 2000). In corrupt nations, firms make private payments to public officials and use their influence to distort both the legal framework and the policymaking process in an effort to gain concentrated rents with detrimental consequences for the economy and society at large (Aslund, 1999; Hellman et al, 2000).

Even though India has carried major economic reforms from 1991, the economy is still constrained by excessive rules and a powerful bureaucracy with broad discretionary powers (PRS, 2009). Corruption and red tape are major issues of concern for investors in India, and the country has fallen from 84th in 2009 to 87th in 2010 (out of 178 countries) in Transparency International's Corruption Perceptions Index (BMI, 2011). Corruption is prevalent at all levels of authority, with politicians and officials routinely demanding bribes in return for awarding contracts or tenders (EIU, 2010). Non-transparent governance rules, excessive bureaucratic procedures and wide-ranging administrative powers provide bureaucrats and politicians with numerous opportunities to extort bribes (BMI, 2011). In particular, the government procurement system has been identified as being riddled with corruption and malpractice. Moreover, the decentralized federal system of government gives the state governments considerable regulatory powers in India. Due to which regulatory decisions governing important issues such as zoning, land-use and environment can vary from one state to another (PRS, 2009).

On the positive side, the central government's efforts to establish independent and effective regulators in some sectors, such as telecommunications, securities, and insurance, have shown good results (PRS, 2009). In December 2004, the GOI also created an independent pension regulator as part of its larger program to reform India's pension system. It also established a Competition Commission and is working towards further strengthening the commodities futures markets (PRS, 2009). Securities and Exchange Board of India (SEBI) has begun to enforce corporate governance, though many companies are yet to comply. According to foreign institutional investors, corporate governance in India is considered better than many other emerging markets (PRS, 2009).

Some progress has also been made in combating corruption in recent years, with several public officials indicted or convicted under anti-corruption laws (BMI, 2011). Amended anti-corruption laws since 2004 have given additional powers to vigilance departments in government bodies and made the Central Vigilance Commission (CVC) a statutory body. Clusters where the business climate is relatively free of corruption have also been developed, such as in the New Delhi suburb of Gurgaon. Officials of foreign businesses in these areas say that local political and bureaucratic machinery generally leaves them alone (BMI, 2011).

A-3.3 Foreign Investment in India

Foreign Direct Investments (FDI) into India has increased significantly over the last decade. Foreign investors seem to be attracted primarily by India’s large market size, positive cost structure, favourable macroeconomic climate, large educated work force and strong management talent (BMI, 20111). Inward FDI increased to US$ 41.55bn in the financial year 2008/09, from US$ 19.66bn in 2006/07 (Table A-3.3). Although, FDI inflows into India have increased considerably over the last few years, it was still substantially lower than that in China. In 2008/09, the FDI inflow into China was estimated to be US$ 108.3bn (Table A-3.3). Moreover, FDI inflows into India are concentrated on skill-intensive sectors such as information and communication technologies and services (BMI, 2011).

Table A-3.3 Annual FDI Inflows for Select Countries in Asia and Oceania

Country	2006/07 US$ Bn	2006/07 US$ per capita	2007/08 US$ Bn	2007/08 US$ per capita	2008/09 US$ Bn	2008/09 US$ per capita
Australia	25.7	1,255.4	22.2	1,075.7	46.7	2,227.3
Bangladesh	0.8	5.7	0.6	4.7	1.1	7.6
Cambodia	0.5	34.2	0.8	60.3	0.8	55.8
China	**72.7**	**55.3**	**83.5**	**62.5**	**108.3**	**80.4**
Hong	45.1	6,520.6	59.9	8,602.3	63.0	9,000.4
India	**19.6**	**17.3**	**22.9**	**19.9**	**41.5**	**36.0**
Indonesia	4.9	21.5	6.9	29.9	7.9	33.8
Malaysia	6.1	231.6	8.4	316.2	8.1	298.3
Pakistan	4.2	27.5	5.3	34.0	5.4	33.8
Philippines	2.9	33.9	2.9	33.3	1.5	16.9
Singapore	24.7	5,646.5	24.1	5,441.2	22.7	4,695.1
South Korea	4.8	101.6	2.6	54.6	7.6	156.4
Sri Lanka	0.5	24.0	0.5	26.0	0.7	38.8
Taiwan	7.4	324.0	8.1	354.8	5.4	236.2
Thailand	9.0	142.0	9.5	149.9	10.0	156.9
Vietnam	2.4	27.5	6.7	77.5	8.0	92.7

Source: BMI (2011)

Traditionally India has been controlling foreign investment with limits on equity and voting rights, mandatory government approvals, and capital controls (PRS, 2009). But realising the importance of FDI's to the Indian economy, the government has taken several steps towards liberalising its FDI regime. Recently the government allowed for increases in caps on investment in the much protected civil aviation industry and has promised to loosen its restrictions on foreign investment in the rapidly growing retail sector (BMI, 2011). The government has operated a system of automatic FDI approval in a number of sectors, with the list of areas open to investment increasing gradually since the mid-1990s. Some areas do not need government approval, with only a simple notification of the Reserve Bank of India (RBI) necessary (PRS, 2009). But others need approval from the Foreign Investment Promotion Board or the Cabinet Committee on Foreign Investment (PRS, 2009). Additionally, depending on the proposal, approvals might be needed from the Dept. of Economic Affairs (Ministry of Finance), and/or Dept. of Industrial Policy and Promotion (Ministry of Commerce and Industry). The process is complicated further because the rules vary from industry to industry and are changed frequently (PRS, 2009).

Various sectors open to 100% FDI are - manufacturing, advertising and film, power, coal and lignite processing, drug manufacturing, business-to-business e-commerce, hotels, tourism and restaurants, non-banking financial services, petroleum marketing, ports, postal services, and telecoms equipment manufacturing (BMI, 2011). Foreign investment is currently prohibited in many areas or subsectors of real estate, multi-brand retailing, legal services, security services, nuclear energy and railways (PRS, 2009). As a part of the government's privatization process, foreign investors are also allowed to bid for the sale of state owned units (PRS, 2009). In January 2005, the government eased restrictions on new FDI by foreign partners of joint ventures (PRS, 2011). Previously, foreign partners in a joint venture needed to obtain a release by the Indian partner and government approval for any new investment. Now, new joint venture partnerships are free to negotiate the terms as they see fit (BMI, 2011). Hence the local firms' ability to restrict its foreign partner's business strategy has been reduced, but exit strategies and dissolution procedures for existing joint ventures remain uncertain (PRS, 2009).

India has signed bilateral investment treaties with 57 countries. The rupee is fully convertible for current account transactions, and full repatriation of profits is allowed. As a result of these efforts, the confidence levels of foreign investors have been increased. However, investors frequently complain about a lack of sanctity of contract, and the court system is still clogged with disputed cases involving foreign investors (BMI, 2011). Leading sectors for FDI are Information and Communication Technologies, software, business services and consumer electronics. The key country sources of FDI are the US, UK and Germany (Business Monitor International (BMI), 2011).

Although India has made a number of improvements since 1991, the country presents a far from uniform picture in its openness to FDI (BMI, 2011). Overseas investment is still prohibited in some sectors or sub-sectors. A lack of consensus or a clear policy framework within the government is resulting in continued delays in increasing the FDI limit in vital sectors. Realising its full FDI potential will require further measures across a range of areas. Significant obstacles include the lack of an enabling legal environment for investors, an overweening regulatory burden and concerns over labour market flexibility (BMI, 2011).

A-3.3.1 Special Economic Zones

The GOI has established several foreign trade zone schemes to encourage export-oriented production (PRS, 2009). These zones provide a means to bypass many of the domestic economy's fiscal and infrastructural obstacles that otherwise make Indian goods and services less competitive in international markets (PRS, 2009). The most recent of the schemes include the Special Economic Zone (SEZ), Export Processing Zone (EPZ) and the Software Technology Park (STP) (PRS, 2009).

China has been very successful at developing its manufacturing sector by offering tax breaks and other incentives in special zones to attract overseas capital (BMI, 2011). Following China's lead, the GOI too has attempted to implement an aggressive special economic zone (SEZ) policy. The Special Economic Zone (SEZ) is a duty-free enclave with separately developed industrial infrastructure (PRS, 2009). The Special Economic Zone Act, is aimed at attracting industrial investment to rural areas by offering a 15-year tax holiday for activities in the zones. In May 2005, the GOI passed a new legislation called the "Special Economic Zones (SEZ) Bill 2005" to declare its strong commitment to a long-term and stable policy for the SEZ structure. Due to certain controversies over land acquisition for SEZ development projects, the GOI issued new guidelines for SEZ in 2006 (PRS, 2009). Currently SEZ’s account for 22% of India’s export earnings (The Economist, 2011).

SEZs are regarded as foreign territory for the purpose of duties and taxes, and operate outside the control of the Indian custom authorities (PRS, 2009). SEZ units are allowed to retain 100% of their foreign exchange earnings in special Export Earners Foreign Currency Exchange accounts. They are free to sell goods in the domestic tariff area (DTA) on payment of applicable duties. Sales from DTA firms to SEZ units are on par with regular trade transactions and hence eligible to benefit from all export incentive and foreign currency exemption schemes (PRS, 2009). In addition, many state governments have granted a sales-tax exemption for DTA-SEZ sales. SEZ units are also exempt from the central government’s service and excise tax regimes (PRS, 2009).

SEZ businesses are expected to be a positive foreign exchange earner within five years from the commencement of production. None of the FDI equity caps are applicable to units in SEZs, including those sectors reserved for small-scale industries. SEZs are also exempted from the requirements of industrial licensing (PRS, 2009).

A new SEZ legislation has increased the tax holiday period (phased out over time) for SEZ’s from 10 years to 15-years for both SEZ developers and SEZ production units (PRS, 2009). The SEZ legislation also provides for the establishment of an International Financial Services Centre to facilitate financial services for SEZ units. Offshore banking units (OBUs) are permitted to operate in SEZs, virtually like a foreign branch of a bank, to make available financing at international rates. The OBUs enjoy some exemptions from Reserve Bank (central bank) of India, but other limitations have constrained their popularity. After the formulation of the first set of rules for SEZ’s in February, 2006, 531 SEZ projects have been approved so far, and formal notifications for 260 SEZs have been issued (PRS, 2009). The commerce ministry is expecting the SEZs to generate 1mn jobs and attract investments of around US$ 13.5bn (BMI, 2011).

Although legislative changes have been introduced through a new Land Acquisition and Rehabilitation Act, some political unrest over SEZ development projects continue and hence the success of the SEZ policy has been limited. A major challenge for SEZs has been issues related to land acquisition because huge blocks of agricultural lands have been allocated to upcoming SEZs. The farmer backlash has been severe, and this has caused the government's reform drive to stall. In response the government issued guidelines that only uncultivable land can be acquired for SEZ development or if fertile land is involved then it should not be more than 10% of the total area and adequate compensation and rehabilitation to farmers need to be provided (PRS, 2009). However, the compensation and rehabilitation provisions are not transparent. There is also a land ceiling of 5000 hectares on large SEZs which has made it unpopular among many SEZ developers.

Apart from SEZ’s, other initiatives that focus on developing areas for export oriented activities are Export Processing Zone (EPZ) and the Software Technology Park (STP). In addition, India allows an individual firm to be designated an Export Oriented Unit (EOU). All of these schemes are governed by separate rules and granted different benefits (PRS, 2009).

EPZs are industrial parks with incentives for foreign investors in export-oriented business. STPs are special zones with similar incentives specifically for software exports. EPZ/STP units may import intermediate goods duty free (PRS, 2009). EPZ/STP units may sell up to 50% of their level of exports on the domestic market after payment of taxes, with the exception of motor cars, alcoholic beverages, tea, books, and refrigeration units (PRS, 2009).

EOUs are industrial companies established anywhere in India that export their entire production. There are approximately 2,300 fully operational EOUs in India (PRS, 2009). They are granted: duty-free import of intermediate goods; a ten-year income tax holiday; exemption from excise tax on capital goods, components, and raw materials; and waiver of sales taxes. EOUs are permitted to sell up to five per cent of “seconds” on the domestic market after paying appropriate taxes (PRS, 2009).

A-3.3.2 General Policies Concerning Foreign Investments

The process of establishing a business in India is quite complex. Various approvals and clearances are required such as - incorporation of the company; registration and allotment of land; permission for land use in case of industry located outside an industrial area; environmental site approval; sanction of power and finance; approval for construction activity and building plan; registration under State Sales Tax Act and Central and State Excise Acts; and consent under Water and Air Pollution Control Acts (PRS, 2009). Additionally certain Industries need to obtain an environment clearance from the Ministry of Environment and Forests.

Ownership and Establishment: Apart from certain sector-specific restrictions, the GOI allows both foreign and domestic private firms to establish and own businesses in trading companies, subsidiaries, joint ventures, branch offices, project offices and liaison offices (PRS, 2009). However, the GOI does not permit investment in real estate by foreign investors, except for company property used to do business.

Plant Location: Industrial undertakings are free to select the location of a project. The earlier restriction prohibiting location of factories near urban settlements was lifted in July 2008 (PRS, 2009). However, projects still need to get necessary clearance from the concerned state pollution board and the environment industry (PRS, 2009).

Employment: There is no requirement to employ Indian nationals and restrictions on employing foreign technicians and managers have also been eliminated (PRS, 2009). However companies complain that hiring and compensating expatriates is time-consuming and expensive. The RBI has raised the per-diem rate to US$1000, with an annual ceiling of $200,000 for services provided by foreign workers payable to a foreign firm. Employment of foreigners in excess of 12 months requires approval from the Ministry of Home Affairs (PRS, 2009).

Taxes: Most state governments offer fiscal concessions. Large state and central government fiscal deficits, along with attempts to reform both the direct and indirect tax regimes throughout India, have increased uncertainty over tax liability for investors. The general trend, however, has been toward simplification of the tax code, a reduction in tax rates and exceptions, and greater transparency in tax administration.

Sourcing: Local sourcing is generally not required anymore. In some consumer goods industries, the GOI requires the foreign party to ensure that the inflow of foreign exchange and foreign equity covers the foreign exchange requirement for imported goods.

Foreign Trade Policy (FTP): The 2008 annual supplement to the FTP announced some incentives for the export sector, including a duty reduction to 3% from 5% for capital goods imported under the Export Promotion Capital Goods scheme (EPCG is an export incentive scheme that seeks to modernize production facilities); and industry-specific incentives in farm products, toys/sports goods, gems/jewellery, IT hardware and telecommunication. India's FTP exempts exporters from service tax, and provides for duty-free import of inputs and capital goods, exemption from excise taxes on capital goods, textile machinery, components and raw materials, as well as exemption on sales tax at the federal and state level. Tax holidays are available in the form of deductions for priority sectors (PRS, 2009).

Protection of Property Rights: Transactions involving the buying and selling of land are often difficult, complex and unclear because India's legal system puts a number of restrictions and imposes a stamp tax on the transfer of land (PRS, 2009). Additionally, there is no reliable system for recording secured interest in property, making it difficult to use property as collateral or to foreclose against such property.

India has generally adequate copyright laws, but enforcement is weak and piracy of copyrighted materials is widespread (PRS, 2009). But trademark protection is good and meets international standards. The Trade Marks Act of 1999 and implementing regulations accord national treatment for trademark owners and statutory protection of service marks. However, India's weak judicial system can make it difficult to exercise rights established by the law (PRS, 2009). India is currently working on amending its Trademark Laws to make them compliant with the Madrid Protocol. The Indian government in November 2008 approved modification of the Trade Marks (Amendment) Bill 2007 to ensure better protection for Indian trademarks in designated member countries and afford reciprocal protection to trade marks from member countries abroad.

Patent and Intellectual property rights protection laws are quite weak in India. A small but growing domestic constituency of Indian pharmaceutical companies, technology firms, and educational institutions favours improved protection (PRS, 2009). In 2005, India expanded product patent coverage to include pharmaceuticals and agro-chemicals. The GOI introduced these changes through presidential ordinance in order to meet on time India's commitments under the Agreement on Trade Related Aspects of Intellectual Property Rights (TRIPS). The new patent law has been designed to bring India in line with international standards and put local intellectual property rights protection on a par with WTO and Agreement on TRIPS provisions (BMI, 2011). This law eliminated a key tenet of the 1970 Indian Patent Act that restricted patents to manufacturing processes rather than end products (BMI, 2011). However, the new law lacks specificity in several important areas such as compulsory license triggers, pre-grant opposition provisions and defining the scope of patentable inventions (PRS, 2009). Additionally, Indian law provides no protection of trade secrets.

A-3.4 Trade

A-3.4.1 Barriers to Trade

Any restriction imposed on the free flow of trade is a trade barrier. Trade barriers can either be tariff barriers (the levy of ordinary negotiated customs duties in accordance with Article II of the GATT) or non-tariff barriers, which are any trade barriers other than tariff barriers (PRS, 2009).

The government is committed to liberalising its restrictive trade regime as part of an effort to double India's share of world trade. From a very high level, successive Indian governments have worked to bring down tariff rates since the early 1990s. In 2007, peak non-agricultural tariff rate was reduced from 12.5% to 10% (BMI, 2011). However, this progress has been undermined by the imposition of some non-tariff barriers. A 'sensitive' list of imports stretches to 300 items, though the government says these are under constant review. The IMF says there is still considerable scope for further trade liberalisation (BMI, 2009).

With exceptions, most tariffs are ad-valorem – duty levied on the value of the item. All tariffs and duties are reviewed in the annual budget. In recent years India has increasingly relied on non-tariff barriers, including technical standards and regulations, sanitary rules, local content schemes and quotas (BMI, 2011). Non-tariff barriers mainly comprise anti-dumping measures to protect domestic manufacturers. Some of the most commonly exercised trade barriers in India are -

Import Licensing: This is one of the most common non-tariff barriers used by countries to prohibit or restrict imports. India has eliminated its import licensing requirements for most consumer goods. However, certain products like motorcycles and vehicles still face extremely restrictive licensing related trade barriers (PRS, 2009).

Standards, testing, labelling & certification: Though the stated purpose of these non-tariff barriers is to ensure that the goods seeking access into the Indian market are of adequate quality, it is frequently used as a protectionist measure. The Indian government has identified 109 commodities that must be certified by its National Standards body, the Bureau of Indian Standards (BIS) before entering Indian markets (PRS, 2009).

Anti-dumping and countervailing measures: These trade barriers are used to protect domestic industries from the threat of cheap and often subsidised imports flooding the markets. Anti-dumping and countervailing measures are permitted by the WTO Agreements in specified situations. India imposes these measures to protect domestic manufacturers from dumping by foreign firms. India's aggressive implementation of its antidumping policy has, in some cases, raised concerns regarding transparency and due process (PRS, 2009). India initiated 15% of all global anti-dumping cases in the 1995-2004 period (BMI, 2011).

Export subsidies and domestic support: These trade barriers are provided by governments to promote (often nascent) export oriented industries with the objective of making them more competitive internationally. While export subsidies tend to displace exports from other competing countries into third country markets, the domestic support acts as a direct barrier against access to the domestic market. Several Industries receive export subsidies as well and domestic support in India. For example, export earnings are exempt from certain taxes and exporters are not subject to local manufacturing tax (PRS, 2009).

Procurement: The Indian government tends to prefer domestic suppliers over foreign ones. It allows a price preference for local suppliers in government contracts and generally discriminates against foreign suppliers. In international purchases and International Competitive Bids (ICB's) domestic companies gets a price preference in government contract and purchases (PRS, 2009).

Service barriers: The services sector is tightly regulated by the government of India. Within the services sector, industries in which there are significant restrictions include- insurance, banking, securities, motion pictures, accounting, construction, architecture and engineering, retailing, legal services, express delivery services and telecommunication (PRS, 2009).

Other barriers: The government of India gives a substantial advantage to domestic firms through the use of equity restrictions and other trade-related investment measures. The GOI continues to limit or prohibit FDI in what it calls "sensitive sectors" such as retail trade and agriculture (PRS, 2009). Additionally there is an implicit policy that supports counter trade. Several Indian companies, both government-owned and private, conduct a small amount of counter trade (PRS, 2009).

A-3.4.2 Foreign Trade Agreements

India joined the World Trade Organisation in 1995. It has entered into bilateral and regional trading agreements with a number of countries over the years. These agreements, besides offering preferential tariff rates on the trade of goods among member countries, also provide for wider economic cooperation in the fields of trade in services, investment, and intellectual property. The preferential arrangement/plans under which India is receiving tariff preferences are the Generalized System of Preferences (GSP) and the Global System of Trade Preferences (GSTP). Presently, there are 46 member countries of the GSTP and India has exchanged tariff concessions with 12 countries on a limited number of products. The government is also working to improve customs clearance, and is in the process of negotiating a number of regional trade pacts (BMI, 2011).

It has negotiated the South Asia Free Trade agreement (SAFTA), comprising other South Asian countries, and also concluded agreements with ASEAN (Association of South East Asian Nations) and Thailand (BMI, 2011). This will improve its access to a number of promising markets. The SAFTA treaty envisages a trade liberalisation programme, comprising a list for immediate tariff reduction (0-5%) and a residual list. Negotiations are also underway with other countries including New Zealand (India and New Zealand are in the process of concluding and finalizing a free trade agreement). It has also negotiated a preferential trade pact with Mercosur, the Latin American trade bloc (BMI, 2011). Other such preferential arrangements include the SAARC Preferential Trading Agreement (SAPTA), the Bangkok Agreement and India–Sri Lanka Free Trade Agreement (ISLFTA). These arrangements/ agreements prescribe Rules of Origin that have to be fulfilled for exports to be eligible for tariff preference.

India and Singapore have signed a Comprehensive Economic Cooperation Agreement, which is an integrated package of agreements embracing trade in goods, services, investments and economic co-operations in education, science and technology, air services, and intellectual property (PRS, 2009). The agreement, which came into effect on August 1, 2005, provides wide-ranging exemptions and reductions on basic customs duty on products imported from Singapore into India.

India is a member of the World Banks Multilateral Investment Guarantee Agency (MIGA) (PRS, 2009). The GOI states that it has concluded 57 bilateral investment promotion agreements (BIPAs). These included agreements with the United Kingdom, France, Germany, Malaysia, and Mauritius.

A-3.5 Indian Business Environment Ratings

A-3.5.1 Overall Business Environment

In BMI's business environment rankings, India had a relatively low overall score of 44.1 and ranked 13th among select countries in Asia and Oceania (Table A-3.4). India's score was marginally lower than the regional average (45.1) but exactly the same as the global average (44.1) and slightly higher (39.6) than the average for emerging markets (Table A-3.4). New Zealand topped the ratings with an overall score of 81.8, followed by Singapore (80.8). China had a higher ranking (10th) and overall score (51.8) than India (Table A-3.4).

Table A-3.4 Overall Business Environment Ratings for Select Countries in Asia and Oceania

Country	Overall Rating	Ranking	Trend
New Zealand	**81.8**	**1**	**=**
Singapore	80.8	2	=
Hong Kong	78.7	3	=
Australia	74.4	4	=
Japan	71.4	5	=
Malaysia	63.4	6	=
Taiwan	62.7	7	=
Thailand	62.2	8	=
South Korea	60.6	9	=
China	**51.8**	**10**	**=**
Philippines	49.9	11	=
Vietnam	45.2	12	=
India	**44.1**	**13**	**=**
Sri Lanka	42.7	14	=
Indonesia	40.2	15	=
Papa new Guinea	39.4	16	=
Pakistan	36.7	17	=
Cambodia	35.5	18	=
Bhutan	32	19	=
Bangladesh	30.9	20	=
Laos	26.4	21	=
Myanmar	-	22	-
Brunei Darussalam	-	23	=
North Korea	-	24	-

Regional Average 45.1 / Global Average 44.1 / Emerging Markets Average 39.6

Source : Business Monitor International, 2011

India obtained consistently low scores across the various categories measured. In the Infrastructure category India scored 47.4 due to chronic deficits in its transport and power capacities. Japan (80.1) followed by Singapore (79) had the highest infrastructure ratings. Both New Zealand (77.4) and China (56.3) had higher infrastructure ratings than India (Table A-3.5). In the Institutions category India scored just 42 because of a high degree of red tape and poor law enforcement which was considerably holding back private enterprise. New Zealand (91) followed by Singapore (83.9) had the highest institutions ratings.

China (52.4) had a higher rating than India (Table A-3.5). Finally, in the Market Orientation category India scored a low 42.9 due to a high corporate tax rate and the prevalence of trade barriers, mainly in the agricultural sector (Table A-3.5). Hong Kong (85.2) followed by Singapore (79.4) had the highest ratings for market orientation. New Zealand (77.1) had much higher rating than India, while China (46.6) had slightly higher rating (Table A-3.5).

Table A-3.5 Business Operations Risk Rating for Select Countries in Asia and Oceania

Country	Infrastructure Rating	Institutions Rating	Market Orientation Rating	Overall Business Environment
Afghanistan	26.6	24.7	20.5	23.9
Australia	75.0	78.2	70.1	74.4
China	**56.3**	**52.4**	**46.6**	**51.8**
Hong Kong	70.0	80.7	85.2	78.7
India	**47.4**	**42.0**	**42.9**	**44.1**
Indonesia	37.0	31.2	52.3	40.2
Japan	80.1	80.1	55.9	71.4
New Zealand	**77.4**	**91.0**	**77.1**	**81.8**
Pakistan	35.5	32.9	41.7	36.7
Philippines	50.7	39.0	60.0	49.9
Singapore	79.0	83.9	79.4	80.8
South Korea	71.2	52.7	53.5	60.6
Thailand	59.5	59.3	67.8	62.2
Vietnam	47.8	36.7	51.0	45.2

Source: BMI, 2011. Scores out of 100, with 100 representing the best score available for each indicator

A-3.5.2 Ease of Doing Business

According to the World Bank's 2010 Doing Business survey, India ranks a relatively low 134th on the overall ease of doing business in 183 countries (Table A-3.6). New Zealand was ranked 3rd while China received a ranking of 79 (World Bank, 2011). In their analysis, economies are ranked on their ease of doing business, from 1 – 183. A high ranking on the ease of doing business index meant that the regulatory environment is conducive to the starting and operation of a local firm. This index averages the country's percentile rankings on 9 topics, made up of a variety of indicators, giving equal weight to each topic. India scored extremely low in enforcing contracts (182) and dealing with construction permits (165) (Table A-3.6). However, it scored relatively much better for getting credit (32) and protecting investors (44).

Table A-3.6 Ease of Doing Business in India – The World Bank

Topics	Rank
Overall Ease of Doing Business Rank	**134**
Starting a Business	165
Dealing with Construction Permits	177
Registering Property	94
Getting Credit	32
Protecting Investors	44
Paying Taxes	164
Trading Across Borders	100
Enforcing Contracts	182
Closing a Business	134

Source: The World Bank (2011), Doing Business,
http://www.doingbusiness.org/rankings

A-3.5.3 Country Risk Ratings

A recent analysis by the Economic Intelligence Unit (EIU) gave India a poor score of 51 and rating of C for overall country risk (Table A-3.7). This finding indicates that there are significant country risks in India. India received the lowest rating of D, and scores for its tax policy (62) and government effectiveness risk (68). On the other hand, it received relatively better scores (and ratings) for its political stability risk (25) and macroeconomic risk (35) (Table A-3.7).

Table A-3.7 India: Country Risk Ratings

Parameters	Current rating	Current score
Overall assessment	C	51
Security risk	C	46
Political stability risk	B	25
Government effectiveness risk	D	68
Legal & regulatory risk	C	60
Macroeconomic risk	B	35
Foreign trade & payments risk	C	54
Financial risk	C	46
Tax policy risk	D	62
Labour market risk	C	57
Infrastructure risk	C	56

Note: E=most risky; 100=most risky

Source: Economic Intelligence Unit, 2010

A-3.5.4 Legal Framework Ratings

Business Monitor International uses four major parameters – Investor protection, Rule of law, Contract enforceability and Corruption to specifically evaluate countries Legal Framework. Once again India scored extremely low for contract enforceability (11.3), but relatively higher for investor protection (64.2) and rule of law (65.4) (Table A-3.8). Although, India's corruption score was average (45.3), it was higher than that of China (29.3). China's investor protection score (58.5) and Rule of law score (26.8) were also lower than that of India, while its contract enforceability score (86.4) was much higher than India's. New Zealand had extremely high ratings for all four parameters. Its Rule of law scores (92.7) and Corruption score (96.6) were the highest amongst select countries in Asia and Oceania (Table A-3.8).

Table A-3.8 Legal Framework Rating for Select Countries in Asia and Oceania

Country	Investor Protection Score	Rule of Law Score	Contract Enforceability Score	Corruption Score
Afghanistan	1.2	13.7	29.2	6.3
Australia	52.9	91.8	76.5	92.8
Bangladesh	33	28.5	4.6	25.4
Bhutan	12.7	52.9	99.1	65.6
Cambodia	16.7	14.8	40.4	21.3
China	**58.5**	**26.8**	**86.4**	**29.3**
Hong Kong	90.5	44.9	84.5	81.8
India	**64.2**	**65.4**	**11.3**	**45.3**
Indonesia	34.7	37.3	23.3	37.8
Japan	82.5	82.1	75.9	90
Laos	1.2	11.1	50.6	6.2
Malaysia	76.9	56.5	43.9	45.8
Maldives	40.1	41.7	57.7	46.4
Nepal	44.5	27	35.8	25.7
New Zealand	***92.4***	***92.7***	***83.7***	***96.6***
Pakistan	46.5	15.1	35.7	14.1
Philippines	38.7	48.5	33.9	25.1
Singapore	95.6	72.6	76.7	60.1
South Korea	11.1	77	40.3	68.4
Sri Lanka	51.4	52.3	35.3	26.1
Taiwan	64.2	72.4	70.2	72.5
Thailand	63.9	37.7	79.3	38
Vietnam	31.9	24.7	66.9	17.4

Source: BMI, 2011.
Scores out of 100, with 100 representing the best score available for each indicator.

A-3.5.5 Labour Market Ratings

An assessment of the world labour market by the World Bank (and International Labour Organisation (ILO)) gave India a poor score (30) for its labour market rigidity. But, this was marginally better than what China scored (31). However, China had a much higher literacy rate (90.9%) and female participation in labour

(45.9%) than India (Table A-3.9). New Zealand had a very good score (7) for labour market rigidity as well as extremely high literacy rates (99%) (Table A-3.9).

Table A-3.9 Labour Market Assessment for Select Countries in Asia and Oceania

Country	Literacy Rate %	Labour Market Rigidity Score	Female Labour Participation %
Afghanistan	28.1	20	n/a
Australia	99.0	24	45.3
Bangladesh	47.9	28	39.8
Bhutan	47.0	7	31.7
Cambodia	73.6	36	48.8
China	**90.9**	**31**	**45.9**
Hong	93.5	0	46.1
India	**61.0**	**30**	**28.3**
Indonesia	90.4	40	37.0
Japan	99	16	41.6
Laos	68.7	20	50.7
Malaysia	88.7	10	35.2
Maldives	96.3	18	41.1
Nepal	48.6	46	45
New Zealand	**99**	**7**	**46.1**
Pakistan	49.9	43	18.7
Philippines	92.6	29	38.3
Singapore	92.5	0	41.3
South Korea	97.9	10	41.3
Sri Lanka	90.7	20	39.8
Taiwan	96.1	46	20.9
Thailand	92.6	11	46.3
Vietnam	90.3	21	n/a

Source: BMI, 2011 & The World Bank , 2011

A-3.5.6 Trade and Investment Ratings

In the Trade and Investment Ratings of Business Monitor International, India scored relatively low for both major parameters - openness to investment (36.8) and openness to trade (38.9).While both China and New Zealand scored higher than India (Table A-3.10). Hong Kong had the highest score for both openness to investment (96.8) and openness to trade (97.7) among select countries in countries in Asia and Oceania (Table A-3.10).

Table A-3.10 Trade and Investment Ratings for Select Countries in Asia and Oceania

Country	Openness to Investment Score	Openness to Trade Score
Afghanistan	34.7	6.2
Australia	68.6	35.1
Bangladesh	13.8	34.3
Bhutan	33.7	24.6
Cambodia	82.6	81.6
China	**39.9**	**65.5**
Hong Kong	96.8	97.7
India	**36.8**	**38.9**
Indonesia	39.4	60
Japan	5.6	34.4
Laos	35.9	17.7
Malaysia	47.5	97.2
Maldives	27.5	43
Nepal	46.8	20.9
New Zealand	**71.4**	**76.1**
Pakistan	59.6	51.4
Philippines	59.5	62.1
Singapore	67.9	99.6
South Korea	4.9	77.5
Sri Lanka	22.3	57.3
Taiwan	0	87
Thailand	54.8	89
Vietnam	80.7	86.1

Source: BMI, 2011.
Scores out of 100, with 100 representing the best score available for each indicator

A-3.6 Summary and Conclusions

The sustained economic growth of over 7%, large population and rising incomes has made India a popular destination for several multinational firms. The success of multinational firms in foreign countries such as India is strongly influenced by the prevailing local business environment. Thus understanding the business environment is critical for a multinational firm that is planning to enter the Indian market.

According Porter (1998) the Local Context (which is analogous to the business environment) is intricately linked to the performance of a firm in any industry. It defines the association between the four vital elements that govern the performance of a firm – Factor input conditions, Firm strategy and rivalry, Demand conditions, and Related and supporting industries. In general a good business environment is characterised by an efficient legal system, strong creditor and shareholder rights, small regulatory burden for conducting business, and tax system that does not discriminate against incorporated firms (Demirguc-Kunt *et al.*, 2006).

The overall business climate in India is characterised by excessive red tape, lack of transparency, high levels of corruption, an archaic legal system, weak labour conditions and a volatile security outlook. Foreign businesses have to manoeuvre through a maze of rules and certifications to obtain the estimated 70 separate approvals needed for setting up businesses in India (unless they are operating within a special economic zone). Meanwhile, delays are routine and liquidating a bankrupt company can take up to 20 years (BMI, 2011). Moreover, opposition from strong labour unions and political constituencies has slowed reform in such areas as FDI, exit policy, bankruptcy, and labour law. Additionally a significant challenge affecting the business environment in India centre on its poor infrastructure. India's infrastructure output continues to lag behind overall GDP growth and appears to be restricting growth (BMI, 2011). Due to these issues, India scores relatively low for its business environment assessment by several organisations, including the World Bank. Tackling all these issues and improving the overall business environment in India will be a key challenge for the current government as well as governments to follow.

APPENDIX IV

Feasibility Analysis of the Nellore Dairy Project

TABLE OF CONTENTS- APPENDIX IV

FEASIBILITY ANALYSIS OF NELLORE DAIRY PROJECT

List of Tables	**Pg. No.**
Table A-4.1 Market Analysis Based on Population in Vijayawada and Chennai	336
Table A-4.2 Market Analysis Based on Target Group/Segment - Affluent Households	338
Table A-4.3 Herd Composition and feed required on any given day	341
Table A-4.4 Diet composition for the herd (kg DM)	345
Table A-4.5 Diet Composition and Feed Requirements for a Milking Cow	347
Table A-4.6 Significant Places and Features Nearest to the Nellore Project Region	355
Table A-4.7 Manpower Requirements for Day-to-Day Operations	359
Table A-4.7b Educational Institutions in Nellore	360
Table A-4.8 Investments/Fixed Costs	362
Table A-4.9 Recurring/Variable Costs per Year	363
Table A-4.10 Costs of Production	364
Table A-4.11 Economics of the Project	365
Table A-4.12 Market Risk Assessment	366
Table A-4.13 Product/Technology Risk Assessment	367
Table A-4.14 Possible Positive and Negative Social Impacts of this Project	378

A-4.0 Introduction

The data gathered from the world dairy sector analysis, Indian dairy sector analysis and the Indian business environment assessment was used in performing this analysis. Additionally data specific to Nellore region and to the dairy farming model was collected from informal discussions and secondary data sources. This data was used for evaluating each of the 15 feasibility assessment parameters identified.

Fonterra is a New Zealand based dairy cooperative and is one of the largest dairy companies in the world. Fonterra is keen to capitalize on the opportunities presented by a rapidly growing in Indian dairy market. Instead of sourcing milk from domestic producers Fonterra plans on producing its own milk by establishing a large scale (industrial type) dairy farm in India.

A-4.1 Project Scope/ Background/ Context

India is one of the fastest growing economies in the world. Despite the recent prolonged period of global recession (Europe and USA), India has been able to maintain an average growth rate (GDP[1]) of over 7 per cent per annum over the last 5 years. This rapid economic growth has resulted in rising house-hold incomes and increase in the purchasing power of consumers. These large numbers of increasingly wealthy Indians, especially the 350 million strong and upwardly mobile middle class, provide a lucrative market for multinational companies trying to increase revenues and achieve growth.

Under these circumstances, for a multinational dairy company like Fonterra which depends entirely on export markets for revenue, venturing into the Indian market is strategically essential. But Fonterra cannot capture the market by simply exporting its products to India because the import of dairy products into India is strictly regulated by means of tariffs, quotas and non-tariff barriers. It would therefore have to produce or source milk in India and enter the domestic

[1] GDP – Gross Domestic Product

dairy sector. However, given the structure of the dairy industry in India, the task of penetrating the Indian diary market is relatively difficult, especially for a multinational dairy company that has little or no experience in India.

India is the largest milk producer in the world with a total production of around 112 million tonnes in the year 2010. Since India consumes nearly 100 per cent of its production, it is also the largest consumer of dairy products in the world. A key characteristic of India’s milk production process is that most of the milk is produced by millions of small farmers (less than 5 animals) located in villages and small towns (rural areas) scattered across the country. Interestingly, nearly 55 per cent of milk produced by these farmers is consumed by the farm house-hold itself and only 45 per cent of production actually enters the dairy markets. Of this 45 per cent marketable surplus, only 30 per cent enters the formal (organised) sector, while the remaining 70 per cent is marketed by the informal (un-organised) market channels. The formal sector is comprised of cooperatives and large private dairies, while the informal sector comprises milk vendors/agents and small dairies. Although the role of the informal sector is slowly decreasing, it is expected to play a dominant role for many more years to come.

The quality and safety of milk and milk products in India are generally very low by world standards. A recent survey on Milk Quality across India by the Food Safety and Standards Authority of India (FSAI) reported that 69 per cent of milk samples collected failed to meet the basic quality standards (FSAI, 2011). The common adulterants that were found in milk samples included fat, SNF, neutralisers, acids, hydrogen peroxide, sugar, starch, glucose, urea, salt, detergent and formalin. Most of these adulterants could potentially have severe deleterious effects on the health of consumers. Apart from these, quality of milk in India is also characterised by a high Somatic Cell Count and presence of antibiotic residues.

In recent years, with increase in education (literacy rate) in India, there is a growing awareness amongst consumers about such milk quality related issues. A vast majority of India’s middle and upper class families are well-educated and are beginning to realize the ill-effects of consuming unsafe and unhygienic milk.

These consumers have stimulated the demand for better quality milk and are likely to pay a higher price for it.

Most of the dairy companies in India (both privately owned and cooperatives) do not own/operate their own dairy farms, but instead source milk from numerous small farmers. Since the farming system is of subsistence type; it is nearly impossible to implement and monitor milk quality and food safety programs that meet international standards. Moreover penalties for poor milk quality at farm level are non-existent. Hence, even those dairy companies claiming to provide good quality milk, in reality are using the best of the worst approach. Thus, a dairy business that has the capability to produce milk of excellent quality and safety has a good opportunity to capture a niche market whose potential is currently largely un-tapped.

But, local sourcing of milk is not an option for Fonterra at the moment, due to serious quality and safety concerns with the local dairy supply chain. Hence, in order to deliver milk/dairy products of global standards to Indian consumers, Fonterra will have to take control (& ownership) of the entire supply chain from farm to consumer. The only way to achieve this is through vertical integration. However, to be economically viable, sufficient scale in production will be needed before processing plants can be established. Moreover, time to achieve scale is important or else the opportunity may be lost.

Fonterra plans to build/leverage on its earlier experience in large scale dairy farming (in New Zealand and China) by establishing a modern dairy farm in the Nellore region and produce excellent quality milk from NZ Holstein Friesian cows. The farm will have a herd size of approximately 3500 milking cows and would produce close to 70,000 litres of milk a day. During the initial years of operation milk produced on the farm will be sold to one of the large dairy processors in the region. Once the farming model has been fine-tuned and possibly replicated so that sufficient scale in production is achieved, Fonterra will establish a milk processing plant and the milk from the farm(s) will be delivered to this milk processing plant. Following which, the processed milk will be branded and marketed by Fonterra-IFFCO[2].

On the whole the end objective of this venture is to lead towards building large scale dairy farms (by replicating the farming model) so that sufficient scale is achieved to establish Fonterra's own processing plants. This project - by catering to the needs of a niche segment of consumers through the means of a unique model - hopes to create a (new) parallel market and value chain for dairy products in the Indian domestic dairy industry. Since Fonterra has implemented a nearly identical model in China, it has the general expertise and resources to execute this model in India as well.

Although new to India, the concept (farming model) has been quite successful in other parts of the world (USA, Canada, Western Europe, Saudi Arabia). But when applied to the local (Indian) context, the concept is not very clear. This is because the underlying principles, technologies and strategies for large scale dairy farming were developed under a western (developed country) context, hence cannot be directly applied in India. The challenges/constrains to such an operation in India are very different, especially related to material inputs (feed), climate, social, technology, political and environmental.

However this project does fit with Fonterra's overall growth strategy- increasing milk production and entering new markets. Fonterra has successfully implemented a similar project in China and is in the process of developing one in Brazil. Moreover launching this project makes strategic sense because of the follow on business opportunities (exporting Fonterra brand dairy products to India) and new market access that otherwise might not be possible. This particular project might have a small (tiny) market of its own, but it could open up the much bigger Indian dairy products market for Fonterra. India's domestic dairy supply is expected to fall short of demand by close to 40 million tonnes/year in 2020-21. So theoretically India could absorb 100% of Fonterra's dairy exports.

[2] IFFCO – Indian Farmers Fertilizer Cooperative

A-4.2 Demand and Market

As incomes increase in developing countries, one of the first thing consumers do is change their dietary habits from consuming staples to high value agricultural products such as dairy. India is traditionally a dairy products consuming country and dairy products form an integral part of the diet of Indians. It is quite likely that the need and desire to consume dairy products will increase. With its population being largely vegetarian (lacto-vegetarian), milk and milk products form an essential component of an Indian’s diet. It is estimated that nearly 70 per cent of animal protein in the diets of Indians comes from dairy products. Milk and milk products are also deeply linked to the culture, traditions and religious sentiments of the predominantly Hindu (82%) population. Dairy products (especially milk based sweets/deserts) are frequently exchanged as gifts during important occasions and festive seasons. Moreover, milk (or milk product) offerings form an integral part of the rituals performed daily in hundreds of thousands of Hindu temples spread across India.

Due to these reasons (and many more), the per capita milk consumption (although low by western standards) in India is approximately 95 kg/year, which is higher than that in relatively much richer Asian countries such as China, Taiwan, South Korea, Singapore and Hong Kong. It is therefore likely that with further economic growth resulting in increased incomes and rapid urbanisation, the demand for dairy products will rise considerably in India; and the per capita consumption could reach as high as that seen in developed counties (200 kg/year). The National Dairy Development Board (NDDB) has projected that India’s demand for milk will reach around 200 million tonnes in 2021-22. However, going by the current scenario the domestic dairy industry will only be able to supply around 160 million tonnes in 2020-2021. This anticipated demand-supply gap and socio-cultural/traditional attributes associated with dairy consumption ensures that a vibrant market for dairy products exists in India.

The present model is based on an assumption of a likely increase in demand of high quality and safe (hygienically produced) milk. But it is not very clear how much this demand will be. This is because traditionally, consumers' perceptions of milk quality in India are quite different from those in the west. It has been reported that most consumers in India evaluate the quality of milk based on freshness, richness (degree of cream formation), colour and taste. Additionally, convenience factors, such as price, retail volume flexibility, home delivery, relaxed payment schemes, etc. also play a critical role in consumer's milk purchasing decisions. It's often suggested that these factors are probably the most important reason for the existence of a thriving informal milk sector/market in India. The informal sector is able to outperform the organised sector in critical measures while being slightly below/just about adequate on others [The milk man delivers fresh milk at the consumer's doorstep everyday (sometimes twice a day). Also, because of a very short supply chain and no processing/manufacturing costs- he is able to offer lower prices to consumers].

The ability of the manufacturing and distribution system to deliver superior value on factors other quality is unclear. Also, developing brand loyalty and the ability to convert consumers from existing brands to a new one would be challenging. Additionally, a vast majority of Indians have very low incomes by global standards and do not have significant purchasing power. Most consumers will not be able to buy the product. Moreover, these consumers are very price sensitive and issues such as food safety and milk quality are considered a luxury.

But in recent years the consumer in India is becoming increasingly aware of the benefits of good quality milk (and ill-effects of poor quality milk). One contributing factor for this has been the large role media (local and national) has played in bringing poor milk quality related issues in India into the public domain. A segment of "affluent" urban Indians with much higher incomes and purchasing power have begun to demand for better quality milk. These consumers comprise the top 10 per cent of the population and account for 33% of the countries income (India Together, 2003). In absolute terms this segment is made up of nearly 120 million consumers.

On the basis of there being a large demand for dairy products in India, quality focus of this operation, and lack of alternatives (perfect substitutes) in the market, this product should satisfy the market. The current model (through near complete vertical integration) is perhaps the only means of providing these consumers with milk of highest quality. *Therefore it will clearly satisfy a consumer need and offer superior value than available alternatives.* But it is likely that (for target consumers) quality alone might be insufficient to offset the high price for the product. Since no major milk quality related health epidemic has occurred, majority of consumers appear satisfied with current (low quality) standard of milk. Hence, if the product is based entirely on quality, and other attributes (ex. convenience, price etc.) are not considered, it might fail to satisfy the market.

Since the dairy project is located in the Nellore region, probable markets would be the cities/towns that are closest. Apart from the town of Nellore (population 0.80 million), significant markets for milk produced on this farm would be the metropolitan cities of – Chennai (9.24 million; 175 Km), Bangalore (8.42 million; 381 Km), and Hyderabad (6.80 million; 456 Km). Apart from these metropolitan cities, markets also exist in nearby Tier II cities (municipal corporations/towns) such as Tirupati (0.39 million; 130 Km), Guntur (0.81million; 246 Km) and Vijayawada (1.04 million; 289 Km).

Assuming that the milk produced will be sold in Vijayawada and Chennai markets, the following analysis is made (Table A-4.1 and A-4.2). The population of Vijayawada is around 1 million and that of Chennai (including suburbs and greater Chennai metropolitan area) is around 9 million. The average per capita consumption of milk in India is around 250 ml (0.25 L) per day. The total milk consumed by this market of 10 million people would be 2.5 million litres per day or 912.5 million litres per year. The average farm gate price of milk in the region is Rs 16.5/L (0.47 NZD[3]). Based on this price the total value of the market is Rs 15.06 billion (430.28 million NZD). It is projected that the farm will sell 25.55 million litres a year (70,000 L/day X 365 days) at a price of Rs 25/L (0.71 NZD) and will earn revenues totalling Rs 638.75 million (18.25 million NZD) per year. In order to achieve this, the farm will need to obtain a market share in volume terms of 2.80 per cent and in revenue terms of 4.24 per cent (Table A-4.1).

[3] NZD – New Zealand Dollar

Table A-4.1 Market Analysis Based on Population in Vijayawada and Chennai

	Vijayawada City	Chennai City	Both Combined
Population (Approx.)	1,000,000.00	9,000,000.00	10,000,000.00
Per capita milk consumption/Day (Liters) India Average	0.25	0.25	0.25
Total Milk Consumed/Day (Liters)	250,000.00	2,250,000.00	2,500,000.00
Total Volume of Milk Market/Year (in Liters)	91,250,000.00	821,250,000.00	912,500,000.00
Total Value of Milk Market /Year @ Rs 16.5/L Farm gate (in Rs)	1,505,625,000.00	13,550,625,000.00	15,056,250,000.00
Estimated Volume of Milk Sold by the Farm per year	25,550,000.00	25,550,000.00	25,550,000.00
Estimated Revenue from Milk Sale @ Rs 25/L Farm Gate	638,750,000.00	638,750,000.00	638,750,000.00
Market Share in Volume Terms (%)	28.00	3.11	2.80
Market Share in terms of Revenue (%)	42.42	4.71	4.24

In the second analysis we looked at the market from a perspective of the target group/segment- affluent households in Vijayawada and Chennai. The target group/segment is identified as affluent households because it is understood that they have higher household incomes, are less price sensitive, more aware of the benefits of good quality milk (and ill-effects of poor quality milk) and hence are most likely to pay a premium price for the farm's milk. For the present discussion, the unit of analysis is a household since all individuals within a household would generally consume the same type/brand/quality of milk and milk purchase decisions are made at the household level.

Since on average each household comprises of 4 people, there are a total of 2.5 million households in both these markets combined. Assuming that 10 per cent of these are affluent households, we have a total of 250,000 households in our target group. Using the general population average for per capita milk consumption (0.25L/head), each of these households consumes 1 litre of milk (4 X 0.25) each day. The total milk consumption of the target group would be 250,000 litres per day and per 91.25 million litres per year. As the farm plans to sell 25.55 million litres of milk to this market, it would need to achieve a market share in terms of volume (and affluent households) of 28 per cent (Table A-4.2). In a competitive and highly fragmented industry, it will be difficult for a new entrant to achieve such a high market share.

But apart from end consumers and food retailers (who sell milk to end consumers), other important customers for milk produced by the farm would include institutions such as – hotels, restaurants, sweet-meat shops (manufacture and sell predominantly dairy based traditional Indian deserts), educational institutions and hospitals. For these customers, quality and safety of milk is important and they are more likely to pay a higher price (premium) for such milk. Moreover, they have the ability to purchase large volumes of milk. However, most of these institutions would have a preferred milk supplier and getting them to change suppliers would be a challenge.

Table A-4.2 Market Analysis Based on Target Group/Segment - Affluent Households

	Vijayawada City	Chennai City	Both Combined
No. of Households @ 4 people /HH[4]	250,000.0	2,250,000.0	2,500,000.0
No. of Affluent HH @ 10% of total HH	25,000.0	225,000.0	250,000.0
Volume of Milk Consumed per Day (L) by Target Group @ 1L/Day per HH	25,000.0	225,000.0	250,000.0
Total Volume of Milk Market/Year (L) - of Target Group	9,125,000.0	82,125,000.0	91,250,000.0
Total Value of Milk Market / Year @ Rs 35/L (in Rs) - of Target Group	319,375,000.0	2,874,375,000.0	3,193,750,000.0
Estimated Volume of Milk Sold by Farm (Liters)	25,550,000.0	25,550,000.0	25,550,000.0
Estimated Revenue from Milk Sale @ Rs 25/L (Rs)	638,750,000.0	638,750,000.0	638,750,000.0
Market Share in Terms of Volume (%)			28.0
Market Share in terms of Number of Affluent HH (%)			28.0

[4] HH – Household

A-4.3 Production, Technical and Engineering

A-4.3.1 Operations Plan

This farm will be made up of approximately 6930 animals of which milking cows will be 3500, dries 500, R2 heifers 1225, R1 heifers 1225 and calves 455 (Table A-4.3). All animals will be housed in-doors in a free-stall type barn and will be fed a total mixed ration. The two important elements of this operation will be the core dairy farm and fodder/crop production farm. The core dairy farm includes – cattle barns (free stall), calf rearing facility, milking parlour and equipment, and office buildings. This core zone will need to be completely fenced-off from the surrounding areas for bio-security reasons. The fodder/crop production farm will be located adjacent to the core dairy farm, but will be separated by a buffer zone (for bio-security). The crop farm would include – Maize production zone, Hybrid Napier production zone, Lucerne production zone, silage pit/tower, feed (bought in) storage facility and office buildings. The entire crop farm will also need to be fenced for bio-security reasons. A staff residential facility might need to be constructed for on-farm staff and family. All of the total 550 ha of available land will be utilised.

A-4.3.2 Production Methods and Equipment

The dairy farm would consist of 3500 milking dairy cattle of the NZ Holstein Friesian breed. They will be imported from New Zealand. It is expected that these dairy animals will yield approximately 6000 Litres of milk per lactation (305 days) or on an average 20 litres/day. Although it is much less than the productivity achieved by a Holstein Friesian dairy cow in similar farming systems in the USA, this level of productivity would be optimum for the present scenario because of issues related to availability of quality feed resources.

It is essential for a farm of this type to have well-designed breeding, feeding and animal health management systems in place. In order to achieve this, excellent data-recording, and analysis systems will be fundamental. Proper cow identification through RFID[5] tags will be vital. Individual cow data from RFID tags will be transferred on a daily basis onto the central herd management database. The database will be managed using a comprehensive herd management program. This integrated system of data capture and management will form the foundation for implementing breeding, feeding and animal health related management strategies.

These data recording and management systems are well developed and widely used on dairy farms in USA. But they are not available in India and will need to be imported. Access to local service and support services will be limited. Also, it must be noted that it's highly unlikely for local personnel to have an understanding of RFID or intensive data based dairy herd management systems. Hence execution would be quite difficult.

A-4.3.2.1 Feeding

Having possession/control of a fodder/forage crop plantation is one of the most significant positives of this dairy farm model. It ensures feed costs are reduced considerably, and gives greater control over feed resources quality/supply and makes the management of such a large scale dairy farm much more effective and efficient.

But given the large amount of feed required (34.72 million kg DM/year), even if all land resources available to the project are used, only 36% of the total feed or 50% of milking cows feed requirements can be met from own grown forages (Table A-4.3). Therefore a large amount of feed will need to be sourced locally. This would mainly comprise of agro- industrial by-products and crop residues. A detailed description and analysis of feed composition and related issues is presented in the Material Inputs/Supply section.

[5] RFID – Radio Frequency Identification

Table A-4.3 Herd Composition and feed required on any given day

	Milkers	Dries	R2 heifers	R1 heifers	Calves	Total
Numbers	3500	525	1225	1225	455	6930
Cow/day (kg DM)	20	11	9	5.5	3.5	
Total /day (kg DM)	70,000	5,775	11,025	6,737.5	1,592.5	95,130
Total /year (kg DM)	25,550,000	2,107,875	4,024,125	2,459,188	581,262	34,722,450

A-4.3.2.2 Housing

For the purpose of efficient management the dairy cattle will be housed in 4 cattle barns. The first barn will comprise of 2 sections and will be designed to house 1) Calves, 2) Young heifers. The second barn will comprise 3 sections and will house 1) Dry cows, 2) Transition cows and 3) Sick cows. The third barn will also comprise of 2 sections and will house 1) First lactation heifers, 2) Second lactation heifers. The fourth barn will comprise of 1) Older cows (3 to 7 lactations). All milking cows will be housed in a free-stall type barn with a 4 row drive through feeding design. The covered space required per milking cow will be around120 Sq. Ft in such a system. If not all barns, at least both barns housing milking cows will need to be equipped with ventilation and cooling systems.

Since this would be a first of its kind construction operation in India, an engineer/supervisor familiar with constructing free stall cattle barns from abroad will be needed. Also key elements such as the cooling systems and other material might need to be imported. The lack of local know-how and support services in these areas could be a significant constraint for the project. It would result in delays, project over-runs and improper design/poor construction.

A-4.3.3.3 Breeding

The breeding system has to ensure that desired objectives such as inter-calving interval, days in milk to 1st and 2nd AI[6], and target conception rates and pregnancy rates are met. This can only be achieved by means of a synchronised breeding protocol. The most commonly used (and well accepted) synchronised breeding protocol is the Ovsynch. The Assistant herd managers will be responsible for implementing the Ovsynch protocol on the proposed farm. The semen for AI will have to be imported from New Zealand. Due to the socio-cultural complications associated with culling of bull calves, it is suggested that a high proportion of sexed semen be used to ensure lesser production of bull calves. Additionally, it might be worth considering the option of incorporating genetics from local breeding service providers in order to produce cross-bred (hybrid) offspring's (which are more tolerant to local conditions) that can be supplied to local farmers or retained by the farm.

A-4.3.3.4 Milking

Milking of cows will be done twice a day in a primary parlour comprising a double 50 parallel (or parabone) milking parlour and secondary parlour comprising of a 20 a side herringbone (parabone) parlour. The primary milking parlour will be equipped with 100 milking machines and the secondary parlour with 20. The milking system design and equipment supply will be by DeLaval-India. Each milking will be performed by 6 skilled milkers (who will be in the parlour pit) and will be supervised by a milking supervisor. All standard guidelines related to cow preparation and hygiene will be followed during milking.

The primary parlour will be used to milk high production cows, while the secondary parlour will be used to milk cows with lower production (close to dry off), high SCC[7] milk (poor quality), sickness, antibiotic treatment and colostrum.

[6] AI – Artificial Insemination
[7] SCC – Somatic Cell Count

Having two parlours and segregating the milk will be vital to producing high quality and safe milk by this farm. The harvested milk will be stored under refrigerated conditions (<4ºC) in bulk milk coolers (15,000 Litres X 5). Milk produced on the farm will have to be procured by the processor on a daily basis by specifically assigned refrigerated milk tankers.

Majority of milking equipment for this farm will need to be imported. This would present a challenge when it comes to routine maintenance and repairs, because none of the local personnel will be familiar with it and also getting replacement parts and spares could be difficult.

A-4.4 Material Input/Supply

There is a close relationship between the definition of input requirements and various project stages, such as definition of plant capacity, location and selection of technology and equipment, as these interact with one another (UNIDO, 1978). In our model, the most critical input is feed because it is the most important limiting factor/constraint. Ideally, the farming model (especially farm size and production model) should be driven by issues/factors associated with feed. In this case, after considering feed related factors target productivity per cow was reduced. That is, instead of focusing on obtaining maximum production per cow given its genetic potential, production per cow was framed (& lowered) based on the best available ration (feed resources) under local conditions.

In essence a dairy farm is a production operation that converts feed (input) into milk (output). As discussed earlier, a dairy farm of the magnitude proposed in the model requires large (by Indian dairy farming standards) amounts (34.72 million kg DM/year) of feed (Table A-4.3). Ensuring that the feed requirements of this farm are met would be one of the biggest challenges that this farming model will face.

In USA and Canada, where factory type dairy farms like that proposed in the current model are quite common, Maize (corn) silage, Alfalfa (Lucerne) grass hay and Corn grain usually form the major portion (85%) of a cow's diet. Using a similar diet to feed cows in this model may not be viable because growing large amounts of these forage crops under local conditions is near impossible- mainly due to lack of suitable land. Moreover, production risks are considerable (weather, plant disease etc) and could significantly impact farm performance.

Due to the enormity and complexity of this model, challenges associated with efficiently managing feed inputs are huge. Moreover, from a logistics, transaction cost and risk perspective, it would not be viable to source the entire feed requirement of the farm from third parties (local farmers and agro-industries). This is because of issues associated with the negotiation, collection, storage and transportation of variable amounts of feed from several thousand local farmers. The quality and composition of feeds would vary considerable between farmers, resulting in productivity issues. Also, sourcing feed from several farmers introduces significant risks associated with the transmission and spread of cattle diseases such as FMD, Anthrax etc. It's therefore suggested that the farm diversify (dilute) its feed risk by own-growing a proportion of feed (as an independent operation) and sourcing the rest from local farmers and agro-industries. However, backward linkages of production of basic inputs such as feed usually require large capital outlays and should be considered as well.

After considering both nature of the farming model and prevailing agro-economic environment in India, it is best to ensure that feed inputs comprise a mix of – forages, and local agro-industrial by products and crop residues. The farm should focus on growing high quality forages such as Maize, Hybrid Napier grass and Lucerne. Forages/crop residues such as Napier grass, Leuceana, sugar cane (tops), legume (peas) residues and paddy straw can be sourced from local farmers. Agro-industrial by products such as – rice bran, cotton seed cake, palm kernel extract, soy hulls, molasses etc can be sourced from local agro-industries. Based on this rationale and likely feed requirement per cow (animal)/day diets has been formulated for the different categories of dairy animals (Table A-4.4).

Table A-4.4 Diet composition for the herd (kg DM)

Feed	Milkers	Dries	R2 Heifers	R1 Heifers	Calves
Maize (forage)	3.5	0.0	0.0	0.0	0.0
Hybrid Napier (forage)	5.0	2.0	2.0	2.0	1.0
Lucerne (forage)	1.5	0.0	0.0	0.0	0.0
Leuceana/Soobabul (forage)	1.0	0.5	0.0	0.0	0.0
Paddy Straw	2.0	1.0	1.0	0.5	0.0
Rice Grain (broken)	2.0	1.0	1.0	1.0	0.0
Rice Bran (de oiled)	1.0	2.0	1.0	0.5	0.0
Wheat Bran	1.0	1.0	1.0	1.0	0.5
Cotton Seed Cake	1.0	2.0	2.0	0.0	0.0
Molasses*	1.0	1.0	0.5	0.5	0.0
Sugarcane Tops	1.0	0.5	0.5	0.0	0.0
Calf Starter	0.0	0.0	0.0	0.0	2.0
Total (kg DM)	20.00	11	9.0	5.5	3.5

The feeds that can be grown on farm are - Maize, hybrid Napier grass and Lucerne. These forage crops (in silage form) will constitute 50 per cent of the diet of milking animals alone. However, to produce required amount of feed, substantial amount of land (by Indian standards) – 489.10 hectares will be required. Due to strict agricultural land ceiling laws in AP state (and also other states of India), no individual farmer is allowed to own more than 21 hectares of land. It would hence be impossible rent/lease/or buy a continuous track of required amount of land from local farmers. Moreover, there has been a spate of agitations across India in response to buying/acquiring agricultural land from farmers for infrastructural, industrial and real estate purposes. The farmer backlashes were very severe and violent in some regions resulting in deaths and damage to property.

A significant plus for this project is that a substantial portion of agricultural land requirements can be met without much hassle. Since all of the land that is available for lease/acquisition is government (or IFFCO) owned there would be no need to negotiate with (for buying/leasing) or displace local farmers.

A-4.4.1 Milking Cow Diet – Explanation

Since milking cow feed requirements account for a major proportion of total feed required by the farm, a detailed explanation is provided. Going by the prescribed diet (ration) a total of 70 tonnes of DM per day or 25,550 tonnes of DM per year would be required for milking cows alone (Table A-4.5). All milking cows will be stall feed on a total mixed ration (TMR) comprising forages (Maize + Hybrid Napier grass + Lucerne silage), crop residues (Leuceana, paddy straw, sugarcane tops) and agro-industrial by-products (rice grain, rice bran, palm kernel nut, cotton seed cake, and molasses). In theory, each milking cow will require to be fed 20 kg of DM[8] per day. Of this, based on available land, forages would account for only 50 per cent (10 kg DM). The remaining 50% will need to be met through feeding of - crop residues 10 per cent (2 kg DM) and agro-industrial by-products 40 per cent (8 kg DM) (Table A-4.5).

[8] DM – Dry Matter

Table A-4.5 Diet Composition and Feed Requirements for a Milking Cow

Feed	Kg DM/Cow/ Day	Total Kg DM/Day (3500 cows)	Total Kg DM/Year	Cost/ Kg DM (NZD)	Total Costs (NZD)
Maize (forage)	3.5	12250.0	4471250.0	0.00	0.0
Hybrid Napier (forage)	5.0	17500.0	6387500.0	0.00	0.0
Lucerne (forage)	1.5	5250.0	1916250.0	0.00	0.0
Leuceana/Soobabul (forage)	1.0	3500.0	1277500.0	0.30	383,250.0
Paddy Straw	2.0	7000.0	2555000.0	0.03	79,843.7
Rice Grain (broken)	2.0	7000.0	2555000.0	0.36	922,638.8
Rice Bran (de oiled)	1.0	3500.0	1277500.0	0.17	212,916.6
Palm Kernel Nut	1.0	3500.0	1277500.0	0.39	496,805.5
Cotton Seed Cake	1.0	3500.0	1277500.0	0.25	319,375.0
Molasses	1.0	3500.0	1277500.0	0.25	319,375.0
Sugarcane Tops	1.0	3500.0	1277500.0	0.25	319,375.0
Total	**20.0**	**70,000.0**	**25,550,000.0**		**3,053,579.8**

A major issue related to the production of forage crops is the quality of soil and climatic conditions. The soil in the Nellore region may not be ideal for farming forage crops such as maize, but with proper inputs and management practices maize can be cultivated. It is estimated that maize yields close to 25 tonnes DM/ha/year can be achieved at the proposed site. Maize will be cultivated on 178.8 ha of land and will yield 4471.25 tonnes of DM/year.

Hybrid (hyb) Napier is the most commonly cultivated fodder grass in Southern India. This grass is well adapted to grow in rice and sugarcane producing soils which are predominant in Nellore. Being a grass that is widely cultivated as a forage crop, local know how about managing this crop is quite good. It is reported that on well managed and irrigated farms, total yield would be around 35 tonnes DM/ha/year. In this project hyb Napier will be cultivated in 182.5 ha of the farm land, giving an approximate DM yield of 6387.5 tonnes/year.

Lucerne grass is an excellent legume forage crop and is used for the feeding of dairy cattle the world over. It is a rich source of protein in the diet. Like in the case of maize, it too can be grown in the Nellore region provided proper management practices are developed and followed. It is estimated that an approximate yield of around 15 tonnes DM/ha/year can be achieved. To meet the herds yearly Lucerne requirements (1916.25 tonnes of DM/year), it will need to be cultivated on 127.75 ha.

In general, state of the art cultivation methods (which will include – land preparation, sowing, fertilization systems, weed control operations, harvesting technologies, and irrigation systems) will need to be used to manage the fodder plantations. But even after adopting such methods, it is possible for yields to fall below expectations. Also service support and local know-how about such state of the art cultivation methods may not be available.

All three forage crops would require irrigation to achieve required levels of productivity. Although water is a critical limiting factor for agricultural operations in India, it appears that there is sufficient ground water in the region and irrigation systems can be established. However, this needs to be thoroughly investigated further by a hydrologist. Also, prior to starting this venture, it might be good idea to set up experimental growing farms to establish the validity and viability of growing these forage crops.

Apart from forages that will be grown on the farm/project site, a considerable amount of other feed inputs (which will make up the remaining diet) will also be required. These feed inputs, mainly comprising of crop residues and agro-industrial by products will need to be sourced from third parties. Since the Nellore area is a substantial rice growing region, rice/paddy based feeds are available almost year round. By products such as rice bran and rice grain can be sourced from several of the locally operating small and medium scale rice mills.

Rice based crop residues like paddy straw (rice hay) can also be easily sourced from local paddy farmers. A supply contact with one or more of the sugar/cane crushing factories will ensure that the farms molasses and sugar cane tops requirements are met. Leuceana (locally known as Soobabul) is a tree fodder that can be used to feed cattle. The farm can source this fodder from local farmers (no market- either formal or informal exists for Leuceana). Alternatively, the farm can possibly grow leuceana along the outer fencing of its crop farm. This practice is quite common in AP, especially around horticultural plantations. Both the palm kernel nut and cotton seed cake requirements of the farm may not be easily available in Nellore district. The farm can consider sourcing these feeds from adjoining districts of AP such as Prakasham, Guntur, Krishna and Chittoor. Moreover, since there is a fairly high degree of substitutability of these (agro-industrial by products) feed inputs, the farm could incorporate various other conventional or non-conventional feeds as when the situation demands.

In general considerable volatility in the availability and price of these feed inputs exists. A model based on least cost combination of available feed resources will need to be developed and used on a regular basis to arrive at the best diet at given point of time. This would require considerable effort in the area of feed market intelligence – to gather accurate and timely information. Also, the prospect of sourcing feeds from numerous third parties will present a huge logistics challenge. Additionally, quality control of feed supplies will also be very difficult to monitor. However, if these challenges are not addressed, it’s quite likely that feed requirements will not be met and the model will be unsuccessful.

A-4.4.2 Auxiliary Materials and Farm Supplies

Apart from feed, the project also requires various auxiliary materials and farm supplies such as – breeding services (hormones & semen), preventive and therapeutic drugs, spares, repair/maintenance materials, fuel, office supplies etc. There exist considerable challenges with the sourcing of some these auxiliary materials. For example, although India has a huge state run breeding program for cattle, the specific breeding needs of this farm cannot be met by the local breeding service providers. The farm will therefore need to have its own (in house) breeding service operations. This would require import of hormones and genetic material (semen straws) from abroad. Additionally, many of the spare parts for equipment will not be available locally and will have to be imported. Not only would this increase costs but would also cause critical time delays.

A-4.5 Location and Site

Nellore region was selected because Fonterra's Indian partner in this venture IFFCO has ownership/control of a sizable amount of land at an SEZ[9] in Nellore.

District Overview:

Nellore district is one of the coastal districts of Andhra Pradesh and is divided into 46 revenue mandals. It is situated in the south-eastern part of the State and has a geographical area of 13,160 sq.km. As per 2011 census, the population of the district is 2.96 million with a population density of 224 per sq.km. The district is bounded by the Bay of Bengal in the east and has a coastline of 169 km.

With 77.3 per cent of the districts' population being classified as rural, agriculture forms the principle occupation of the population. Out of 1.36 million hectares of total geographical area, 18.7 per cent is under forest cover, particularly in the western part of the district. The total cropped area is 0.38 million ha (29.0%) and the net area sown is 0.34 million ha. In Nellore district, the most commonly cultivated crops are paddy, sugarcane, black gram, sunflower, tobacco and fruit (mango & citrus) crops. The cultivation of cash crops like chillies and cotton is relatively much less due to the high risks involved.

The soils of the district are classified as red, black and sandy. The red soils are predominant and cover over 40 per cent of the area, whereas black cotton soil and sandy loams occupy 23 per cent and 34 per cent of the area respectively.

[9] SEZ – Special Economic Zone

For projects that are not largely resource or market oriented, it’s recommended that an optimum location would be one that provides a combination of – reasonable proximity to raw materials and markets (centres of consumption); favourable environmental conditions; basic infrastructure facilities, a good pool of labour, adequate power and fuel supply, and facilities for proper waste disposal (UNIDO, 1978).

Due to the significance of transport costs, proximity to market and raw materials are considered very significant factors in agro-industrial projects. Therefore, it is suggested that the base unit (dairy farm) should be located near the source of basic input materials or else transport costs might be high. However, due to the perishable nature of agro-industrial products (milk in particular); it may be more advantageous to locate production sites near principal consumption centres. Hence, by taking either a resource orientated or a market oriented viewpoint, the project location could follow in the locality of resources or the consumption centres as the case may be.

In this particular farm model, it is far more important to be situated close to the source of basic input materials – feed. Although the proposed site (dairy farm) is located relatively far from consumption centres, it is very close to feed inputs. For this reason the proposed site is considered to be a good option. Apart from these two factors, other location (local) factors which could exert considerable influence on the projects’ economics such as –infrastructure, climate, proximity to sensitive places, social environment, public policies, etc. - need to be considered in the analysis of location as well.

Infrastructure is vital to the operation of the proposed dairy project and therefore power/energy availability, transport, water, communication and living requirements of the staff affiliated to the project needs to be assessed. India in general and the AP[10] state in specific suffer from a power deficit. The lack of foresight by the political establishment in investing into power generation projects, in conjunction with poor policies such as providing free-of-cost power

[10] AP – Andhra Pradesh

to farmers (in AP state for example) are blamed for the severe energy crises in India. Consequently, in order to feed the mega cities with critical power, rural areas are frequently starved of power. Power cuts ranging from 4 to 8 hours a day are quite a frequent phenomenon in many parts of the AP state. The inadequate/erratic availability of electricity can be a major constraint for this project because it is indispensable for operating the milking parlour, refrigerators, cooling systems and other vital on-farm equipment/machinery. The project might have to meet some of its power requirements from generators; thereby increasing the cost of production considerably.

However, since the project is located in a SEZ, power supply would probably be more reliable and regular than in other areas. Moreover, the central government has made “power” a priority issue and has begun a massive investment effort (through public-private partnership) in this sector. Apart from thermal, wind and hydroelectric projects, the government is focused on meeting a large portion of its energy requirements from nuclear sources. Joint partnerships in this area with USA and Russia will ensure that at least 30 nuclear power plants will be operational by 2030. In Nellore region specifically, a mega thermal power project has been sanctioned in the Krishnapatnam area. To the project’s benefit, this will ensure that the region does not have a critical shortfall in power requirements.

Good transportation/access to and from the farm is needed to ensure seamless flow of inputs into the farm and products (out) to markets. Since the proposed site is located right next to one of India’s major national highways (NH-5), road transportation systems/facilities would be close to the best India can provide. The site is also at close proximity to a major railway line (Chennai – Howrah line) which gives it access to railway facilities as well. Additionally, a major sea-port has been recently constructed at Krishnapatnam (24 Km from Nellore city), which gives the project site access to sea-transport facilities as well. The closest international Airport with state of the art facilities is located at Chennai (180 Km). Thus from a transportation perspective, this site appears to be a good one.

Finally the availability of good telecommunication and networking facilities is also essential for smooth and efficient functioning of an agro-industrial project. Well-developed telecommunication infrastructure and an extremely competitive telecommunication industry have ensured that excellent telecommunication systems are available almost anywhere in southern India. Major telecom companies – such as BSNL, TATA's, AirTel and Reliance have operations in the Nellore region. Hence this may not be a constraint for the proposed project site.

A-4.5.1 Water Supplies

Due to the considerable water requirements of this project- especially for irrigating forge crops and cleaning operations; water availability is critical for the success of this project. An analysis of water supply is therefore essential. The district is drained by Pennar, Swarnamukhi, Upputeru and Manneru rivers. There are two medium irrigation projects - Kanupur canal and Gandipalem project with a registered ayacut (area served by the irrigation project) of 7,679 and 6,475 ha respectively. The annual rainfall of the district is 1088 mm, which ranges from 894 mm at A.S. Pet mandal to 1331 mm at Sullurupet mandal. Overall, the district has had 13 per cent above normal rainfall during the period 2000-2006, indicating the absence of drought in the region.

The district is dependent on ground water for irrigation and domestic needs. 60% of the irrigated area is through ground water, which consists of 30,416 bore-wells and 35,239 dug-wells. The general depth of dug-wells varies from 7 to 10 m with sizes of 7 x 7 or 10 x 10 m. The yield of dug-wells ranges from 15 to 36 cu.m/hr. The deeper aquifers in consolidated formations are generally tapped by bore-wells of 0.1 to 0.18 m dia bore-wells with a general depth of 40 to 70 m. The yields of the successful bore-wells vary between 0.5 and 7 liters per second, depending on available potential aquifer zones and when fitted with 3 to 7.5 HP submersible pumps. Overall, the district falls under safe category and only 8 mandals fall in the semi-critical category where ground water is under stress due to citrus and mango orchards.

The ground water in shallow aquifers in the district is generally suitable for domestic and irrigation purposes. Ground water in dug-wells and bore-wells in consolidated and semi-consolidated formations is good except in small patches where high mineralization is reported. At this site in particular, the ground water quality has been reported to be good/adequate. But given the enormous water requirements of this project, even a relatively good area in terms of water supply may not be adequate.

A-4.5.2 Public Policies

The role and impact of public policies on the project need to be evaluated as well. Since this project is located in a SEZ this factor (public policies) assumes critical significance. There are several benefits and financial incentives/subsidies that are given to industries located in SEZ's. These include easy access to capital at low cost, tax holidays for up to 10 to 15 years, much better supply of power/energy, more transparent administrative and bureaucratic processes, more effective and efficient legal machinery etc.

It should be noted that SEZ's were created with the specific objective to promote export oriented activities and increase India's foreign exchange earnings. As a result, if an industry situated in an SEZ wants to sell its product in the Indian domestic market (domestic tariff area) - like in this model; it would have to pay the domestic tariff similar to imports. This policy would cause an increase in the price of end product – possibly resulting in the model being financially unviable. However, since food security is a top priority negotiations with the government could lead to a reduction (or elimination) of these tariffs.

A-4.5.3 Proximity to Sensitive/Significant Places

It is vital that the project site is not close to sensitive/significant places of interest. This site is reasonably far off from sensitive places or features such as national parks; wildlife sanctuaries; biosphere reserves; military/defence installations; and places of historical, religious, or cultural importance. A list of sensitive places closest to the proposed project site and approximate distance is given in Table A-4.6.

Table A-4.6 Significant Places and Features Nearest to the Nellore Project Region

Type	Place	Approximate Distance (KM)
Military Establishment	Chennai	180
Cultural or Historical Place	Venkatagiri	110
Wildlife Sanctuary or Biosphere	Nelapatu Lake	120
Reserve	Pulikat Lake	95
National Park	Penchala Kona	135
	Kaligiri	65
Dam/Reservoirs	Kandaleru	75
	Somasila Dam	85
Religious Importance	Sri Balaji Temple, Tirupati	180
Other - Satellite/Rocket Launching Station	SHAR, Srikarikota	135

A-4.5.4 Conditions and Local Environment

Climate is an important location factor for this project. Apart from the direct impact it has on project costs associated with factors such as humidification, air conditioning, refrigeration, drainage systems, and cooling systems, the broader environmental effects of climate need to be assessed as well.

The climate of the south-eastern coast of the Bay of Bengal where Nellore district lies is generally characterized by annual seasonal monsoons that divide the year into three seasons: (1) the northeast monsoon (post monsoon) from October to March is the cool season with predominantly north-easterly winds; (2) the pre-monsoon from March to May is usually the hottest part of the year, and with a cyclones sometimes occurring in May; (3) the southwest monsoon runs from June to September and is characterized by predominantly southwest winds.

The peculiarity of the Nellore district is that the contribution of the south-west monsoons to annual rainfall is far less than the contribution of north-east monsoon rainfalls. About 70 per cent of the annual rainfall is contributed by the north-east monsoon. The heaviest rains occur between August and December. Rainfall is highly variable in extent and duration. During the pre-monsoon and post-monsoon periods, rainfall is brought by frequent cyclones that are consequences of depressions in the Bay of Bengal. The annual average rainfall of Nellore is 1,042 millimetres, occurring over an average of 48 days a year. Relative humidity is high and fairly uniform throughout the year, ranging from 46 to 84 per cent, with an average of 67 per cent.

The local area, as monitored by the Indian Meteorological Department at Nellore town, has an average daily minimum temperature ranging from 19.9°C in January to 27.9°C in May, and average daily maximum temperatures varying from 28.9°C in December to 41.4°C in May. However, the daily maximum temperature on certain days in May and June can reach as high as 45ºC.

The high temperature and relative humidity in Nellore region make it unsuitable for maintaining high producing dairy cattle such as Holstein Friesians. The average daily temperature even during the coldest month of the year (December) is above the thermo-neutral zone for these animals. The climatic environment would put these dairy cattle under considerable heat stress for almost the entire year. Considerable amount of energy will be spent by dairy animals for thermo-regulatory functions and this would reduce their efficiency of milk production. Moreover other complications associated with heat stress – such depressed immunity, reduced fertility and increased risk of disease could also have significant impacts.

A-4.5.5 Socio-Cultural Environment

The overall population density for Nellore District was 222 people per sq. km, with an average household size of 4.0. The average literacy rate was 54.1%, 48.4% for women and 60.0% for men. Hinduism is the most widely practiced religion of the region. Agriculture is the dominant economic sector in the area. Most households keep a few buffalo, cows, bulls/bullocks, goats, poultry, and sheep. The area also supports aqua culture in artificial ponds. All local villages have access to electricity and basic social infrastructure and services, including access to roads, water supply, post and telephone services, schools, and public transportation. Telugu is the official language of state and also the region. Majority of the population speaks and understands just telugu. A small minority (located in Urban areas) do speak/understand English and Hindi as well. The region is largely peaceful and free from social tensions, such as communal and politically motivated riots.

The project site is located about 10 KM from the Nellore city and is well connected by public transport. Travel from project site to Nellore wouldn't be difficult. Nellore city being the district capital is reasonably well developed in terms of basic medical care, recreational centres, schools and educational institutions, shopping facilities and places of worship. But access to more advanced medical care and international educational institutions are available only in Chennai (180 Km). On the whole, the socio-cultural environment does pose a challenge to the establishment and operation of the dairy farm.

A-4.6 Labour & Management

The provision of qualified and experienced personnel, especially managers is a basic prerequisite for successful project implementation and operation. But the inadequate skills and experience of local staff will reduce the performance and productivity of this farm, especially in the initial stages. Most of the roles that require limited skills and little knowledge like – milk harvesters, herdsmen, milking supervisor, technical support staff, finance/administrative staff and machine operators can be easily filled by recruiting personnel from Nellore region. Roles that require specialized skills and knowledge like: Assistant herd & farm manager, engineer, IT & data analyst, and Asst. General Manager may not be available locally in the Nellore region. These personnel will need to be recruited from other regions of AP state or other regions of India. All personnel will require extensive training/capacity building to make up for essential knowledge and skill gaps.

Finally, roles that are highly specialized and require considerable amount of knowledge and experience of large scale dairy farming systems such as Herd Manager and perhaps General Manager will not be available in India. This can be compensated through the employment of foreign personnel. This is often very expensive and does not help in developing indigenous managerial skills, which would be essential for long term projects. Ideally the purpose of foreign managerial personnel should be to train suitable domestic counterparts who can take over responsibilities gradually. This transfer of management skills is of great importance to a developing country and can be viewed as being parallel to transfer of technology.

It is assumed that the farm will require 40 personnel to efficiently and profitably carry out day to day operations (Table A-4.7). Depending on role & responsibility the wages of employees range from NZD 313/month to NZD 7000/month. On the whole, the total cost of labour and managerial personnel is expected to be around NZD 430,500/ year (Table A-4.7).

Table A-4.7 Manpower Requirements for Day-to-Day Operations

Skill Type/Role	Units	Wage/ Unit/Month (NZD)	Total/ Month (NZD)	Total/ Year (NZD)	Qualifications	Local Availability	Level of Training Required
Milk Harvesters	10	313	3125	37500	HSC or SSC	XXXXX	*****
Milking Supervisors	3	500	1500	18000	BSc	XXX	****
Herdsmen & Farm personnel	10	313	3125	37500	HSC or SSC	XXX	****
Assistant Herd & Farm Manager	4	1500	6000	72000	MVSc or MSc Agriculture	XX	***
Farm & Herd Manager	1	6000	6000	72000	MSc (Ag. Science/ Vet Science)	No	**
Engineer	1	1500	1500	18000	BE (B Tech), Electrical/Mechanical	XXX	***
Information Technologist & Data Analyst	1	1500	1500	18000	BE (B Tech), IT/Computer Science	XXX	***
Technical Support Staff	2	500	1000	12000	Poly Technique	XXXX	***
Finance /Accounts Personnel	2	500	1000	12000	B.Com	XXXX	**
Drivers/ Farm Machinery Operators	2	500	1000	12000	HSC or SSC	XXXX	***
Administration/ Office Assistants	2	313	625	7500	BA/B.Com	XXXX	**
General Manager (GM)	1	7000	7000	84000	MBA –Ag Business	X	**
Assistant GM	1	2500	2500	30000	MBA	XX	***
Total	40		35,875	430,500			

The Nellore region has a reasonably good number of educational institutions (Table A-4.7b). Personnel with basic educational qualification can be found quite easily. But shortfall in experience can only be made up through intensive training and capacity building programs. These training programs can be organised on-farm or by setting up a training unit or by using outside training institutes in similar farms in India or abroad. However it is important that realistic norms (considering local context) are adopted and manpower needs are assessed accordingly.

Very few institutions in India offer avenues for obtaining training in animal husbandry related operations. Even in these institutions, training provided will be of limited use because they will not be able to meet the full requirements of this project. It might therefore be necessary to send local staff abroad to learn, train and acquire the necessary knowledge and skills. This is not only expensive, but also a time consuming operation. Moreover, this could be further complicated by a high staff turnover and attrition rate due to weak labour laws and enforcement.

Table A-4.7b Educational Institutions in Nellore

Type of Educational Institution	No.
Schools (Elementary, Primary, Middle and High Schools)	3743
Junior Colleges	22
Undergraduate/Degree Colleges (Arts, Commerce and Science)	19
Industrial Training Institute (ITI)	11
Polytechnics	5
Engineering Colleges	8

A-4.7 Project Economics

The estimation of costs (both fixed and variable) is based on informal discussions with relevant people and secondary data sources. On the whole, there may be a variation in these costs of about 25 per cent. Also, based on the hypothesized farming model, only the most obvious (explicit) costs have been considered. An exchange rate of Rs 40 to 1 NZD was used in this analysis. A summary of the projects Investment/Fixed costs is shown in Table A-4.8. The major expenses will be cows (NZD 7.35 million) and cattle housing facilities (NZD 5.04 million). The milking parlour, milk harvesting and milk storage equipment will cost NZD 0.360 million. Initial crop land preparation and installing of irrigation systems will cost NZD 0.150 million. Construction of office buildings is expected to cost NZD 0.250 million while farm machinery/equipment is expected to cost NZD 0.331 million. A buffer (at 10% investment costs) of NZD 1.34 million was included as other/miscellaneous costs. In total, fixed costs of this project was estimated to be around NZD 14.83 million (Table A-4.8).

The list of recurring/annual costs of the project is shown in Table A-4.9. The highest costs are associated with feed (NZD 5.83 million) and labour (NZD 0.430 million). The total feed costs were estimated for the entire herd based on diets of milking, dries, R2 heifers, R1 heifers and calves that were discussed in material input and supply. The labour costs are derived from the analysis of labour and managerial staff that was discussed earlier.

The annual costs on animal health are expected to be around NZD 0.250 million. Using the concept of opportunity cost, land rent was estimated to be 0.648 million. Fertilizers costs are estimated to be NZD 0.086 million, fuel/energy costs NZD 0.06 million and repairs/maintenance costs NZD 0.06 million. Animal insurance costs are NZD 0.101 million. A buffer (@10% of all expected annual costs) of NZD 0.74 million is included per year under other costs. In total, annual costs per year are estimated to be NZD 8.22 million.

Table A-4.8 Investments/Fixed Costs

Item	No of Units	Cost/Unit	Total Cost (NZD)
Cattle	3,500.00	2,100.00	7,350,000.00
Barn/Cattle Housing @ 120 sq ft/cow & $ 7/sq ft	3.00	1,680,000.00	5,040,000.00
Milking Parlour & Milking Equipment (1 double 50 + 1 swing 20)	2.00	140,000.00	280,000.00
Bulk Milk Cooler/Tank	4.00	20,000.00	80,000.00
Land Investment (Plowing, sowing, irrigation)	500.00	300.00	150,000.00
Office buildings	1.00	250,000.00	250,000.00
Equipment/Farm machinery			
Tractor +Trailer	4.00	36,000.00	144,000.00
Transport Vehicles	12.00	10,600.00	127,200.00
Feed mixer + Feeder Wagon	2.00	30,000.00	60,000.00
Other/Miscellaneous (Buffer @ 10 %)	1.00		1,348,120.00
Total Fixed Costs			**14,829,320.00**

Table A-4.9 Annual/Recurring Costs per Year

Item	No of Units	Cost Per Month/Unit	Total Cost Per Year (NZD)
Labour	40		430,500.00
Feed	6,930		5,838,526.36
Animal Health/Veterinary	6,930.00	3.00	249,480.00
Land Rent	500.00	104.00	648,960.00
Land Treatments (N,P,K) [11]	1.00	7,214.58	86,575.00
Energy and Fuel	1.00	5,000.00	60,000.00
Repairs & Maintenance	1.00	5,000.00	60,000.00
Insurance	4,025.00	2.10	101,430.00
Other (@ 10%)			747,547.14
Total Annual Costs			**8,223,018.50**

[11] N – Nitrogen, P – Phosphorus, K - Potassium

Assuming a depreciation ranging from 10 to 20 per cent (on plant, equipment, machinery and construction) and interest rate on investments (fixed costs) of 12.5%, the total annual production costs were found to be NZD 10.69 million (Table A-4.10). Since it is expected that the farm will produce 25.550 million litres of milk each year (or 2.04 million Kg MS), cost of production on a per litre basis was found to NZD 0.42/L (or NZD 5.35/Kg MS). Thus in order to make a profit the farm will have to sell its milk at a price greater than NZD 0.42/L.

Table A-4.10 Costs of Production

Item	**Cost in NZD**
Depreciation (Buildings & Equipment)	619,680.00
Interest on Investment/Fixed costs	1,853,665.00
Annual/Recurring Costs	8,223,018.50
Total	10,696,363.50
Milk production per day in liters (Kg MS)	70,000 (5,600)
Milk production per year in liters (Kg MS)	25,550,000 (2,044,000)
Per Liter cost of production in NZD/L (NZD/Kg MS)	0.42 (5.35)

The economics of the project based on probable revenues and profit that the farm can generate at 4 possible farm gate milk prices is shown in Table A-4.11. The average retail price for premium quality milk sold by competitors (Nestle, Amul, Heritage) is around Rs 42/L (1.05 NZD). In general (in India), the share of (dairy) farmers in consumer spending in around 62%. Assuming that the farm will have a 60 per cent share in consumer spending and processors and retailers combined will have a 40 per cent share, the possible farm gate price of milk would be Rs 25/L (0.63 NZD/L). At this likely premium (for quality & volume) farm gate price of NZD 0.63/L of milk, the revenues from milk sale would be 15.96 million

NZD. This would equate to a profit of NZD 5.27 million or 33.02 per cent (ROI, 49.2 %). Similarly, if the farm is able to obtain a high premium for its milk of NZD 0.75/L, its revenues from milk sale would be NZD 19.16 million. The resulting profit would be NZD 8.46 million or 44.18 % (ROI, 79.1%). If the farm gets a lower premium price of NZD 0.50/L, its revenues from milk sale would be 12.77 million NZD. It would still make a profit of 2.07 million NZD or 16.27% (ROI, 19.4%). However, if the farm does not get a premium price for its milk, but instead sells at current average farm gate price of NZD 0.41/L, its revenues from milk sale would be NZD 10.53 million. In this case the farm will make a loss of NZD 0.156 million per year (Table A-4.11). From this analysis it is clear that the farm can be profitable only if it sells milk at a premium price that is above current farm gate prices in Nellore.

Table A-4.11 Economics of the Project

	Likely Premium	**High Premium**	**Low Premium**	**Current Farm Gate Price**
Sale Price of Milk/Litre (NZD)	0.63	0.75	0.50	0.41
Margin/Litre (NZD)	0.20	0.32	0.07	
Total revenue from milk sale/year (NZD Million)	15.96	19.16	12.77	10.53
Total Costs/Year (NZD) (from table 10)	10.69	10.69	10.69	10.69
Gross Profit (Loss) /Year (including Depreciation and Interest) (NZD Million)	5.27	8.46	2.07	(-0.15)
Gross Profit % (ROI)	33.02 (49.2%)	44.18 (79.15%)	16.27 (19.4%)	

A-4.8 Risk Issues

A-4.8.1 Applying the Risk Matrix

This analysis looks at how familiar to the company the intended market (market risk) and product/technology are. The **market risk** is assessed based on 6 criteria with each criteria having a possible score ranging from 1 (very familiar/low risk) to 5 (very unfamiliar/high risk) (Day, 2007). Based on the interpretation of data/information available, the project received a score of 21 for market risk (Table A-4.12)

Table A-4.12. Market Risk Assessment

Criteria	Score	Comment
Customer behaviour and Decision making process	3	Partially overlap present markets
Distribution and Sales Activity	4	Quite different from present
The Competitive Set	4	Quite different from present
Brand promise	3	Somewhat relevant
Customer relationships	4	Not very relevant
Knowledge of Competitors behaviour and Intension	3	Somewhat relevant
Total (out of 30)	21	

The **product/technology risk** was assessed based on 7 criteria with each criteria having a possible score from 1 (low risk/familiar product or technology) to 5 (high risk/unfamiliar product or technology) (Day, 2007). Once again based on the interpretation of data/information available, the project received a score of 24 for product/technology risk (Table A-4.13).

Table A-4.13. Product/Technology Risk Assessment

Criteria	Score	Comment
Current development capability	4	Requires significant adaptation
Technology competency	3	Requires some degree of adaptation
Intellectual property protection	4	Requires significant adaptation
Manufacturing and service delivery system	4	Requires significant adaptation
Required knowledge and science bases	3	Somewhat similar to those of current offerings
Necessary product and service functions	4	Quite different from those of current offerings
Expected quality standards	2	Quite similar to those of current offerings
Total (out of 35)	24	

When both the market risk score (21) and product/technology risk score (24) are viewed in conjunction using the Risk Matrix described by Day (2007), the project has a reasonably high probability of failure (45-60%).

A-4.8.2 Climate

As discussed earlier, the climate in Nellore is hot and humid and hence not conducive to farming high producing dairy animals such as Holstein Friesians. The upper end of the thermo-neutral zone for these animals is around 26° C. Beyond the upper limit, the animals will be under heat stress and physiological changes (for thermoregulation) will occur. Depending upon how extreme the temperature is, the effects can range from a minor drop in milk production to death of the animals. To limit the impact of heat stress on the animals, the farming model has proposed to include cooling systems in animal houses (barns). Since the daily maximum temperature is above 26°C for nearly 11 months in the year, cooling systems need to be operational almost year round. The potential impact of a cooling system failure will be significant, especially in the summer months (May, June) when daily maximum temperatures can reach as high as 45°C. The failure of cooling systems can be due to non-availability service support and spares, and lack of adequate power supply.

A-4.8.3 Animal Health and Bio-security

Several livestock diseases and pathogens are endemic in India. The significant ones include Foot and Mouth Disease, Anthrax, Brucellosis, Tuberculosis, Johne's disease, and Haemorrhagic septicaemia. An outbreak of one of these diseases in the proposed dairy farm could have disastrous effects ranging from significant drop in production, infertility and death of animals. This is mainly because these animals are more susceptible (less immune) to infection and the housing system makes it quite easy for contagion to spread from one animal to another. Vaccination could limit the damage against some diseases, but even then, the effects would significant. Therefore having a well designed and implemented bio-security system which prevents the entry of pathogens into the farm is critical to the success of this model.

A-4.8.4 Milk/Output Price

This model is based on the assumption that there is a (increasing) demand for good quality milk in India and that consumers will be able to pay a higher price for it. However, when it comes to essential food items like milk, most consumers are highly price sensitive. Although many consumers are aware of the ill effects of low quality milk, and have the willingness and ability to pay more for higher quality milk, it may not translate onto their final milk purchasing decision. Hence it is possible that an increase in price may suppress demand considerably, especially because much cheaper (lower quality) substitutes are available in the market.

Also, the issue of milk pricing is a very sensitive one in India, with local (state) governments playing an active regulatory role through state controlled cooperatives. There is always a huge public outcry whenever milk prices (consumer/market) are increased. The farm gate milk prices in India are amongst the lowest in the world. Although private dairies are free to fix their own prices (farm gate and market), it is usually the cooperatives that set the benchmark price. This makes it difficult for private dairies to compete on price.

Since the cost of milk production is much higher in this model, it would be financially unviable to sell milk at current farm gate prices. Unless the farm is assured of a much higher price for its milk, this business venture would be failure. However in India, there are no such assurances because legally enforcing contractual obligations is difficult. Hence the risk of having to sell milk at a price lower that cost of production is significant.

A-4.8.5 Feed/Input Price

As discussed earlier feed supply is the most critical constraint for this model. To address this issue, the farm plans to own- grow a substantial amount of feed. But due to the land limitations, the farm will only be able to supply about 36% of feed requirements though its own forage production operations. The remaining 64% will need to be bought from the open market. These feeds will be predominantly agro-industrial by products and crop residues. The price of feeds can vary considerably depending on several factors such as season, climatic conditions, and policies (regional, national & global). For example a bad monsoon will reduce agricultural output and increase feed costs. Or a decision by the state government to ban export of rice from Andhra Pradesh to other states will reduce the price of rice based inputs. On the whole price volatility of feed inputs is very high and this can considerably affect project economics.

A-4.8.6 Milk Quality

On the whole, the strength of the business is on delivering hygienically produced milk of the highest quality and safety. Any shortfall in this regard will lead to the collapse of the model. But the type of farming model, climate, animals, prevalent pathogens, lack of worker experience and infrastructural issues would make the implementation of clean milk production protocols quite challenging. Also, since the farm does not have control of milk beyond farm gate, adulteration/contamination of milk further downstream in the supply chain cannot be ruled out.

Since milk is extremely sensitive to temperature, care should be taken to ensure the cold chain is strictly enforced from production to consumption. Given India’s huge infrastructural challenges, implementation of this critical process will be extremely challenging. Due to drastic power shortages across the country, power failure at all stages will be quite common. Use of generators as a back-up to supply power to milk refrigerators will be a pre-requisite. However, if the power failures are very frequent (quite likely), this option may not be financially viable. Additionally, the lack of refrigerated milk transport trucks and failure of several retailers to strictly adhere to cold chain specifications will make this task harder.

A-4.8.7 Industrial Strife

Worker strikes are a common phenomenon in India across all sectors. Recently Government doctors in the state of AP were on strike. More specifically, due to the presence of powerful industrial workers unions, strikes are frequently used as a tool for negotiation by industrial workers. Strikes can often get violent as well. A recent strike by workers at a Suzuki car manufacturing facility resulted in the brutal murder of a senior manager. Given the nature of the project, a workers strike could have crippling effects on the farm. All steps need to be taken to ensure that strikes are avoided. Additionally contingency plans would need to be developed.

A-4.8.8 Security

India faces numerous security threats from both external and internal anti-social elements. India has been a target country of choice for several radical (extremist) groups. Bomb blasts with resulting loss in life and damage to property is a relatively common event in India. Historically Indian population is divided on basis of caste and religion. The same bias persists in majority of the population and any situation can become a security risk. Communal and sectarian clashes which are often violent are also common.

An extremist organisation called the Naxals (or Peoples War Group) is India’s largest internal security threat. The Naxals are a militant Communist group(s) operating in different parts of India under different organizational envelopes. They are considered far-left radical communists, and supportive of Maoist (Chairman Mao's) political sentiment and ideology. Their primary targets are the Government, major Indian corporations and multi-national companies.

These issues increase the physical security risks of farm. Although a direct attack on the farm is unlikely, but given its high profile (visibility) nature it is possible and needs to be considered. Steps and measures that can be taken in order to prevent such incidents from occurring include employing a third party security agency to oversee farm security as well as building a strong relationship with local law enforcement agencies.

A-4.9 Sustainability

Analysing the Sustainability of Fonterra Nellore Dairy farm using IFCN Approach

Economic performance is given the most importance in the current practice of project feasibility study, while less attention is given to the social and environmental performance. It is however important to include the principles of sustainable development as well while conducting project feasibility studies. Sustainability concerns the interactions, integrations and significant relationships among ecological, social, and economic systems. With reference to business, sustainability is about achieving a win-win outcome by contributing towards an improved environment and advancement of society, while at the same time gaining competitive advantages and economic benefits for companies.

As climatic changes limit the resource availability for dairy farming, it will become increasingly challenging for the supply side to keep up with the increasing demand for dairy products (IFCN, 2010). The sustainability of dairy farms therefore becomes more important because dairying competes with other agricultural operations for limited resources. Analysing the sustainability of dairy farms can aid farmers, dairy investors, policy makers and other stake holders in selecting farm strategies, deciding on resource allocation and implementing environmental protection laws (IFCN, 2010).

The IFCN (2010) method of measuring the sustainability of dairy farms involves 3 steps – 1) selecting the areas of sustainability to be measured, 2) identifying the right indicators to represent these areas and 3) establishing the limits to separate sustainable form unsustainable farms (IFCN, 2010). The areas, indicators and limits selected will depend on the priorities for sustainability in the particular region/context. The 10 broad areas used to measure the sustainability of dairy farms by IFCN (2010) are -1) economic, 2) environmental, 3) social, 4) risk issues, 5) policy issues, 6) dairy cow issues, 7) feed issues, 8) animal health issues, 9) output prices and 10) input prices. Since most of these areas have already been covered under different parameters, only those areas that haven't been studied yet are discussed.

The farm is not dependant on any government subsidies. But as mentioned in the project economics section, the cost of production is relatively high (USD 35/100 kg milk), and current farm gate milk prices (USD 33/100 kg milk) and retail milk prices are quite low. Unless farm gets a high premium price, this model will be unviable. The operating profit margin is uncertain but is likely to be around 20% (refer to Project Economics section). It is quite likely that milk yields of 7000 kg/cow/year can be achieved provided issues related to feed and environment (climate) are solved. But due to lower quality of feeds and harsh environmental conditions, feed conversion efficiency is expected to be low. Labour wages are very low in India and are one of the significant positives of this model. Finally, the quality of milk produced on the farm is expected to be very good.

A-4.10 Implementation and Scheduling

Project overruns are very common in India and hence Implementation and Scheduling has to be given importance. In general, the implementation phase covers the entire period from when the decision to invest is taken to the start of commercial production. Ideally this project should be implemented in three phases. During the first phase focus should be on establishing the dairy farm. The significant activities during the first phase would be – obtaining required permissions/approvals, taking control of land, preparation of land and sowing of fodder crops, construction of cattle barns and milking parlour, construction of office buildings, purchasing of equipment and machinery and recruitment and training of staff. At the end of the 1st phase, first lot of (1000 pregnant but dry cows) should be imported. The first phase could be completed in 12 months.

In the second phase of the project local supply contracts should be finalised, feeding systems made operational, first lot of cows (which would have calved) will be milked, staff will be further trained, and the entire model will be tested and studied. At the middle of the second phase, second lot of cows (1500 pregnant but dry cows) should be imported. The second phase would last 12 months.

In the third phase of the project –final lot of cows (1000 pregnant but dry cows) should be imported, challenges in the model will be identified, required adjustments to the model will be made and studied, and the whole farm will be fully operational. The third phase should last for 6 – 8 months. By the end of the third phase, the farm would be milking close to 3500 cows a day.

One of the big challenges in meeting implementation deadlines would be due to bureaucratic red tape, hazy regulations and corruption that is largely prevalent in India. Permissions and approvals are required from several different departments/ministries and this could delay the project considerably, specifically the first phase. However, since the project is to be established in a Special Economic Zone, such bureaucratic/administrative issues could perhaps be much less.

Ensuring the timely delivery as well as quality of key supplies such as construction material, machinery/equipment etc. will be quite difficult due to the inability of the legal system to ensure contractual obligations are met. Project delays (especially construction) can also be caused by inclement weather, security issues, industrial strife etc. All these factors need to be thoroughly considered before the implementation schedule is finalised.

Apart from these challenges, the recruitment and training of personnel could also slow down the project, especially because of lack of relevant experience amongst local staff. Ideally, for the training programs to be most effective, recruitment of personnel needs to be performed well in advance. The timing of training is also critical because it is important that persons are sufficiently trained before they take up their positions or when required. Significant consideration needs to be given for this in the implementation and scheduling plan. Additionally, other factor such as – import of machinery/supplies, sourcing (and disease testing) of cows in New Zealand and import constraints and quarantine requirements in India can also result in project delays.

A-4.11 Political and Legal Issues

Due to the economic, political, and social importance of food and agriculture to India's wellbeing, the Government of India (GOI) plays a major role in the nation's food and fibre production systems. Consequently, business environment of agro-industries in India is significantly shaped by the government's policies and actions. In India in particular, food security is a top priority in government's policy and welfare schemes. The government (through the state controlled Food Corporation of India) plays a large role in the procurement and distribution of agricultural commodities. This way the government informally controls the baseline procurement and sale prices of agricultural commodities.

As the end objective of this system is to keep consumer prices of food low/affordable (else would result significant public unrest), producers often do not receive a fair price (especially from agents) and also food manufactures margins are squeezed. Dairy industry in particular is quite often caught in this basic food policy dilemma. Since most dairy cooperatives in India are largely government controlled, its influence in the dairy sector in general is very significant. Government policies that are aimed at protecting both farmers and consumers through ad hoc increases in procurement prices and regulating consumer prices to keep them as low as possible puts dairy industries margins (for processors/manufacturers/retailers) under pressure. This interventionist role played by the government creates an imperfect market. This in turn could seriously impact the viability of the project.

Additionally, dairying is a very politically sensitive area because of the direct involvement/participation of millions' of farmers (voters!). The potential impact dairy farmers can have on the outcome of elections is quite significant. Appeasing dairy farmers through welfare schemes such as – giving farmers cattle for free, providing subsidised (or free) cattle feed, delivering free animal health care and breeding services etc. plays a vital part of a political parties vote bank related strategy. Allowing the fading out of small farmers would mean giving up/loosing loyal vote groups that political parties have groomed/invested in for several decades. Hence keeping large farmers out and ensuring dairy farming continues to remain in the hands of small farmers is in the best interest of most political parties. Due to the salient characteristics of this project, it would be viewed by many (in political circles) as a threat to the survival of small farmers in India. It's therefore likely that this project will face politically motivated challenges to its establishment and functioning.

An indirect challenge that this venture could face from the political front is from other (competing) politically aligned dairy companies operating in the region- mainly AP Dairy Development Co-operative Federation (APDDCF) and Heritage Foods Pvt Ltd. APDDCF is the apex body for dairy development in AP state. It plays a substantial in role in the procurement and sale of dairy products in the state. It sources 1.6 million litres of milk from 0.8 million farmers each day. It offers a wide range of dairy products under its flagship brand Vijaya. Being a state controlled organisation, APDDCF's board comprises entirely of high ranked civil servants. This gives them large powers to frame and implement policies (unfair advantages) that are favourable to their organizations objectives. Heritage Foods (HF) Ltd is one of India's largest private dairy companies with market presence restricted to South India. The founder of this company is a leading politician and former chief minister of Andhra Pradesh state, Dr N. Chandrababu Naidu. Although he is known for his visionary leadership, especially in areas of governance and attracting foreign investment, the possibility of political interference to give HF unfair advantages cannot be ruled out.

India has a strong and largely independent judiciary, which (if the situation arises) has enough power to ensure that the project is put on hold (or terminated) indefinitely. For example, under the orders of the Court, local officials in Kerala state shut down a US $16 million Coke (Coca cola) bottling plant blamed for a drastic decline in both quantity and quality of water available to local farmers and villagers. The legal system is also archaic and prone to systemic flaws (and loop holes). This makes the settlement of disputes a long, complicated and tiresome process. Cases can often stretch on for over 10 years before a final decision is made by the courts. For this project in particular, main legal concerns are related to – disputes over acquisition/leasing of land, ensuring contractual obligations are met, solving employee/worker issues, and environmental concerns. Employing the services of a reputed local law firm to handle legal issues would be a mandatory requirement. On the whole, the legal environment is not very conducive to such projects.

A-4.12 Socio-Economic Impacts

A socio-economic impact assessment examines how a proposed development/project will affect social and economic welfare of current and future residents of a community. Socio-economic impacts of this project need to be evaluated from two dimensions – the positives and the negatives. On the positive side, a large capital intensive project of this magnitude can cause significant socio-economic development for the local community through the generation of employment for local residents, providing a market for local goods and services, developing/improving local infrastructure, generating tax revenue, development of human capital, transfer of technology etc. Socio-economic gains will also include consumer benefits that arise from a more competitive and quality focused dairy sector and other flow on impacts.

On the negative side, this project could cause - displacement of local farmers, reduce food security, increase in price of cattle feed inputs, increased pressure on available resources – mainly land and water, pollution, social conflicts etc. The possible displacement of local farmers (although unlikely) could negatively impact their livelihood. Special efforts need to be taken to identify project affected people and suitably re-habilitate them. Moreover, using land to produce feed for animals instead of food humans could result in food security issues. In a country with the highest number of malnourished children in the world, food security (feeding the nation) is a top priority. Also, being a large buyer of local agro-industrial by products and crop residues, the farm would inevitably result in an increase in price of these livestock feed resources which are critical for poor farmers. The increase in price could make it extremely difficult for small local farmers to continue dairy farming – both profitably and sustainably. This would seriously impact the income and livelihood of several local dairy farmers in the region. A detailed list of possible positive and negative social impacts of the project is presented in Table A-4.14

Table A-4.14 Possible Positive and Negative Social Impacts of this Project

Positives Impacts	Negatives Impacts
• Increased employment – direct and indirect	• Less access to (community) land (reduced availability)
• Increased income earning opportunities (i.e. through sale of goods and services to the farm)	• Reduced food-security
• Increased cash for consumption and savings/investment (i.e. in livestock, education, dwellings etc)	• Loss of land rights and entitlements
• Increased supply of (quality) Milk into the market	• Disruption of social networks and relationships
• Development of a more competitive and quality focused dairy business environment	• Disruption of relationship with the land and natural resources
• Development human capital by transfer of knowledge and skills to locals	• In-ability to maintain household food production (depends on labour, input costs, productivity and cash)
• Contribution of value added tax & corporate tax over the project life	• Less compliance with local norms and regulations (due to influx of foreign ideologies)
• Transfer of technology & Supply of high genetic merit dairy animals to local markets	Increased Social Conflicts due to – • Competition between groups for employment and other economic benefits (contracts) ; competition and differences between locals and in-migrants; tensions between resettled households and residents in host areas and neighbouring areas; increased pressure on land and natural resources and tensions around land administration and

	land use management;
• Decreased risk of milk related food borne infections	• Decreased availability of water for drinking and irrigation purposes- by possible surface and ground water depletion. • Health risks from employment, pollution, introduction of pathogens, and sanitation problems • Increased pressure on basic infrastructure and services • Challenges (threats) associated with management of resettlement and social tensions • Changes in administration of land rights and use • Development of unplanned concentrated villages and urban centres – near project site • Damage to roads and other basic infrastructure and services

In general, an agro-industrial project of this nature can deliver important socio-economic benefits by ensuring local farmers are active participants in the supply chain. But socio-economic benefits of this project are quite limited because small and resource poor farmers are intentionally left out of supply chains. It would therefore be better to rethink the strategy and include local dairy farmers in the supply/value chain.

A-4.13 Environmental Impacts

Approaches to producing food must be measured partly by their impact on the natural systems that we depend on. Confined Animal Feeding Operation (CAFO) or factory farm model of dairy farming that has been proposed can be categorised to be a type of industrial-style agriculture. Farms in this category are characterised by being often very large, highly specialized, and run like factories with large inputs of fossil fuels, pesticides and other chemicals, and synthetic fertilizers derived from oil. As a result such farming systems can have large, complex effects on the -environment, economy, human and animal health, and a regions socio-cultural fabric. Thus a thorough analysis/assessment of impacts needs to be performed. Specifically, the unintended (externalities) and long-term consequences of these systems needs to studied in depth.

Estimating the economic costs of industrial agriculture is an immense and difficult task. Such costs are difficult to assess for a number of reasons. Apart from being hidden or implicit, another difficulty is due to the incomplete understanding of potential harms. More research is needed to determine the extent of health and environmental damage done by such factory farms. And in some instances, such as water pollution and global warming, agriculture is only one of several important contributors.

A full environmental impact accounting should weigh the benefits of the somewhat lower prices consumers pay for food and the profits of agri-business firms (including fertilizer and pesticide manufacturers), against the health and societal costs of environmental pollution and degradation. In addition, there are indirect costs implicit in the high energy requirements of industrial agriculture. This form of agriculture uses fossil fuels at many points: to run tractors, combines and harvesters, to produce and transport pesticides and fertilizers, and to refrigerate and transport perishable produce cross country and around the world. The use of fossil fuels contributes to ozone pollution and global warming, which could exact a high price on agriculture and the rest of society through increased risk of diseases, violent weather events, droughts and floods, and rising oceans.

One of the big environmental concerns of factory farms is the disposal of animal waste. Factory farms generate large amounts of animal waste on farm site– often as much as a small city. But unlike cities, factory farms do not process waste at sewage treatment facilities – instead, waste is stored in huge, open cesspools called manure lagoons, and eventually spread onto surrounding cropland. Since factory farms create much more waste than can be absorbed by crops in nearby fields, waste is over applied, which pollutes soil, groundwater, and surface waters. Waters are also polluted by manure lagoons which might leak, and can overflow or collapse during heavy storms. The potential impact (costs) of manure run off (pollution of water resource) on biological life (flora & fauna) as well as human health needs to be studied. Also the costs associated with cleaning of contaminated water resources should be considered.

The availability of land (in close proximity) for safe disposal (spreading) of dairy effluent is a huge plus for this project. By following recommended good effluent management practices, the farm can ensure manure spreading is done in the most effective and safe manner. Moreover, the farm is not close to dense urban communities and nor is it upstream to a drinking water supply. Hence the potential impact of drinking water contamination and associated health risk low.

Manure can also be used for generating power. A few feedlot dairy farms in the USA recycle and convert their animal waste into fuel, thereby simultaneously solving problems of waste disposal, environmental pollution and energy supply. Similarly small scale bio-gas (methane) plants have been operating at the village level in India. This farm should consider installing a bio-gas plant because it not only solves issues related to manure disposal, but also provides a valuable source of energy, thus reducing the farms dependence on energy from conventional sources (burning of fossil fuels & nuclear). Additionally, a large informal market exists for manure. Farmers buy manure from dairy operations and spread it onto their fields. The farm could also consider the possibility of selling/donating effluent to local farmers.

It has been reported that dairy cows are significant contributors of methane pollution; and such a factory type dairy farms would increase the regions methane emissions (pollution) level. However, it could be argued that if such a factory farm was not established, India would have to meet its increasing milk demand from traditional dairy farming practices. These farming systems are of a subsistence type and are characterised by low productivity. In order to produce the same amount of milk as this farm, traditional farming systems would require nearly three times the number of cows. The amount of methane produced would therefore be close to equal, if not greater than in the case of this model. Moreover none of these small farmers need to comply with environmental regulations and therefore do not adopt any pollution limiting practices.

It has also been suggested that in factory type dairy farms, water resources are being exploited because irrigation systems are pumping water from reservoirs faster than they are being recharged. This results in rapid depletion of water resources. This farm too requires substantial amounts of water for irrigation and other operations. But by incorporating sate of the art irrigation (such as computer controlled micro-irrigation systems) and water management systems, wastage can be significantly reduced. Also monitoring systems can be devised to ensure depletion (over usage) of water resources does not occur.

Factory farms use a lot of fossil fuels, chemical fertilizers, toxic herbicides, insecticides and pesticides. The farm could reduce its fossil fuel usage considerably by investing in alternative forms of energy such as solar and bio-gas. Not only would this reduce the farms dependence on erratic state power supply, but would also be good on the environment. Chemical fertilizers run off the fields into water systems where they generate damaging blooms of oxygen-depleting microorganisms that disrupt ecosystems. This farm would have to use excellent nutrient management techniques to ensure the total quantity of fertilizers and pesticides applied is lesser (due to reduced wastage) and also contamination of surrounding areas and water resources is prevented.

On the whole, from an environmental impact perspective, this farm appears feasible provided changes in environmental policy (regulation) do not occur, good management practices are in place and proper monitoring systems are used. However these management practices and monitoring systems would add to the cost structure making the farm less competitive. Local dairy farmers do not have to invest in such environmental damage mitigation practices.

A-4.14 Good Will & Follow-on Opportunities

Like in many parts of the world in India too large scale factory type farming systems are generally frowned upon. In India this perception is even more significant because small farmers dominate agricultural production operations and large scale commercial farms are virtually non-existent. Dairy farming in particular is almost entirely driven by small farmers who at the most own 3 to 5 dairy animals and large factory farms are viewed as a significant threat to the livelihoods of small farmers. In fact, to prevent the establishment of large farms, the government has strict land size regulation by means of a land ceiling act.

Against such a backdrop, establishing of large scale commercial dairy farm and earning goodwill from both the local community and consumers will be quite a daunting task. On the bright side, Indian consumers currently face serious milk quality issues, especially from unhygienic production practices and adulteration at various points in the supply chain. The focus of this project on production and sale of high quality and safe milk will be widely applauded by certain consumer segments. Moreover, Fonterra’s hands on approach towards developing the domestic dairy industry will also be appreciated by certain sections of society. Additionally, other benefits that the project would provide the local community (agro-industries) will help it earn vital “Good Will”.

Follow on Opportunities

The fundamental purpose of any dairy cooperative is to maximise the price of milk for member (owner) farmers. Although the profits made by this project, will trickle back to its producer-owners, it may not directly work towards maximising their milk price. The sure way to maximise milk price (in the now and future) is by finding/developing markets for milk. If this project can help Fonterra gain a valuable presence/foot-hold in India's rapidly growing dairy market, it would contribute towards directly increasing milk prices of owner-members.

As discussed earlier, India's dairy market is expected to grow very rapidly over the next decade. It's highly unlikely that the domestic dairy industry will be able to full fill market expectations. The estimated demand-supply gap is expected to be close to 40 million tonnes per annum in 2020-21. In a world with freer trade (10 years from now!), it's quite likely India will buy a substantial portion of its dairy shortfall from world markets. By being a committed, responsible, recognised and valuable player in India's domestic dairy Industry, Fonterra could use its status to become a preferred supplier of dairy products to India. By ensuring market access for New Zealand dairy products into India, the project would have strategically contributed towards maximising milk price for its member-owners in the long run. Thus the follow on opportunities of this venture can be substantial.

A-4.15 Other Factors

A 4.15.1 Animal Welfare and Culling

Other allied issues such as animal welfare and worker safety should also be addressed. In general animal welfare standards and laws are quite low in India. But the cow in particular is considered a sacred animal in India and has an immense socio-cultural significance. Cow welfare has to be given priority. Training, monitoring and control systems need to be in place so that all workers/staff (animal handlers) treat animals with required respect and consideration. Sick animals must be identified early and required care and treatment provided. No animal brutality can be tolerated. Any shortfall in maintaining animal welfare standards can be used as a tool by social activists and the powerful media to cause significant damage (tarnish) to the projects/company/brands image.

The slaughter of cows is banned/ prohibited in almost all Indian states. Due to this culling/ disposal of unproductive animals will be challenge. The farm would need to clearly identify potential outlets for these animals before starting operations. One possibility is to have the cows for a maximum of 4 lactations (6-7 years) and then sell them to local farmers at a nominal price. The local farmer would rear the animal for the remainder of its productive life (3+ lactations) and in the process generate valuable income. This way the farm would be indirectly contributing towards socio-economic development of rural poor. The cows could also be sold or donated to educational/research institutions or bull mother farms. In the case of unproductive animals (culls due to productivity, fertility, health, milk quality issues etc) the farm would have to either identify potential recipients for such animals such as temples, ashrams etc. or set up a separate establishment to deal with them. Measures should be taken to ensure that the farm is not responsible, either directly or indirectly for the slaughter of its animals. This would increase costs and make the farm less competitive. Also, with a large number of animals being disposed, it is likely (even after measures are taken) than one or few animals will end up being slaughtered.

A-4.15.2 Competition

At the global level the firm has some of the best resources in the areas of management, engineering, service delivery, brand equity, and logistics. However, this may not be adequate to solve problems at the local level in India. As discussed earlier the challenges in India are very unique and solutions need to be applicable under the local context. The ability of Fonterra to achieve this is limited due to its lack of direct experience of the Indian market. However this issue can be solved to a certain extent by hiring suitable local talent.

Issues related to leveraging Fonterra’s brand equity would also be very challenging. Apart from AMUL brands (owned by the 65 year old Gujarat based cooperative GCMMF) there are no significant nationally recognised dairy brands in India. AMUL brands are relatively successful due to their massive marketing campaigns. Most dairy companies tend to operate at a regional level – hence local brands are very important. The competition amongst brands at the local level is quite intense. Being largely unrecognised in India, Fonterra's brand equity would be neither relevant nor superior to that of local competition. It neither provides nor denies market entry.

As discussed earlier there are no dairy companies in India that produce and market milk that meets international quality and safety standards. Most large dairy companies in India source milk from small scale farmers and do not have own milk production operations. Given the nature of small holder farming (subsistence type) in India, even if the competitors start quality focused operations, it would be hard for them to match the level of milk quality delivered by this model. It's therefore highly unlikely that other dairy companies can provide customers with the same quality related benefits at this point of time.

But most dairy companies are conscious of rising quality concerns of consumers and have started initiating/implementing milk quality programs across their supply chains. Moreover there are quite clearly cheaper ways to achieve improvements in milk quality that might be enough satisfy consumer need. For example, by targeting larger (10+ animals) progressive farmers and offering them an incentives tied to quality, better quality milk can be sourced. It's quite likely that dairy companies will deliver milk of superior (than current) quality in future. These products can significantly increase the intensity of competition and reduce competitive advantage of Fonterra because closer substitutes will be available.

The state plays a very significant role in the governance and management of dairy cooperatives. Due to the politically sensitive nature of milk pricing many cooperatives offer consumers very low prices, and make huge losses in the process. These losses are usually covered by the state. It would be very difficult for Fonterra to survive a sustained price war against these state funded cooperatives.

Additionally business practices in India are not always ethically and morally sound. The political establishment and bureaucracy are corrupt and companies tend to exploit this situation to their advantage. Firms routinely pay “bribes” to government officials in order to get unfair advantages. This behaviour will not fit-well with the cooperative structure and ethos of Fonterra. But not paying bribes could reduce the firm’s competitive advantage significantly.

Moreover there are no barriers to imitation and other dairy companies can quite easily choose to adopt a similar model. If this model is successful, private dairy companies (existing or new) as well as medium to large producers who directly sell milk to consumers (small un-registered dairies in the informal sector) can adopt a similar model and produce milk of similar quality levels.

Finally, given the intensity of competition in fluid milk market at end-consumer/retail level, the company should focus on the “institutional” market instead (that is institutions/firms that require high quality dairy products such as – hospitals, food service firms, food manufacturers and pharmaceutical companies). This way the company can leverage its core competency in (R & D/ product development) and deliver to the demands of these institutions. Moreover by negotiating for exclusive supply contracts (these firms are also more likely to honour contracts) with these firms the competitive advantage can be sustained. Ideally, this is what the company should seek to do.

Summary

The proposed model/concept was developed based on the rationale that the only possible method to provide consumers with good quality milk is by taking complete control of the supply chain- starting with milk production at farm level. To achieve sufficient scale at production level (and justify investments in processing), the company plans to establish a large- factory type dairy farm. But improved milk quality alone does not necessarily mean greater value for consumers. The product will have to outperform the incumbents on other measures as well.

Producing high quality milk will not be a challenge provided farm personnel are sufficiently trained and certain standard operating procedures are followed on the farm. However it may not be possible to produce and deliver milk efficiently and cost-effectively under locally available technology and resources. Issues related to climate (extreme), feed availability (quality and quantity), animal health, social concerns, legal etc. could pose serious constraints.

Based on general yet conservative assessment of project economics, it appears that returns will be greater that costs only if farm is able to obtain a premium price for its product. This price may prove to be too expensive and potential customers may not buy the product. Additionally a value chain specific for this product (high quality milk) does not exists and firm will need to develop one. Moreover, the risks associated with this venture, specifically production and price are quite significant. Due to these reasons, it is quite possible that the product cannot be made unless certain trade-offs are made and redesigning of the model/concept are done. Hence at this point it might not be worth going ahead with this venture.

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