



INDIAN INSTITUTE OF MANAGEMENT
AHMEDABAD • INDIA



**Institutional Innovations and Models in the
Development of Agro-Food Industries in India:
Strengths, Weaknesses and Lessons**

**Vasant P. Gandhi
Dinesh Jain**

**W.P. No. 2011-04-03
April 2011**

The main objective of the working paper series of the IIMA is to help faculty members, research staff and doctoral students to speedily share their research findings with professional colleagues and test their research findings at the pre-publication stage. IIMA is committed to maintain academic freedom. The opinion(s), view(s) and conclusion(s) expressed in the working paper are those of the authors and not that of IIMA.



**INDIAN INSTITUTE OF MANAGEMENT
AHMEDABAD-380 015
INDIA**

Institutional Innovations and Models in the Development of Agro-Food Industries in India: Strengths, Weaknesses and Lessons

Vasant P. Gandhi

Professor, Indian Institute of Management, Ahmedabad
Email: gandhi@iimahd.ernet.in

Dinesh Jain

Doctoral Student, Indian Institute of Management, Ahmedabad

Abstract

Agro-industries are given high priority in India particularly because of their great potential for contributing to development. The emphasis on village-based agro-industries was introduced almost a century ago in India by Mahatma Gandhi as an important ideology and corner-stone of the independence movement. The approach has undergone substantial transformation since then, but major challenges to its success in development remain: how to organize sustained production and procurement from large numbers of small farmers, how to ensure adoption of the right technology and practices to generate quantity and quality output at a reasonable cost, how to obtain capital for ensuring good processing technology and meeting the high working capital requirements in a fluctuating business, how to deliver strong marketing efforts to compete and open nascent markets, and how to ensure effective ownership, management and control to ensure performance for its main stakeholders of producers, consumers and investors. To address these challenges, effective institutional frameworks are a must, and a number of innovations and institutional models have emerged in India. These include the HPMC model, the AMUL model, the Pepsi model, the E-choupal model, the Nestle model, the Heritage model, the Suguna model, the Reliance model and more. The paper uses available literature and data to examine the performance of several of these models with respect to the above mentioned challenges. Many findings and lessons emerge which would be useful for business and for guiding supportive policies and practices in developing countries.

Keywords: Agro-food industry, business models, supply chain, value chain, India

Institutional Innovations and Models in the Development of Agro-Food Industries in India: Strengths, Weaknesses and Lessons

Introduction

Agro-industries have been given high priority in India due to their significant potential for contributing to rural and small farmer development. The emphasis on village-based agro-industries was initiated by Mahatma Gandhi in the 1920s as a part of India's independence movement. However, even today the development of agro-industries is a central part of the national development strategy due to their significant role in bringing value-addition to agriculture's output, increasing rural incomes and employment, and alleviating poverty in the countryside (see India, Planning Commission 2008). The sector, however, faces a number of challenges and bottlenecks to its growth including raw material sourcing difficulties, rural market imperfections, supply-chain inefficiencies, investment constraints, and product marketing challenges (for example see Srivastava and Patel (1989), Goyal (1994), CII-Mckinsey (1997), Gandhi, Kumar and Marsh (2001)). Questions remain on what institutional arrangements/models would be appropriate and should be encouraged for the organization of agro-industrial activity that would work and maximize the contribution to rural and small farmer development.

Mahatma Gandhi's approach of village agro-based industries was founded on a strong economic, social and political ideology (Goyal 1994), but later failed because it became a blanket basis for nationalists to favour less efficient techniques of production, oppose modern industry, and became incompatible with market preferences. After independence, up to early 1980s, agro-industrial policy was dominated by the thinking of Prime Minister Nehru and his economic think-tank led by Mahalanobis who argued that India needed large industries for the capital goods sector, while the consumer goods sector should be reserved for small-scale, agro and rural industries which were labor-intensive and required less capital. This was consistent with reducing demand on the limited available capital and savings, and expanding employment. However, such agro-industries failed because of outdated technology and management, and failure to meet changing and expanding demand for quality goods from a rapidly growing population with rising incomes.

From the early 1980s and particularly after liberalization reforms in the early 1990s, there has been significant opening-out towards promotion of agro-industries with stress on market demand, up-to-date technology and efficient management of the supply chain. However, this trend may lead to large private capital-intensive agro-industrial enterprises and a strong risk that the interests of small farmers and the rural poor will be bypassed. This would result in a negative outcome for rural employment, and a weakening of the development linkage for which agro-industries have been given priority in India. Major questions for the future remain on what policies and institutional models would be appropriate. In this context, this chapter examines the experience of various innovations and institutional models of organizing agro-industries that have been experimented with in India. The experiences and lessons learnt may be useful for future agro-industrial development in India as well as other developing countries.

Features of Agro-industries in India

Data from the Annual Survey of Industries (India, Ministry of Planning 2005/06) shows that 41 percent of all factories in India are agro-industries (Table 1), that contribute 19 percent of the manufacturing value added and 43 percent of manufacturing industry employment (this does not include the employment generated in the agriculture sector). These figures indicate that agro-industry contribution to both employment and manufacturing GDP is very significant, substantiating the national priority historically given to this sector in India.

Table 1: Importance of the Agro-industry Sector in India: Some Features (2005/06)

Industries	Percentage Share		
	No. of Factories	Employment	Net Value Added
Agro-based Food Industries	18.35	15.27	7.52
Agro-based Non-Food Industries	22.69	27.63	11.45
Total Agro-based Industries	41.05	42.90	18.97
Other (non-agro) Industries	58.95	57.10	81.03
All Industries	100.00	100.00	100.00

Source: India, Annual Survey of Industries 2005/06.

What are the structural and financial characteristics of agro-industries in India? Table 2 shows that only 21 percent of total industrial fixed capital is invested in agro-industries, while the sector employs 41 percent of Indians engaged in industrial employment. This shows that, on average, agro-industry continues to be relatively labor-intensive and capital saving. The share of payment to labour out of total value added is also greater at 35 per cent in agro-industries as compared to 21 per cent in other industries.

Furthermore, agro-industries require relatively less fixed capital and more working capital as compared to other industries (43 percent vs 30 percent). Agro-industries, on an average, are able to generate employment for 31 persons per fixed investment of Rs. hundred thousand where the figure for other industries, this is much lower at 11 persons. These figures do not include added employment generated in agriculture and input supply chain through backward linkages. On an average, agro-industries generate 47 per cent value added (income) over invested fixed capital annually, as compared with 53 per cent value added for other industries. Agro-industries are also able to absorb more inputs from other sectors (e.g. agriculture) as a percentage of the value of output compared to other industries. These features indicate that the agro-industrial sector deserves the priority given to it in the national strategy of development with employment.

Table 2: Some Structural and Financial Features of Agro-industries in India (2005/06)

Description	Share of Fixed Capital (Percent)	Total Persons Employed per Factory	Fixed Capital per Factory (Rs.Million)	Emoluments as a % of Net Value Added	Percentage of Working Capital to Invested Capital	Net Value Added to Fixed Capital	Employment to Fixed Capital Ratio (per Rs.100 thousands)	Material Input Consumed to Value of Output
Agro-based Food Industries	7.47	54.10	17.63	31.19	50.72	51.71	30.68	84.68
Agro-based Non-Food Industries	13.41	79.16	25.60	37.44	36.55	43.84	30.92	76.84
Total Agro-based Industries	20.89	67.95	22.04	34.96	42.47	46.66	30.84	80.62
Other (non-agro) Industries	79.11	62.96	58.11	21.10	29.51	52.63	10.83	75.82
All Industries	100.00	65.01	43.30	23.73	32.68	51.38	15.01	77.01

Source: India, Annual Survey of Industries 2005/06.

The FAIDA report of the Confederation of Indian Industry (CII) and Mckinsey and Company shows that there is great scope and potential for development of food processing and agro-industries in India. However, there are various major constraints to the rapid development and growth of agro-industries in the country. The literature indicates that agro-industrial growth in India has historically been constrained by both supply of raw material and slow growth in consumer demand for agro-industrial products (see Srivastava and Patel (1989), Boer and Pandey (1997)). Srivastava and Patel (1989), Kejriwal (1989) and Gulati et.al (1994). indicate that beside the quantity of raw material, the quality of the raw material is also a major constraint. Available raw material is often of unsuitable quality, processing varieties are frequently not available, and the period of availability of the raw material is too short and unreliable. Gulati et.al. (1994) indicate that only about 5 per cent of the fruits and vegetables grown in India are commercially processed. Both quantity and quality supply constraints indicate that there is a great need to improve the linkages between small farmer suppliers (which constitute the majority of raw material producers) and agro-industries. Effective and innovative institutional arrangements that would address multiple objectives are required.

Srivastava and Patel (1989) indicate that another major constraint is the obsolete technology used in processing, resulting in low efficiency and poor quality of the output. According to Boer and Pandey (*Op. cit.*) a major problem in improving technology is the very small size of the average agro-processing unit, suggesting a clear need to integrate in order to achieve a larger scale of operation. However, Goyal (*Op. cit.*) and others have shown that private sector industrial concentration is often associated with delinking with small farmer suppliers and losses in rural employment.

Srivastava and Patel (1989) show evidence of two additional major constraints to Indian agro-industrial development, mainly: small market size for many processed products and difficulties in obtaining adequate financing. The financial institutions in India are mainly geared to lending for fixed capital requirements, while agro-industries, as shown in the analysis above, have a large requirement of working capital. Banks lend working capital, if at all, at higher interest rates than other capital loans. Furthermore, the government of India typically considers processed and packaged goods as luxury items and as a result their production is heavily taxed. There are also myriad special regulations and licensing requirements for specific agro-industries, such as the Milk Product Order for the dairy

industry. These policies create disincentives for investment in higher value-added agro-processing.

Agro-industry Models in India

The challenges arising from the aforementioned constraints in the creation and functioning of agro-industries, on the one hand, and the need for their continued growth to contribute to rural and small farmer development, on the other, call for new and innovative approaches and models for their organization in India. Several models have been tried and need to be evaluated to provide lessons for what is required in the future in India, and perhaps other parts of the developing world as well.

Whatever the nature of the model, a few key success factors have been observed (Gandhi, Kumar and Marsh 2001): 1) creation of sufficient incentives for farmers to produce the required quantity and quality of raw materials, and supply the produce as stipulated in the contract (rather than sell elsewhere); 2) required farm inputs and technology need to be provided and the question of who bears what costs (and risks) should be transparent and well understood; 3) access to high quality processing technology; 4) ability to address new and changing consumer demand through effective market intelligence; 5) adequate performance and capability to attract capital for investment and growth; and 6) overall, adequate attention to the crucial issues of ownership, organization, management and quality control. Some significant questions asked in this light are:

1. How do the models perform in organising production and procurement from large numbers of small farmers, thereby ensuring a significant impact on rural incomes and employment?
2. To what extent are the models able to ensure adoption of right modern technology and practices by the farmers generate the required quantity and quality output at a reasonable cost?
3. Are the models able to ensure the use of up-to-date modern technology in processing and meet the high working capital and other capital needs in a business characterised by seasonality and variability?
4. Are the models able to deliver the necessary strong marketing efforts to compete and open nascent market for processed agri-food products?
5. Are the issues of sound ownership, management and control adequately dealt with to ensure sustained performance in delivering benefits to the main stakeholders including the farmers, consumers, investors and the government (nation)?

Study of Different Agro-industry Models

This section examines a range of different agro-industry models that have emerged and developed in India. They include government, cooperative and private business initiatives and span many sub-sectors including dairy, fruits and vegetables, grains and oilseeds, horticulture and poultry. Using the available literature, the section examines their evolution, structure and operation, and provides observations on their performance with respect to the questions poised above.

Model 1: The AMUL Cooperative Model

A model which has been quite successful in certain agro-industries (such as dairying) is the AMUL cooperative Model. This model evolved out of a successful dairy cooperative initiative in the Kaira district of the Gujarat state of India. Even though milk was produced efficiently in the rural areas of India, its movement from the rural areas to the urban markets, where the demand was high, was difficult. Due to this, private dairying had picked up in the urban areas and urban periphery, but this was proving troublesome, unhygienic and inefficient. Seeing the opportunity, a private dairy at Anand in Gujarat state – Polsons, had developed a business of procurement of milk from the rural areas in the Kaira district through middlemen, and its processing and transport to Bombay some 425 km away (Korten, 1981).

In the mid-1940s, however, facing exploitative practices of Polsons and its middlemen, the milk producers/ farmers of Kaira district went on strike, refusing to supply milk to Polsons. Then on the advice of a prominent leader of India's independence movement, Sardar Vallabhbhai Patel, they decided to come together to a cooperative body of their own to take up this operation on their own. This body later became the Kaira District Cooperative Milk Producers' Union, popularly known as AMUL (based on its original name of Anand Milk Union Limited). The cooperative union started procuring milk through affiliated village milk cooperative societies, processing it, and sending it on its own to Bombay. The model and its methods were perfected by the cooperative under the leadership of its enlightened chairman, Tribhuvandas Patel, and its competent professional manager, Dr. Varghese Kurien. It has grown enormously over the years, spawning other district unions and becoming a state cooperative federation. This now markets milk products across the whole country (see Table 3 below).

Table 3: AMUL at a glance

Members:	15 District Cooperative Milk Producers' Union	
No. of Producer Members:	2.7 million	
No. of Village Societies:	13,141	
Total Milk handling capacity:	10.21 million litres per day	
Milk collection (Total - 2007-08):	2.69 billion litres	
Milk collection (Daily Average 2007-08):	7.4 million litres	
Milk Drying Capacity:	626 MT per day	
Cattle feed manufacturing Capacity:	3090 MT per day	
Sales Turnover	Rs (million)	US \$ (in million)
1996-97	15540	450
1997-98	18840	455
1998-99	22192	493
1999-00	22185	493
2000-01	22588	500

2001-02	23365	500
2002-03	27457	575
2003-04	28941	616
2004-05	29225	672
2005-06	37736	850
2006-07	42778	1050
2007-08	52554	1325

Source: <http://www.amul.com/business.com>

Structure

In this model, ownership is with the farmers on a cooperative basis. It has a 3-tier organization structure, with primary cooperatives at the village level, a cooperative union at the district level, and a cooperative federation at the state level. Broadly, the village cooperatives take the responsibility for procurement of the produce from the farmers, the district union is responsible for transportation and processing, and the federation is responsible for marketing and strategic planning and investment. The cooperatives are governed by a rotating board of farmer-elected directors, but the management is done by professional managers who are well empowered and largely independent. Apart for the agro-industrial activity of the dairy business, the cooperative undertakes substantial developmental agricultural/ dairy extension activities, and the provision of veterinary, breeding and other services.

The primary level is the Village Cooperative Society under the three-tier structure. It has membership of milk producers of the village (usually 200 or more members per village) and is governed by an elected Managing Committee consisting of 9 to 12 elected representatives of the members. The Managing Committee elects a Chairman and appoints a Secretary and staff. The main function of this cooperative society is to collect milk from the milk producers of the village and make payments based on quantity and quality. It also provides support services to the members such as veterinary first aid, artificial insemination breeding service, sale of cattle-feed, mineral mixtures, and fodder seeds, and sometimes training on animal husbandry and dairying.

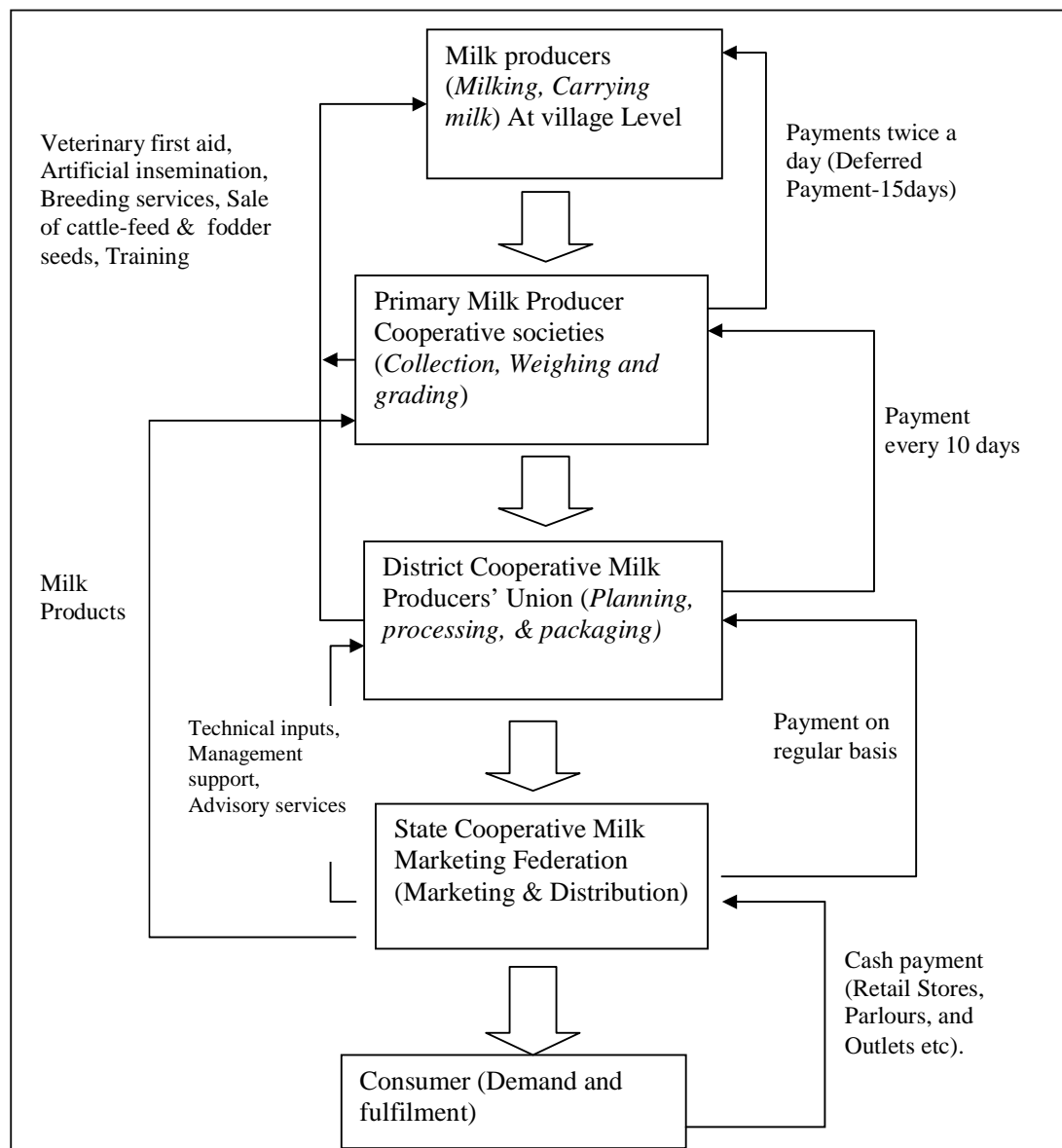
The district-level Milk Union is the second tier under the three-tier structure. It has membership of Village Societies of the district through their Chairmen, and is governed by an elected Board of Directors consisting of 9 to 18 elected representatives from among the Village Society Chairmen. The Board of Directors elect a Chairman and appoint a professional Managing Director and staff. The main function of the Milk Union is to procure raw milk from the Village Societies of the district, transport it from the villages to the Milk Union owned dairy plant, and process it into pasteurized milk and other milk products. It also undertakes significant supportive activities such as veterinary services, breeding services, cattle feed and other inputs to the village societies and producers, and undertakes initiation, training and supervision of the village level societies.

The State-level Federation is the apex tier under the three-tier structure. It has membership of Milk Unions of the State through their Chairmen, and is governed by an elected Board of

Directors from among the Chairmen of Milk Unions. It elects a Chairman and appoints a professional Managing Director and staff. The main function of the Federation is the marketing of the milk and milk products manufactured by Milk Unions. The Federation manages the distribution network for marketing of milk and milk products and maintains the supply chain network. It also provides support services to the Milk Unions such as technical inputs, management support and advisory services. The structure and services of the model are outlined in the Figure 1 below.

Though not as significant but there is also a national level, the National Cooperative Dairy Federation of India (NCDFI), which is a national body that formulates which promotes and lobbies for policies and programmes to help and safeguard the interests of milk producers.

Figure 1: Outline of the Structure and Functioning of the AMUL Model



***Based on Sridhar and Ballabh (2006)**

Functioning

At the village level, a dairy cooperative society is formed with primary milk producers. A milk producer becomes a member by paying an entrance fee and buying a share of the society. A farmer producer becomes eligible to get a voting right in the society if she/he is a member and supplies at least 700 litres of milk per year and 180 days of supply in a year. The allocation of voting rights is one member-one vote. Members of the society elect a managing committee as per the by-laws and the committee elects its chairman. Committee members are honorary and their role is restricted to policy formulation and overseeing the programme. The society has a few critical functions like collecting milk (twice a day), making regular payments to milk supplier members and providing cattle feed, fodder and animal breeding and health care services to members.

Member producers bring milk to society every morning and evening. Initially, union provides each society with a fat testing machine free of cost. The quality (i.e. fat content) and quantity are assessed, and the amount payable to each producer is worked out. When the producer comes to the centre in the evening, she/he is paid for morning delivery and for the milk delivered in the evening; money is paid the next morning. Apart from the daily cash income, members also get bonus and a difference in price at the end of the year. Amount of bonus is pro rata to the value of milk supplied by the producers at the society. The society also makes profit on the milk it sells to the union and gets difference in price. The entire profit of the society is generally not distributed to member producers. A part is allotted for the developmental activities within the village and maintenance of the society. Societies also act as dissemination modes for various activities of the union such as member education, production enhancement. The staff at the societies is also trained to undertake the veterinary first aid and artificial insemination.

The cooperative union is the representative of all the Village Societies located at the district level and is governed by a Board of Directors having representatives from village societies, but also includes representatives of financial institutions, state cooperative department, dairy experts, federation, government nominees, and the managing director of the union. The Board elects a Chairman and Vice Chairman and appoints a Managing Director who in turn appoints supporting staff. The Board is responsible for policy formulation and the staff is responsible for looking after the day to day operations. One-third of the village representatives in the Board retire every year and the vacancy is filled by election. Chairman is elected every year. Given the perishable nature of milk, it was imperative for the cooperative to devise ways and means of transporting the milk procured from distant villages in the shortest possible time, and under refrigerated conditions to the processing units. Hence, milk transportation routes are designed in a manner that all villages are covered in the shortest possible time and in a cost-effective manner.

Bulk cooling units and chilling centres are often set-up along these milk routes. Milk is collected by unions from villages twice a day with the help of contracted private transport vehicles. Milk from the society is measured for its quantity and quality (Fat and SNF i.e. Solids-Not-Fat) and is paid on this basis. Payments to the societies are made every 10 days. Cooperative union also provide many services to its farmer members. The union runs mobile veterinary dispensaries to provide veterinary care free or at a small charge to the members, runs semen production centres for breeding, trains the society staff in artificial insemination

(AI), and conduct various technical extension programmes for increasing the production of milk.

The Gujarat Cooperative Milk Marketing Federation (GCMMF) is the sole marketing agency for the products produced by different cooperative unions, under the popular brand names 'AMUL' and 'Sagar' (Kurien, 2003) and has a network covering over 3,500 dealers and 5,00,000 outlets (Subramanyam, 2004). There are 47 depots with dry and cold warehouses to carry inventory of the entire range of products. The distribution network comprises 300 stock keeping units, 46 sales offices, 3,000 distributors, 100,000 retailers with refrigerators, an 18,000-strong cold chain, and 500,000 non-refrigerated retail outlets. List of products marketed include fresh milk, UHT milk, brown beverage milk drink, infant milk, milk powders, sweetened condensed milk, butter, cheese, ghee, yogurt/curd, bread-spreads, pizza, *mithaee* (ethnic sweets), ice-creams, chocolate & confectionery. The network follows an umbrella branding strategy. AMUL is the common brand for most product categories produced by various unions. By insisting on an umbrella brand, GCMMF avoids inter-union conflicts and creates opportunity for the union members to cooperate in developing products.

GCMMF's technology initiatives include development of new products, processing technology, and measures to enhance milk production and quality, and e-commerce. Village societies are encouraged through subsidies to install chilling units. Automation in processing and packaging areas is adopted, as is HACCP certification. GCMMF actively pursues development of embryo transfer and cattle breeding in order to improve cattle quality and increase milk yields. Another initiative underway is to provide farmers access to information relating to markets, technology and best practices in the dairy industry through net enabled kiosks in the villages. GCMMF has also implemented a Geographical Information System (GIS) at both ends of the supply chain, i.e. milk collection as well as the marketing process.

AMUL or Anand Pattern of Cooperatives represents a methodology of building and sustaining an economic enterprise and has ensured high levels of patronage, cohesiveness, governance and operational effectiveness (Shah, 1996). The cooperative model enjoys commitment of the farmers, and cost-efficiency in raw material production and procurement. It also extensively engages with the small farmers as well as the landless rural poor who may keep even 1-2 animals, and is reported to contribute significantly to rural incomes and employment through its three-tier organization. However, its drawbacks includes its need for enlightened and committed leadership (through its governing board), and capable management which is sometimes difficult to ensure. The board is elected and may become politicised, detracting from sound cooperative and business practices. Further, antiquated laws governing cooperatives invite government interference and prevent use of financial markets for raising equity capital, thereby to an extent constraining expansion and growth.

Model 2: Nandini Model

Another similar agro-industry model on the cooperative lines is "Nandini" of the Karnataka Cooperative Milk Producers' Federation Limited (KMF). KMF is the Apex Body in the Karnataka state in south India of its dairy farmers' co-operatives. It is the third largest dairy co-operative in the country. In south India it stands first in terms of procurement as well as sales. The brand "Nandani" is a household name in Karnataka state for pure and fresh milk and milk products. KMF has 13 Milk Unions throughout Karnataka state which procure milk from primary dairy cooperative societies, and distribute milk to the consumers in

various cities/ towns/ rural markets in Karnataka. The district milk producer unions receive milk from 11000 primary dairy cooperative societies which are at the taluka (sub-district) and village levels. About 1.965 million dairy farmers in the Karnataka state are covered. (www.nandini.com/aboutus.htm). The growth over the years of KMF is summarised in the Table below:

Table 4: Growth of Nandini

		1976-77	2007-2008
Dairy Co-operatives	Nos	416	11,063
Membership	Nos	37000	1,956,163
Milk Procurement	Kgs/day	50000	3,025,940
Milk Sales	Lts/day	95050	2,129,790/curd:1.77LKPD
Cattle Feed Consumed	Kgs/DCS	220	3,010
Daily Payment to Farmers	Rs. '00,000	0.90	342
Turnover	Rs.billion		27.07

Source: www.nandini.com/aboutus.htm

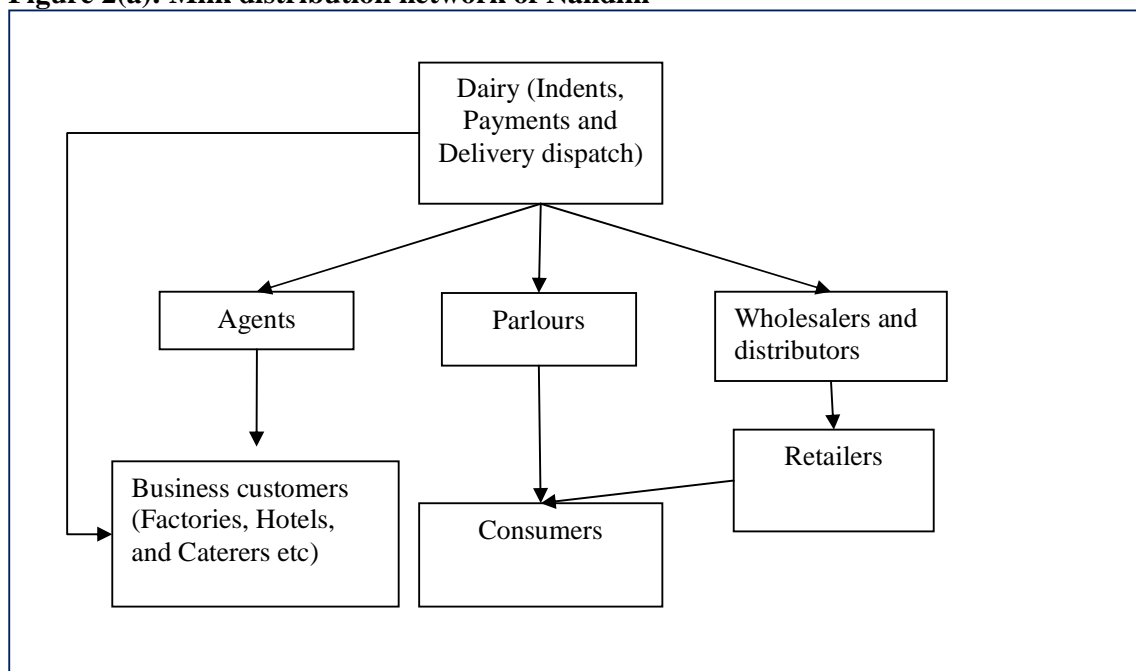
The cooperative evolved under a World Bank funded dairy development program in Karnataka started in 1974 with the financial assistance from World Bank under Operation Flood II & III national dairy development programs. Village dairy co-operatives were promoted in the AMUL/ Anand pattern in a three tier structure with the Village Level Dairy Co-operatives forming the base level, the District Level Milk Unions at the middle level to take care of the procurement, processing and marketing of milk and the State Milk Federation as the Apex Body to co-ordinate at the State level. Coordination of activities among the Unions and developing markets for milk and milk products is the responsibility of KMF. However, unlike in AMUL, the marketing of milk in the respective district jurisdiction is organized by the respective milk unions. Surplus/deficit of liquid milk among the member Milk Unions is monitored by the Federation. All the Milk and Milk products are sold under a common brand name Nandini (<http://www.nandini.com/aboutus.htm>).

The milk unions also provide the following technical inputs at subsidized rates or free of cost to their members:

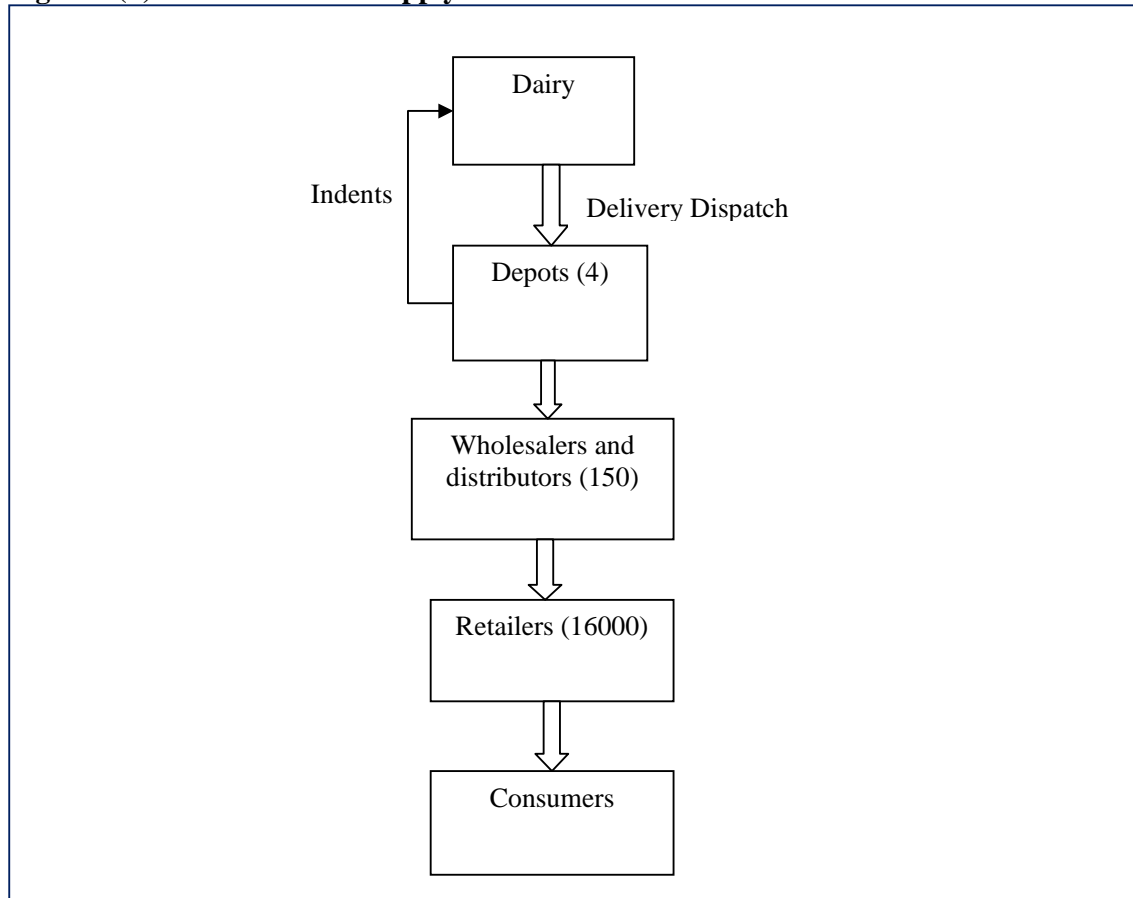
- Veterinary emergency services round the clock at milk producer door step.
- Free animal health camps conducted by veterinary staff at village level.
- Animal feed, and planting material to grow fodder crops.
- Artificial insemination (AI) services to cross breed animals and free infertility camps a village level
- Free vaccination to milch animals for diseases like Foot and Mouth disease, Theileriasis etc.,
- Free training to Milk producers and DCS Staff.
- Women empowerment programme in association with GOI by forming women co-operatives which are governed by women
- Through Dairy Farmers' welfare trust, on death of a milk producer, the Union pays Rs 10,000 to his/her immediate dependents. Giving them scholarships and fellowships for the education of milk producer's children.

KMF supports the livelihoods of around 1.95 million dairy cooperative members through over 11,000 dairy cooperative societies. KMF has become second largest milk-procuring organisation in cooperative sector with daily milk procurement of 3.02 million litres resulting a white revolution in Karnataka. The milk procurement has increased 2.5 times in the last 10 years. The sale of milk per day has reached 1.7 million litres per day, increasing by 1.4 times. The milk procurement is growing at 9.65 percent annually against the national average of production growth of 4.8 percent. The technical inputs, such as animal health care, artificial insemination services, cattle feed supply have had a large impact. The surplus milk is sold to neighbouring milk deficit states such as Kerala, Andhra Pradesh, Goa, Maharashtra, and Pondicherry and the rest is converted into products. The Nandini product family consists of 35 products and the new products are frequently added after market research. The marketing system and network are outlined in the Figures below.

Figure 2(a): Milk distribution network of Nandini



Based on Revanna (2006)

Figure 2(b): Milk Products' supply chain of Nandini

Based on Revanna (2006)

The major challenges facing the Nandini model are:

- inadequate processing facilities
- difficulties in maintaining quality of raw milk under the prevailing conditions
- increasing costs of transportation and processing
- un-healthy competition from private dairies in procurement,
- inadequate roads and power infrastructure.

Some of these problems seem to stem from a relatively limited role of the Federation (compared to AMUL), and as a result, inadequate scale economies and lack of support in larger roles such as marketing, investment and logistics.

Model 3: Nestle Model

Nestlé is the largest food and beverage company in the world. Nestle uses the Milk District model for its agro-industrial activity in India. Nestle India started its operation in the Moga district of Punjab in 1961 with setting up its first milk factory in India. The factory produces milk powders, infant products and condensed milk. The annual fresh milk intake of the Moga factory rose from less than 12,000 tons in 1970 to 240,000 tons in 2003 obtained from 85,000 farmers. By 2008, it covered 100,000 farmers and had an intake of 1.25 million litres milk/day. Nestlé India states that it supports a system of sustainable dairy farming with

regular milk payments and sustainable methods and states that it has a positive impact on the community and rural economy of Moga as a whole. (<http://www.nestle.com/AllAboutNestle.htm>).

Setting up a milk district involved:

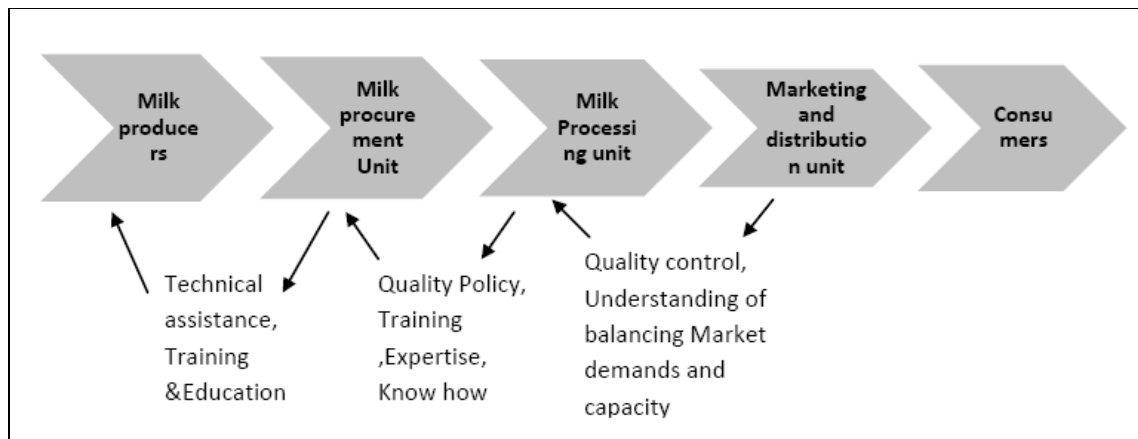
- negotiating agreements with farmers for twice-daily collection of their milk
- installing chilling centers at larger community and collection points or adapting existing collection infrastructure
- arranging transportation from collection centers to the district's factory,
- implementing a program to improve milk quality.

Nestle India has its milk-processing factory in the town of Moga and sources raw milk from the districts of Moga, Ludhiana, Sangrur, Mukatsar, Ferozepur and Faridkot. These districts have been collectively referred to as 'Moga Milk District'.

Selecting a location for collection points is based on several factors (<http://www.nestle.com/AllAboutNestle.htm>).

- Present milk production and potential of the area based on available fodder resources, agricultural land, and farmers' interest in dairying.
- Present milk production costs and milk prices in the area
- The income farmers could earn from fresh milk versus the income from alternative (i.e., not supplementary) crops
- Present milk collection systems (if any), the presence of competitors, present milk quality and potential to achieve the required quality

To ensure quality, Nestlé undertakes training and has manuals detailing good farm practices for each district. The farms are audited regularly to make sure the right practices are followed. Nestlé provides technical support to farmers to guide them in reaching the quality/competitive standards. Testing is done at the collection centres and cooling centres (Goldberg, 2005). Nestle works to have a stable business relationships with farmers. Surpluses present a challenge for Nestlé and the farmer. Nestle tries to offset the expense of buying up surplus in the spring season against the security of a steady supply at a stable price throughout the entire year (<http://www.nestle.com/AllAboutNestle.htm>.) The chain structure is outlined in the figure below.

Figure 3: Nestlé's milk value chain

Based on <http://www.nestle.com/AllAboutNestle.htm>

Some 64320 dairy farmers supply milk under contract and the company maintains their records. The company has stringent quality specifications. Company staff members regularly monitor milk quality and the performance on contractual obligations, and the farmers obtain feedback on milk quality at the collection points. Company technologists determine quality in laboratories with samples being taken in the presence of both the farmers and the company representatives. Company is not obliged to collect milk that does not meet the quality standards specified in the contract. The contract also allows the technologists to punish the producer with a 30 days ban and if antibiotics are found, the price of milk is reduced by 15 percent. Repetition of any discrepancy is considered a serious breach of contract. Farmers have the right to complain through registers located at each collection point if he/she believes there is a problem. The system still works because it provides an assured market at remunerative prices for the milk to the farmers.

Nestlé states that the milk district model has changed the lives of farmers and also boosted the company's bottom line. The small township of Moga in Punjab is today on the world dairy map. Moga processes over 1 million litres of milk everyday and that's twice the amount processed in the rest of Punjab. Nestlé procures over 11,00,000 kg of milk per day from the states of Punjab and Haryana during the peak season, covering 14,000 square kilometres area and 98,000 dairy farmers through an efficient milk collection system with a network of 2240 milk agencies, collection points and 698 milk cooling centers. It also provides farmers with training and advice on right dairy farming practices. A news report indicates that covering even 90,000 farmers and ensuring timely payment, linked to both quantity as well as quality for the milk supplied, is no small task. It is certainly something that very few private corporates have done and succeeded in doing (*Business Line*, December 9, 2001).

Comparison of the Nestle Model with the AMUL model

In the 'Anand model' of AMUL, the primary milk collection centre is the village cooperative society, an elected body that is owned and directly accountable to the dairy farmers themselves. In the 'Moga model', the job of sourcing milk from farmers is done not by a

cooperative society, but a private commission agent appointed by the company. Nestle operates a network of 1,100 agents, who receive a 2.3 per cent commission on the value of the milk supplied to the dairy. Both the agent as well as the farmers are paid on a consolidated fortnightly basis, unlike the system of daily milk payments to farmers followed by AMUL.

In terms of scale and reach, Nestle's milk procurement pales against that of AMUL. During 2000-01, AMUL's unions procured on an average 4.576 million kg per day of milk from over 2 million farmer-members in Gujarat. The unions procured 31.4 per cent of Gujarat's estimated milk production of 5.313 million tons in that year, implying that almost every third litre leaving a milch animal's udders in the State ended up being collected by societies affiliated to AMUL (*Business Line*, December 9, 2001). Nestle's operations, by contrast, are much less and confined to districts around Moga. The company's average procurement of 0.65 million kg per day, covers hardly 3 per cent of Punjab's annual milk output of 8 million tons. The average Nestle farmer pours about 7.25 kg of milk per day, whereas the corresponding figure for AMUL is slightly over 2 kg per day, indicating that the latter's reach perhaps extends to small/ marginal farmers and landless farm labourers who may own only 1-2 milch animals. (*Business Line*, December 9, 2001).

With respect to price paid, Nestle in 2000-2001 paid an average price of Rs 9.84 per kg, which is lower than the Rs 13-14 per kg that AMUL paid to its farmers. However, about 45 percent of Nestle's procurement is cow milk with fat content of about 3.5 per cent as against the bulk of AMUL's procurement being buffalo milk with a fat content of about 6.5 per cent or more. Adjusting for this, there is little difference between the farm gate prices paid by Nestle and AMUL. This would be also be offset by the higher productivity of the animals (especially cross-bred cows), which enable the Nestle farmer to deliver more than 3 times the quantity of milk that an average AMUL farmer pours (*Business Line*, December 9, 2001).

In 2000-01, Nestle's payments to Moga's farmers against procurement of milk amounted to nearly Rs 1950 million. If one adds to this, the value of various developmental inputs provided by the company -- free veterinary aid, breed improvement and extension services, subsidy on installation of farm cooling tanks, etc - the amount given to farmers would be around Rs 2040 million. This comes to almost 47 per cent of the value of company's sales of milk products. In comparison, this proportion for AMUL and its unions is over 80 per cent. It must be noted that Nestle is a company accountable to its shareholders and investors and AMUL is an entity accountable to and owned by farmers. (*Business Line*, December 9, 2001).

Model 4: Heritage Foods

The Heritage Group based in Andhra Pradesh was founded in 1992 by Chandra Babu Naidu, the former Chief Minister of Andhra Pradesh, and it is a fast growing private enterprises with three-business divisions viz., Dairy, Retail and Agri, under its flagship company Heritage Foods (India) Limited (HFIL). Heritage's milk products have market presence in the states of Andhra Pradesh, Karnataka, Kerala, Tamil Nadu and Maharashtra and it has retail stores in the cities of Hyderabad, Bangalore, and Chennai. Integrated operations in Chittoor and Medak Districts form the backbone of the retail operations (<http://www.heritagefoods.co.in/dairy/home.html>). Heritage is considered a successful dairy enterprise and is known for its high quality standards and premium range of milk and milk products. It follows high quality standards in manufacturing, packing and distribution practices. Heritage has become an ISO

22000 certified company by maintaining international quality standards. Heritage has 12 packing stations, 74 chilling centres/bulk coolers with operationally safe process equipments. The products are sold under the brand "Heritage".

Heritage covers about 200,000 farmers, and has the capacity to process 1.5 million litres milk per day. The products of Heritage Foods include Full Cream milk, Toned Milk, Double Toned Milk, Cow Milk, UHT Milk (Tetra pack), Cow Ghee, Buffalo Ghee, Cooking Butter, Fresh Cream, Skim Milk Powder, Curd (Cup & Pouch), Flavoured Milk in Bottles & Tetra packs Butter, Milk Lassi, Paneer Doodh peda, Ice Cream and Bread Cookies. The annual turnover crossed Rs.34.7 million in 2006-07 (<http://www.heritagefoods.co.in/dairy/home.html>).

Heritage has established a supply chain which procures milk from farmers in rural areas (mainly in Andhra Pradesh and some parts of Karnataka, Maharashtra and Tamil Nadu). The Heritage model's starting point is harnessing the current milk collection centers which are also rural retail points and use them to penetrate into the rural market. Two-way or reverse logistics is used to transfer and sell goods from the urban markets to rural markets and with this direct retail presence also mobilize milk procurement. This enables economies in supply chain cost and serves both the rural customer and producer and improves penetration in the rural areas.

It connects to consumers through representatives (who are also milk collection representatives of Heritage) who sell consumer goods. This also provides opportunity to Heritage to launch their private labels in rural markets. Heritage rural retail network has increased to 1515 stores with 13 distribution centers. A typical rural store is of 100 square feet size and is based on franchisee model to cater to villages with less than 5000 population. The objective is to reach popular fast moving consumer goods (FMCG) products and quality groceries at affordable prices to the interior villages across South India, also leveraging on the milk procurement network. Besides milk, vegetables and seasonal fruits are also produced and procured through contract farmers and reach pack houses via collection centres strategically located in identified villages. The collection centres undertake washing, sorting, grading and packing and dispatch to the retail stores through distribution centres. Other features of the model are:

- Promotion of annual crop calendar of sourcing that seeks to ensure higher annual income per unit area.
- Technical guidance- Agri advisory services, regular training of farmers, credit linkage and input supply.
- Package of improved farm practices for better productivity & quality.
- Assured Market at doorstep.
- Assured timely payments.
- Transparency in operations.

The Heritage model provides an example of using the existing marketing points and chains for the purpose of agro-industry rather than building new/dedicated chains. This may achieve faster roll-out and reach. It also provides an example of using two-way or reverse logistics for improving the efficiency and economics of the supply chain. Both these methods are not seen in the AMUL, Nandini or Nestle models.

Model 5: Mother Dairy

Mother Dairy, Delhi was set up by the National Dairy Development Board (NDDB) under the first phase of Operation Flood Programme in 1974 with the objective of improving the availability of liquid milk to city consumers. Mother Dairy is a subsidiary of the National Dairy Development Board (NDDB). Even though Mother Dairy is not owned by the farmers, it is associated with the Anand Model co-operative setup. Given the potential markets for liquid milk in the big cities, entities like Mother Dairy were set up in all the four metros - Mumbai, Kolkata, Chennai and Delhi. Subsequently such dairies were setup in all state capitals. The objective was to help those cooperatives who needed help to the process and market the milk.

It is estimated that Mother Dairy - Delhi commands 40 per cent market share in the organized liquid milk sector in and around Delhi. Mother Dairy brand name is used for distributing milk in the Delhi national capital region. Mother Dairy also markets dairy products, such as ice creams, flavoured milk, *dahi*, *lassi*, *mishti doi*, *ghee*, butter, cheese, dairy whitener, Dhara range of edible oils and the Safal range of fresh fruit and vegetables, frozen vegetables and fruit juices in Delhi and at a national level.

Mother Dairy sources its entire requirement of liquid milk from dairy co-operatives - it buys the liquid milk from state federations. Since it runs on the principle that the landed price of milk at Delhi should be the same for all, only state federations near Delhi supply milk to Mother Dairy. Profitability is not the core motive and the procurement is done more or less at the market price. The marketing is mainly done through bulk vending machines apart from 12 packaging stations for polypack preparation, which are outsourced from the state federations. The costs of the processing units are borne by the federations whereas those of the distribution centres are borne by Mother Dairy (<http://motherdairy.com>).

Mother Dairy pays almost 70 per cent of the market price to the milk suppliers. The payment is made through cheques and the milk suppliers receive the payment within 10 days. The surplus from the remaining amount is shared among the Mother Dairy, state federations, district unions, and the village-level societies. For the procurement of fruit and vegetables, the grower associations are paid a commission of 1.75 per cent to meet the expenses of running the association.

The annual turnover of liquid milk distribution is about Rs.12-13 billion and the total turnover of Mother Dairy is Rs. 27 billion. Bulk vending milk sales are growing at 3-4 per cent per annum, whereas polypack milk sales are growing at 12-13 percent.

Table 5: Mother Dairy Daily Milk Sale, July, 2007 (in litres)

Variant	Milk shop	Retail	Total
<i>Bulk vending milk</i>	646854	189849	836703
<i>Polypack milk</i>	333781	1075149	1408930
<i>Total</i>	980635	1264998	2245633

Source: <http://www.motherdairy.com>

Mother Dairy is reported to have brought benefits to the farmers. In recent times, Mother Dairy is facing competition from other organized retailers and maintaining quality is also a major challenge. (<http://www.motherdairy.com>). The reach of the Mother Dairy model to the farmers depends substantially on the efficiency and the effectiveness of the cooperatives since it does not connect with the farmers directly. On the other hand it assists the farmer bodies to market the milk in the vast markets of the major urban areas – a capability many of them lack. It also undertakes the necessary investments for processing and distribution which is difficult for some of the farmer bodies to make.

Model 6: Suguna Poultry

India has a rapidly growing poultry market and its size is now estimated to be around Rs 12 billion (Business Standard July 08). However, the poultry industry is highly fragmented and unorganized. In this, Suguna Poultry is one of the largest organized players and is believed to rank among the top ten poultry companies worldwide. The company is based in Coimbatore, Tamil Nadu state and has operations in 11 states in India, offering a range of poultry products and services. Suguna Poultry started its operations in 1984. The company pioneered contract farming in the poultry industry in India. The company sources its products through 12000 contract farmers across different states.

In the Indian market, consumers used to prefer live birds to frozen chicken. Suguna came into the unorganized market with the concept of branding chicken. Suguna has been able to create a mind space for itself and was able to make its brand prominent in this market, become a part of the growing Rs. 75 billion frozen poultry market. Suguna also sold live birds and eggs worth Rs 20.2 billion in 2007 without owning a single poultry farm. (Business Today, July, 2008). Its fully integrated operations extend from broiler and layer farming to hatcheries, feed mills, processing plants, vaccines and exports. Suguna sells live broiler chicken, value added eggs and frozen chicken, and has set up a chain of modern retail outlets with the aim of provide consumers with fresh, clean and hygienic packed chicken (http://www.sugunapoultry.com/about_suguna/overview.asp)

In 1993, the company set up a “parent farm”, where the parent breed was reared. Day-old chicks hatched by these birds are sent to the contract farmers. In 2000, it began to directly import “grandparent chicks”— that have the best genetic make-up for breeding broilers— from the UK and set up a “grandparent farm”(Business Today, July, 2008). The company also forayed into the layer (egg) segment of the poultry business in 2007, and grabbed a 6.6 per cent market share in the first year. Venkateshwara Hatcheries (90 per cent market share) is the dominant player in the layer segment.

Suguna’s operations are divided into 13 regions, each under the charge of a manager who has independence to decide on issues in his region (Business today, July, 2008). Products of Suguna are Suguna Chicken, Suguna Anytime - Frozen chicken, Suguna Daily Freshh, Suguna Home Bites, Suguna Value Added Eggs. Suguna collaborates with leading international companies to bring the latest technology and practices to the service this massive base of 15000 farms and Suguna has invested in sophisticated technology and infrastructure. This includes:

- state of the art hatcheries,
- an advanced R&D Centre,

- feedmills
- veterinarians
- scientists
- other professionals

Through this setup, quality production through the farmers is assured with the best quality chicks, feed and professional care. Suguna's scientists and employees train the farmers in GMP (Good Management Practices). Through these, Suguna brings substantial value to the industry as well as the farmers who may otherwise on their own be unable to have access to these technologies and services. Quality products results from stringent processes and ultra-hygienic rearing methods that are accepted worldwide. Suguna's presence is now established in 11 states across the country. Suguna has obtained the ISO certification which is further proof of Suguna's commitment to quality. (http://www.sugunapoultry.com/about_suguna/overview).

Suguna had also implemented the Hazard Analysis and Critical Control Points (HACCP) system. Suguna is well prepared with its state-of-the-art processing plant to meet the ever growing demand (http://www.sugunapoultry.com/about_suguna/overview). Suguna offers a wide range of innovative products to its consumers and its partners and had a turnover of Rs 11 billion in FY 2005-06 and a 14 percent share in the Rs 80 billion broiler market. It aims for a turnover of Rs 30 billion by 2010 and have a 20 percent market share in the Indian poultry industry (Business today, July, 2009).

Suguna's business model can be called contract broiler farming or a form of franchise farming and was introduced in 1991. Farmers who own land and have access to resources such as water, electricity and labour can become growers of Suguna's Ross breed of chicks. All the required inputs — day old chicks (DOCs), feed, medicines and expertise — are provided by Suguna. The process of growing the chicks is standardised and must conform to exacting standards laid down by Suguna. Quality control checks are carried out by company staff to ensure the norms are being met. The broilers, as long as they comply with established quality norms, are procured by Suguna and the farmer is paid a 'growing' commission or charge. On an average, a typical farmer franchisee can earn Rs 10,000 monthly for breeding broiler chickens in their farm (http://www.sugunapoultry.com/about_suguna/overview).

If a farmer does not comply with procedures, as laid down in the breeding manual, or sells chickens to another party, it is considered a breach of trust and the contract is unlikely to be renewed. Suguna also provides farmer franchisees with a safety net: not only does the company bear production and market risks, it also shoulders any damage from a change in the market environment. For instance, a rise in feed prices would not affect contract farmers because they are supplied with feed directly by Suguna. When there was an attack of bird flu recently, Suguna bore the losses to farmers.

Suguna successfully reduced middlemen in the poultry chain from 14 to 4. Farmers deal only with the company, and get assured returns. Regardless of the market price, the farmers still get the assured growing charge/ cost, and incentives. Suguna has proved that every state in India is fit for poultry operations with its presence in 11 states. Suguna has benefited large numbers of rural households improving their lives with its innovative business model. Seeing the impact of Suguna's initiatives on rural development, Chief Ministers of other States such as Andhra Pradesh, West Bengal, Punjab and Jharkand have approached and invited Suguna

to set up operations in their states. The model has also attracted visitors from across borders that are keen to learn from Suguna's initiatives and success and to adopt the same in their countries.

This model protects the interests of both the farmer and the integrator (Suguna). The integrator takes responsibility of providing day old chicks, feed, medicines and supervision to the farmers. In addition, the integrator brings Good Manufacturing Practice (GMP), and technical know-how which leads to higher productivity. In the absence of these, independent farmers required heavy investments, multiple interactions, and had overall poor yields. Farmers who follow the practices are assured of good earnings in the integrated / contract farming model. The Suguna model offers fast scalability as the company does not have to buy or lease farms. It keeps costs low, and offers economies of scale including in buying raw materials, feed and medicines.

Model 7: The NDDB Safal Auction Market

The NDDB's Safal Auction Market was set up in Bangalore in 2003 as a highly modern market for the marketing of fruits and vegetables. To enable the National Dairy Development Board (NDDB) to set up this auction market outside of the Agricultural Produce Market Committee (APMC) governed market yards, the Karnataka state government passed a special amendment to the APMC Act. This Rs. 1500 million auction market is on the outskirts of Bangalore on 60 acres of land. It has state-of-the-art marketing infrastructure. It has separate auction rooms for fruits and for vegetables which have electronic display boards and electronic auction equipment. The auction is conducted by the staff and there is a viewing gallery for farmers witnessing it. There are no commission agents, and no commission is required to be paid by the farmers, but there is a service charge to be paid by them. There are storage facilities for farmers and traders including cold storages, and ripening chambers.

The supply chain is simple and direct. The farmers may either bring the produce directly to the Safal Auction Market with their own or hired transport, or take the produce to the closest Safal Growers' Association. In the latter case, a round of grading is done before the produce is sent to the market in the Association's transport. If the produce is brought directly by the farmers, then the grading takes place at the auction centre before the auction. The produce usually arrives in the evening before the day of the auction. Farmers may come along with their produce to view the auction. The buyers are required to pay a deposit to participate in the auction. After the auction, the produce is transported out by the buyer/trader. Some wholesalers procure and transport it to markets in other states.

Despite the world-class facilities that indicate efficiency and hygiene, the Safal Auction Market, even after five years, is operating at only 15-20 percent capacity. Officials expect the market to operate at full capacity only after another five years or so. The main reason they cite for this situation is the boycott of the facilities by the wholesalers. Officials also state that the dependence of the farmer on the commission agent for credit discourages them from coming to this facility. Some buyers - wholesalers and retailers indicate that the main drawback is the lack of product choice. Some farmers and consolidators make use of the cold storage and ripening chambers available at the market even if they do not sell their produce at the auctions (<http://www.business.outlookindia.com/inner.aspx>).

Model 8: HPMC

Himachal Pradesh Horticultural Produce Marketing and Processing Corporation (HPMC) is a government owned and managed organisation for the processing and marketing of horticultural produce, especially apples, grown in the state of Himachal Pradesh. The produce is purchased by HPMC from the farmers at announced prices. It is then stored, processed, and marketed nationally by the corporation. The HPMC has set up processing facilities and infrastructure including produce collection centres, warehouses, cold storages, and processing plants in the state of Himachal Pradesh, principally for apples: two collection centres, ten packing/ grading houses, three warehouses, and five cold storages. It has also set up cold storages in the metropolitan cities of Delhi, Mumbai, and Chennai.

HPMC was established in 1974 as a government public sector undertaking for the objective of marketing of fresh fruits and processing of surplus fruits. HPMC provides various services to the state's fruit growers for the processing and marketing of fruits. HPMC has set up two modern fruit processing plants which can make a range of processed products (<http://www.hpmc.com/aboutus.htm>). Between the years 1974 to 1982, HPMC established pre and post harvest infrastructure, comprising of a network of mechanically operated pack houses, cold storages, transshipment centres and fruit processing plants, besides a network of sales offices in the terminal markets. The infrastructure of grading/packing, pre-cooling and cold storages was established in rural areas to provide pre and post harvest facilities to the farmers close to their farms. (<http://www.hpmc.com/aboutus.htm>). HPMC produces a variety of processed products including apple juice concentrate, concentrate of orange, pear, plum, and strawberry, and pulps of all the above fruits. It also produces fruit juices in tetra packs, natural and blended juices, squashes, jams, canned products, apple cider, cider vinegar, apple and plum wine, baby corn, mushroom in brine and varieties of pickles. (<http://www.hpmc.com/products.htm>)

HPMC seeks to bring remunerative returns to the fruit growers and nutritive quality products at a reasonable price to the consumers. During the year 2005-06, HPMC sold processed products worth Rs. 117.7 million in markets across the country. It signed an MoU with the Agri-Business Information Center of the Federation of Indian Chamber of Commerce of Industry (FICCI) which provides services and information to HPMC for marketing its products in the domestic and international markets. HPMC is supplying its products to Indian Airlines, Alliance Air India and Indian Railways, earning Rs. 2.1 billion revenue annually. It also supplied products worth Rs. 13.7 million to private companies such as Heinz, Parle, Mohan Meakin and Britannia in 2005-06. To export apples, HPMC has signed a MoU with the private company ITC under which HPMC helped ITC procure 10,000 boxes of apples worth Rs. 4.7 million and extended its storage and packing facilities to ITC. Under the Market Intervention Scheme of the government, the corporation procured 22,713 MT apples last year (<http://www.hpmc.com/achievements.htm>).

HPMC procures some fruits such as apples under the government's Market Intervention Scheme (MIS) which helps support prices, preventing them from crashing. The efforts made by the Corporation have resulted in stabilizing the prices of the fruits in the market. Apart procuring under MIS, HPMC also directly procures other fruits like Peach, Pear, Plum, Litchi, Almonds etc. grown in the State, for marketing and processing under hygienic conditions in its processing plants. This helps increase the capacity utilisation of the plants and assists the farmers in getting remunerative returns for their produce.

The HPMC's did well in the beginning but subsequently could not perform in the active market. The producers did not bring apples in sufficient quantities to HPMC due to their scattered, hilly and distant producing locations which made transportation from the producing areas expensive. Bringing produce from producing area to the grading and packing centres was time consuming and they had to wait a long time for their turn to get the produce graded. Because the apple season is very short, the producers preferred to send the produce immediately to the terminal markets to avoid losses and get better returns. Cold storages were often not fully utilized and HPMC had therefore to divert its utilization to mushroom cultivation after modifications (Dhankar and Rai, 2002).

When HPMC found it difficult to process the fruit procured, it sent it to markets for sale in fresh form. This affected the market and prices for fresh fruits. Good quality apple prices crashed when HPMC took such steps, affecting the market prices. Though the corporation has experience in post-harvest management of fruits, it lacks in business skills and capabilities. There has been gradual decrease in its activities and increase in losses. The capacity utilization of grading and packing houses has become very low. HPMC attributes the dismal low utilization to removal of free transport facilities available earlier to the growers through it (Dhankar and Rai, 2002).

As indicated, even though HPMC was fairly successful at one time, reports indicate that it has not been able to sustain the performance (Vaidya 1996, Gandhi, Kumar and Marsh 2001). It has been neither able to attract enough farmer suppliers nor expand distribution beyond its own outlets. While, government owned agro-industries are well funded for investment in infrastructure and technology, and have government support, they depend on bureaucrats for management often with limited business skills. Managers are frequently transferred at the whims of changing governments, and are accountable primarily to their superiors, not to the farmers or consumers. They are unable to sustain commitment to procure from small farmers, on the one hand, and to meet dynamic marketing demand, on the other, thwarting the long-term performance of the enterprise.

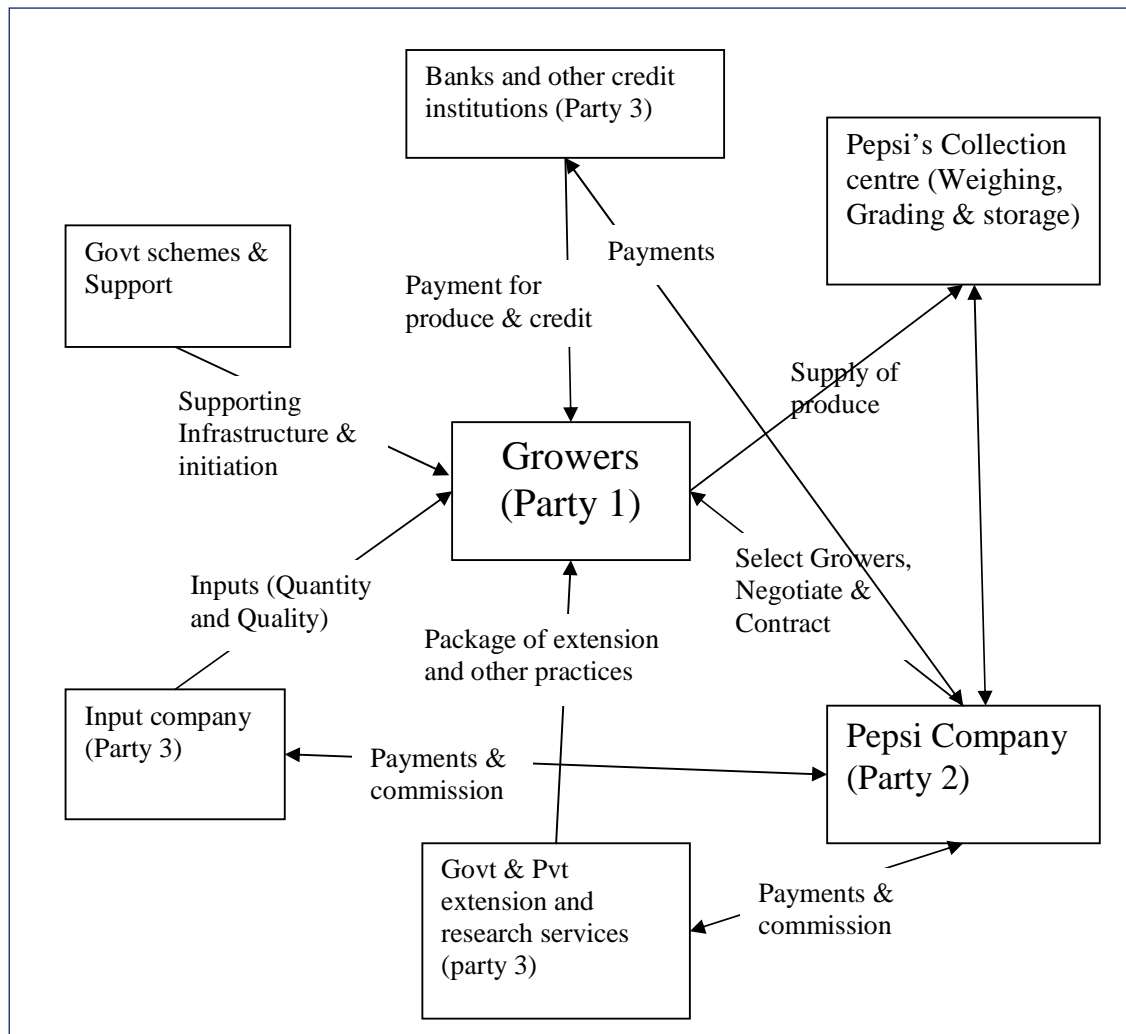
Model 9: PepsiCo India

Pepsico has been working with farmers in Punjab since the 1980s, starting with procuring tomatoes from the farmers and producing tomato pulp, as an initial condition for obtaining government permission to produce and sell its soft drinks in India. In the operation, Pepsi introduced new tomato varieties that helped boost the state's tomato crop from 18,000 tons in 1988 to 300,000 tons. PepsiCo's involvement in Indian agriculture also stems from its aim of creating a cost-effective, localised agri-base in India, and for this, providing farmers' exposure and access to world class agricultural practices. PepsiCo India has worked with farmers and State Governments to improve agri sustainability, crop diversification and raise farmer incomes. PepsiCo helped farmers refine their farming techniques, raise farm productivity, and offered customized solutions to suit specific geographies and locations.

In 1989 Pepsico had launched a joint initiative with Punjab Agriculture University (PAU), Ludhiana and Punjab Agro Industries Corporation (PAIC), Chandigarh, for production, procurement and processing of tomato. This model involved backward integration by a private company with strong marketing capabilities and products and brands that are already established. The initiative led to the setting up by Pepsi Foods in India of a tomato processing plant at Zahura in Hoshiarpur district in Punjab in 1989. By 1994, 350 farmers over an area

of 2700 acres were covered and 650 tonnes of tomato were processed every day (Gulati et al 1994). In this model contracts for production and procurement of tomatoes were made with small farmers - the contracts were moral in reality, rather than legal. The company invested in building relationships of trust with the farmers through their commitment to providing extension services and production inputs. It brought in experts and promoted the use of appropriate farm technology and varieties with the farmers, bringing to bear research and know-how available worldwide. Seedlings were provided to the farmers and the planting was scheduled and programmed using computers. The best available technology was used in processing and the company used its strong marketing capabilities and networks for selling the quality products.

More recently, a similar initiative has been launched for Potato. The initiative has sought to substantially improve agricultural practices and help Punjab farmers produce internationally competitive products. PepsiCo used contract farming under which the company transferred agricultural best practices and technology, and procured the produce at a guaranteed price, see Figure 4 below. To support the initiative, PepsiCo also set up a 27-acre research and demonstration farm in Punjab to conduct farm trials for new varieties of tomato, potato and other crops. They have evaluated more than 100 varieties and hybrids of tomato, more than 200 varieties and hybrids of chilli, 25 varieties and hybrids of corn, more than 60 varieties of peanut and several varieties of basmati rice.

Figure 4: Tripartite Model of Pepsico India**Based on Singh (2007)**

The quality parameters put in place through the chain are driven by the specific requirements for processing and buyer requirements. Processing requires potatoes with low sugar content (0%) and high solids (between 15 to 20%). Apart from these, since the company is HACCP and ISO certified, it requires stringent quality control at all levels in the chain. Specific requirements are met by ensuring quality compliance at every stage, R&D, farming, storing, processing, and packaging (Punjabi, 2008).

Before introducing the varieties to the farmers, extensive trials are undertaken and a package of agronomic practices suitable to the local agro-climatic conditions are developed by Pepsico in collaboration with Central Potato Research Institute (CPRI). The package included specific fertilizer recommendations and spraying schedules (Punjabi, 2008). The company ensures availability of inputs to farmers working in the area. Seed potatoes of specific varieties for processing are also provided by the company. The “vendor” in the region ensures that the farmers falling under their supervision have all the required inputs at the right time. If the company is providing inputs, then the costs are deducted during buy back of

potatoes. Apart from ensuring inputs, the company had also introduced crop insurance under Agricultural Insurance Company (AIC) and weather insurance from ICICI Lombard. In Karnataka PepsiCo created an institutional frame-work roping in the Central Potato Research Institute (CPRI), agro-chemical giant Du Pont and the ICICI Lombard General Insurance company (Economic Times, 2007).

For producing specific variety and for enhancing productivity PepsiCo is very closely involved with its contract farmers for potato production. The company has employed teams of agricultural graduates, who work with the farmers to provide technical input and to monitor the production with the farmers in their specified area. One technical expert deals with approximately 100 farmers. The farmers reported that because of the technical information provided by company agronomists the use of chemicals and fertilizers is much more timely and effective (Punjabi, 2008). The agronomists regularly monitor the fields at the time of planting, spraying, harvesting etc. If there is expectation of an outbreak of any disease or pest, they inform the farmers about timely spraying. Any major problems are attended in consultation with the company researchers if necessary. Apart from Pepsico contract farmers, all potato growers benefit from early detection of diseases, as a “positive externality” of the company’s operation (Punjabi, 2008).

To emphasize the care required in post harvest management, the company agronomists often used messages such as “Handle potatoes like eggs not like stones” (Punjabi, 2008). Traditionally, jute bags have been used for packaging potatoes. Instead of jute bags, the company has propagated the use of plastic bags for packaging as it ensures better storage. At the company’s unloading dock, the potatoes are mechanically graded for size. Potatoes that are too small for processing are separated. Also, there is visual inspection for damaged potatoes. Test for sugar content is undertaken by frying a small sample from the lot. Sample tests are also undertaken for solid content. Potatoes that do not meet the requirements are rejected. Potatoes are stored at 12 degrees to regulate conversion of sugar to starch and at this temperature potatoes can be stored up to 4 months. Potatoes are also treated to limit sprouting.

Selected potatoes are taken to the processing plant. They are washed and peeled and inspected for physical damages and discoloration and are run through rotating slicers, and are deep fried. The rice bran oil is used for frying which has less saturated fat content and the fried chips are optical tested for colour. Finally, the chips are mixed with spices and packed. The plant has a well equipped quality testing lab and thorough testing of inputs and packaging materials is also conducted.

New tomato varieties are stated to have contributed to increase in tomato annual production from 28,000 tons to over 200,000 tons in Punjab (Punjabi, 2008). Yields have increased from 16 tons to 54 tons per hectare. Many high-quality, high-yield potato varieties have also been introduced and is stated to have helped increase farm incomes and have enabled Pepsico to procure world class chip-grade potatoes for its Frito Lay snacks division. The company has partnered with more than 10,000 farmers working in over 10,000 acres for potato across Punjab, U.P., Karnataka, Jharkand West Bengal, Kashmir and Maharashtra.

This model involves not simply procurement or contract farming, but developing a mutually beneficial partnership between the agro-industry and the farmers. This may entail substantial financial losses in the initial years, but followed by profitability thereafter. This model can

result in excellent benefits for small farmers perhaps in limited area, but it requires a long-term view and commitment from the company and willingness by the enterprise to absorb substantial start-up costs and initial losses, (Gandhi, Kumar and Marsh 2001).

Singh and Bhagat (2004) analysed Pepsico model and concluded that, though Pepsi's model is a better model of contract farming as compared to HLL and Nijjer, there are various operational problems in the functioning of contract-farming practices. They indicate that many farmers rate the Pepsico experiment with contract farming as a better model. But in the larger sense, PepsiCo has treated farmers as their supply base and had worked only with the intention of creating sustainable supply bases. As the acreage under tomato crop increases, the production too increases and the open market prices may fall. The company then may base its price paid or contract price on this low open market price. Farmers in Sangrur, as well as Ganganagar, indicate that Pepsi had started paying them as low a price as Rs.1.50 per kg, (Singh & Bhagat, 2004). At times, as reported in Dainik Bhaskar (2nd September, 2000), they have also failed to fulfil their contract.

Singh and Bhagat (2004) indicate that such a wonderful agreement can go haywire if Pepsico does not learn to care for the farmers. PepsiCo must fulfil commitments and should enter into an option contract with the farmers group, i.e. when the open market prices are higher than the contract price, they should pay open market price and vice-versa. They should learn from the experiences of HLL that contract farming without building mutual trust with the supply chain partners might be problematic for the company itself. Pepsico should treat farmers as partners and pass-on benefits to them to create a long-term and sustainable relationship for a sustainable business. Singh and Bhagat (2004) indicate that Pepsi needs to share the benefits to get the trust of the farmers. Indian firms need to partner with Indian farmer to bring about an agricultural revolution which will lead to a win-win situation for both the farmers and corporates.

Model 10: ITC e-Choupal

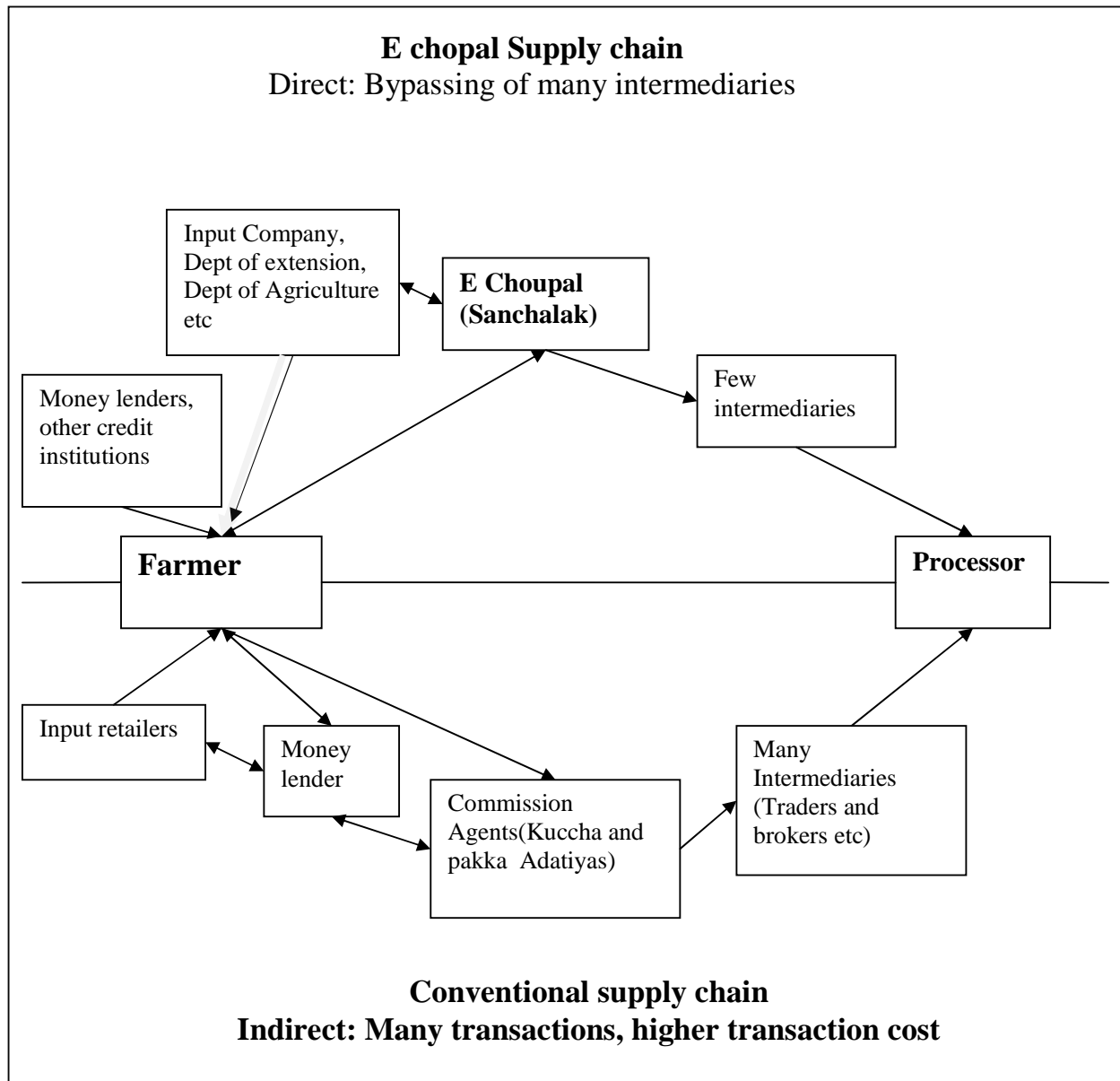
ITC is a large corporate group in India and through its International Business Division (IBD) it undertakes procurement, processing, and export of agricultural commodities such as soybean, wheat, shrimp and coffee. Over the past few years ITC-IBD has developed a unique innovative IT-enabled rural procurement, information and marketing channel through village centres called *e-choupals* that cover a huge number of villages. This model has been used to increase efficiency in the procurement of agricultural commodities resulting in value creation for both the company and the farmer. In addition, the model has created value by taking internet penetration to remote villages, making global commercial contact possible where infrastructural, economic and social limitations had made this impossible.

The project was launched in June 2000 in the villages of Madhya Pradesh. (Launch for Soya farmer website www.soyachoupal.com.) ITC had opened three soya processing and collection center and then started the first 6 village *e-choupals* in June 2000. Soon, this model became rural India's largest internet based initiative. The re-engineered supply chain of e-choupal looks very different from the existing marketing system and has several components (Bowonder, Gupta & Singh, 2002). Company first looked for a farmer from each villages around the collection center to head the village e-choupal. The person is called the '*Sanchalak*', and the person who would become the trained village individual who would

operate and coordinate the activities in the e-Choupal. After selection of the sanchalak a personal computer was install in his house and he was given training on using it. (Bowonder, Gupta & Singh, 2002). The computer had back-up power and was connected to the internet via telephone as well as via satellite. The sanchalak helped the farmer in using the system by guiding them in seeing the prevailing prices and other related information on the PC. The sanchalaks were paid 0.5% of the procurement price for each ton soya procured by ITC from their Choupal (Bowonder, Gupta & Singh, 2002). Before implementing any new initiatives, ITC consult its sanchalaks. Besides, regular 'Choupal' meets were held. This not only provided the company feedback from farmer, but also generated new ideas (Bowonder, Gupta & Singh, 2002).

By May 2007 e-choupal services reached more than 4 million farmers in about 40,000 villages through more than 6500 choupals in Uttar Pradesh, Madhya Pradesh, Rajasthan, Maharastra, Karnataka, Andhra Pradesh and Kerala. ITC is extending its business model to other Indian States including West Bengal, Himachal Pradesh, Punjab and Haryana. The digital infrastructure at the village is complemented and completed with a physical infrastructure in the form of Choupal Saagars. These choupal saagars offer multiple services under one roof a marketing platform: shop for agri equipment and personal consumer products, insurance counters, pharmacy and health center, agri extension clinic, fuel station and a food court (Bowonder, Gupta & Singh, 2002). The ITC e-choupal model is depicted in Figure 5.

Figure 5: Model of ITC e choupal supply chain



Based on Bowonder, Gupta & Singh (2002)

For smooth functioning of its project, ITC could not totally ignore the commission agents who would resist any change. Therefore, the company devised a new role for them and called them as 'samyojkas' (Bowonder, Gupta & Singh, 2002). The samyojak were responsible for collecting the produce from villages that were located far away from the processing centers and bringing it to the ITC centers. The samyojak was paid 1 percent commission for his service (Bowonder, Gupta & Singh, 2002).

According to Bowonder, Gupta & Singh (2002), the previous day's *mandi* closing price is used to determine the benchmark Fair Average Quality (FAQ) price at the e-Choupal. The benchmark price is fixed for a given day. This information and the previous day's *mandi* prices are communicated to the *sanchalak* through the e-Choupal portal i.e. <http://www.itcibd.com>. The commission agents at the *mandis* are responsible for entering daily *mandi* prices into the e-Choupal system. If and when the internet connection fails, the *sanchalak* calls an ITC field representative to obtain the information.

To initiate a sale, the farmer brings a sample of his produce to the e-Choupal. The *sanchalak* inspects the produce and based on his assessment of the quality makes appropriate deductions (if any) to the benchmark price and gives the farmer a conditional quote. The *sanchalak* performs the quality tests in the farmer's presence and must justify any deductions to the farmer. If the farmer chooses to sell his soy to ITC, the *sanchalak* gives him a note with his name, his village, particulars about the quality tests (foreign matter and moisture content), approximate quantity and conditional price.

The farmer takes the note from the *sanchalak* and proceeds with his produce to the nearest ITC procurement hub, ITC's point for collection of produce and distribution of inputs. At the ITC procurement hub, a sample of the farmer's produce is taken and set aside for laboratory tests. A chemist visually inspects the soybean and verifies the assessment of the *sanchalak*. Laboratory testing of the sample for oil content is performed after the sale and does not alter the price. Therefore pricing is based solely upon tests that can be understood by the farmer. The farmer accepts foreign matter deductions for the presence of stones or hay, based upon the visual comparison of his produce with his neighbors. After the inspection, the farmer's produce is weighed on an electronic weighbridge. After the inspection and weighing are complete, the farmer then collects his payment in full at the payment counter. The farmer is also reimbursed for transporting his crop to the procurement hub. Every stage of the process is accompanied by appropriate documentation. The farmer is given a copy of lab reports, agreed rates, and receipts for his records. At the end of the year, farmers can redeem their accumulated bonus points through the e-Choupal for farm inputs, or contributions toward insurance premiums.

The transaction at the ITC hub is faster than at the *mandi*, usually taking no more than two or three hours. ITC's electronic weighing scales are accurate and not susceptible to sleight of hand like the manual weighing system at the *mandi*. The system also does not require produce to be bagged, which avoids the associated loss of produce. E-Choupal allows farmers daily access to prices at several nearby *mandis* and can make better decisions of when and where to sell his crop. Thus, E-choupal attempts to provide the farmers a better price for their crops. The incremental income from a more efficient marketing system is estimated to be US\$6 per ton on an average, or an increase of about 2.5% over the *mandi* system.

Farmers can also make use of the information available to them through e-Choupal to improve yields. Seed, fertilizer, and consumer products are offered to them through e-Choupal cost less than through other local sources such as village traders. Thus there are other economic benefits to farmers. It is reported that in areas covered by e-Choupals, the percentage of farmers planting soy has increased dramatically, from 50 to 90% in some regions, while the volume of soy marketed through *mandis* has dropped by as much as 50%.

A major impact of the e-Choupal system comes from bridging the information and service gap of rural India. Information and services provided by the e-Choupal Web site and e-commerce system include:

- *Weather.* The availability of accurate rain information may cut losses due to weather by more than half. (Bowonder, Gupta & Singh, 2002).
- *Agricultural Best Practices.* Information on scientific practices is available on the Website. Additional questions can be answered through FAQs and access to experts by email.
- *Customized Quality Solutions.* Farmers are given customized feedback on how they can improve crop quality and yield.
- *Product Deployment.* Inputs such as fertilizers and pesticides are supplied along with recommendations and services such as soil testing.

Singh and Bhagat (2004) find that most farmers did not agree with ITC claim that farmers have been getting better prices for their produce, and there are only minor benefits like de-bagging expenses etc. Farmers also indicated that the company does not pay the price agreed by the Sanchalaks. Sometimes, quality is downgraded and resulting in less farmers realization. One significant advantage is correct weight, which was a major worry in traditional Mandi.

Singh and Bhagat (2004) found that the portal did not have the requisite richness for it to become information and knowledge dissemination kiosk. The information as regards to best practices, integrated crop production, inputs fertilizer and seeds were of poor quality. Information was not customized to the farming needs of these agro climatic regions. In all these villages the only information disseminated was the prices and weather conditions.

Singh and Bhagat (2004) find that as regards selling pesticides and fertilizers and seeds that ITC has not taken care to see that there is acceptability of input trading by its Choupals. Selling of inputs of another company does not take the business relationships into account and proper partnerships with these companies are often absent.

Model 11: McCain India

The McCain Foods subsidiary, Canada-McCain Foods India (Private) Ltd, was established in 1997 and its potato processing plant in Gujarat (Mehsana) became operational in 2007, with a processing capacity of 30,000 mt per annum or 4mt per hour. The plant aims to produce french fries and other potato products such as flakes, patties, mashed potatoes, *aloo tikki* and wedges for retail and food service businesses across the Indian subcontinent. It will employ 100 and 125 people at full capacity. It will also create indirect employment in storage, supply chain and outsourced services.

McCain has been buying its potato stock for processing with contracts, of which 85 per cent was from Gujarat and 15 per cent from Punjab. McCain has a choice of three types of contracts with the farmers, namely fixed, flexible and open. In fixed contracts the price is fixed and the transaction at harvest at that price irrespective of the market price. In flexible contract, a range is fixed within which the deal is to be finally settled. If prices at time of

harvesting is more than the upper bound then the farmer gets the upper bound price. In case prices are below the lower bound, company pays the lower bound price. In the open contract, both parties are free to transact or not too. Another type of contract is a mix of two kinds in some proportion.

The farmer gets seed potato from the McCain. 50 percent of the potato seeds are given on credit and the cost is settled at time of procurement. McCain also provides planters, diggers and agri inputs including drip and sprinkler irrigation equipments. The loans are also made available through various banks, for high quality potato production. Company agronomists visit the farmers every weekly and provide guidance on crop management. After harvest, the farmer takes the potatoes to the procurement-cum-storage hubs of McCain. His produce is graded and weighed and quality testing is done. Then the farmers are given a for the amount the company will pay to them. The payment is made within 15 days. The produce is kept in cold storage and when required, is transported to the McCain plant at Mehsana for processing. Quality is very important criteria for the selection of growers. Generally the growers must have 4-6 years of experience in quality potato growing. If the quality or the size are not up to the mark, then it is rejected and the farmer can sell it where he likes, or sell to McCain at a lower price.

Comparison of McCain and Pepsi (Frito-lay)

Both McCain and Frito-Lay contract directly with the growers, and specifying clear quality parameters. Both shifted from acreage contracts to combination acreage/quantity contracts that specified the minimum quantity to be delivered per unit area. Both firms require delivery at a specified place, with growers bearing the delivery costs. However, there are differences: McCain had a smaller area of operation and a more specialized market for its products. While Frito-Lay paid market prices, McCain offered a range of pricing options to its growers. Frito-Lay contracts offered only one price for all rejected chip-grade potatoes and could reject produce at its own discretion to buy it at the lower price stipulated for rejected produce; the final quality tests were done at the factory at Channo and undersized potatoes were not returned to the farmer (Singh, 2007). The McCain contract specified that if there was a deviation of more than 2 per cent in some quality parameters (size, machine damage, mixing of varieties, presence of solid matter), the company could reduce the prices paid by an unspecified amount (Singh, 2007). Thus, there was uncertainty and risk for growers due to information asymmetry and lower bargaining power.

The both contract documents were replete with various obligations on the part of the farmer with regard to quality maintenance, quantity, cultivation practices, post-harvest care of the produce, etc., but with very little obligation on the part of the company. All production risks were borne by the farmers and neither firm provided any reprieve to a contract farmer in case of crop failure. Even having entered into a contract and followed all instructions, there was uncertainty about whether the producer would have a market because neither firm's contract obliged the company to buy the produce (Singh, 2007)

The cost of production for McCain potato contract growers was found to be slightly lower than the McCain non-contract growers but much higher than those selling at the APMC or at farm-gate. The yield and marketing costs for McCain contract growers were higher than any other channel. Marketing costs were higher for growers involved with McCain than they were for the APMC alternative, while net income from McCain was higher compared with income

from alternative channels (Singh, 2007). Variation in net income between growers in the same category was much less in the case of contract growers because of set prices. The McCain growers found that the use of sprinklers rather than flood irrigation reduced their labour requirements, improved soil quality and increased potato yields and quality, besides saving water and extraction costs (Singh, 2007).

In the case of Frito-Lay, the cost of production was higher and transaction costs somewhat lower than for APMC and farm-gate growers despite the fact that contract growers had to deliver to the factory. Gross and net income was lower than that of growers using other channels due to lower yields; contract prices for high quality produce and rejected produce were lower than post-harvest and off-season prices. The trend was for farmers directly supplying the companies to have higher production costs, regardless of whether a contract was involved, than those selling to other market outlets.

Model 12: Desai Fruits and Vegetables (Desai Cold Storage)

The large scale production of fruits and vegetables in the south Gujarat area gave the idea and opportunity to two families of this area of start a Cold Storage in the year 2001. There were two partners in this venture and Mr. Ajitbhai Desai was the active partner. The other partner is associated with a Sugar Mill in the area. The construction of the cold storage was started in 2001 and was completed only in the year 2002. In venturing into this business the main intention was to help other traders and farmers to keep their produce for a longer time. But there was no enquiry for utilizing this facility arose and so no such service was provided to any customer. The facility is now used only for themselves. But they never keep any of their products in cold storage for a long. Instead they have developed a business mainly of trading of fruits and vegetables not only locally but also nationally and internationally.

A major concern and problem that the partners had was attracting farmers to sell their produce to them. To overcome this, they devised number of activities to create awareness amongst the farmers in the area. In the year 2001, they organized a number of face to face meetings with farmers in different villages. To attract the farmers, they offered integrated pest management (IPM) without any charges to the farmers. They also offered the harvesting and handling technology through which the farmers can save labour and get higher quality produce thereby getting higher prices for their produce. Some of the other benefits offered to the farmers were:

- waver of any commission for the transactions (normal market charges amount to about 10%)
- assurance of 100% buying
- quality based pricing – higher than the prevailing market price
- direct buying from the farm gate
- assured minimum price. The minimum price calculated on the basis of the production cost, harvest labour cost, and in addition a margin for the farmers. Through this mechanism, even if the market prices crash, the farmers would get the pre-determined minimum price which is agreed upon. If, however, the market prices become higher then the transactions will be at the prevailing market prices

They started with trading only of mangoes. During the first year of operation in the year 2002, with the help of the Merchant Traders of Canada, France, Netherlands and some other countries, they exported 600 tons of mangoes. During the year 2003, they could increase this and export 1200 tons again through the help of Merchant Traders.

During the initial year (2002) they also tried to sell in the domestic market with their brand through some Super Market chains in major cities and also to the system run by NDDDB Mother Dairy. But this experience was disappointing. The response from the consumers was not as expected, and this venture did not work. They did not find it worthwhile to continue selling in the national market.

In the year 2004, they exported 17000 tons of mangoes directly. The main destinations of these exports were the Middle East and UK. They also continued to sell locally on a minor scale through merchants and the Mother Dairy on a demand basis.

Though the mangoes business is the major one, they also deal with banana, papaya and pomegranate. They have now succeeded in expanding their export destinations to include China and Australia. Necessary approvals/contract have already been signed.

The mango season in India is actually spread over a period of about 8 months. It start as early as the months of January-February from Kerala, then going up to A.P. and the Konkan region of Karnataka, and the further up to Maharashtra, Valsad and the Saurashtra region in Gujarat, and ending during August in UP and Bihar. Therefore, Desai Cold Storage is hopeful of doing the mango business for a period of about 8 months in the year.

Currently to meet the requirements to expand the business towards 8 months, they are buying in the local markets in Gujarat and are doing some improvement and value additions to the produce in their present unit. But in the future they are planning to implement the procurement system they have developed in Gujarat to the other states and areas in order expand the business to 8 months. They have already contacted with farmers some of the above mentioned regions and farmers in these regions have also been guaranteed the benefits and facilities offered to the farmers in Gujarat. The state governments of AP and Maharashtra have also started some processing units to help the farmers. They have been contacted and assured their help.

They also noticed that during the initial 2-3 months of the season, there will not be any competitors from any Asia region countries, and hence their business can have a major competitive advantage during this period. Major competition to this business is from Pakistan, but this is towards the end of the mango season (i.e. July-August), when the *Chosa* varieties of mango from UP & Bihar are available.

To improve and maintain the quality and prevent deterioration in exports, certain processing and handling measures are stringently followed and carried out in the cold storage premises. These include:

- *Deshaping*: The raw mango brought from the farm first go for deshaping. In this process, the extra length of the stem is cut uniformly (to about one inch length only) to avoid damage due to the acidic discharge.

- *Hot water treatment:* After deshaping the mangoes are put through an automatic hot water treatment plant to remove/ destroy the fruit-fly eggs.
- *Fungicide treatment:* After the hot water treatment, the lot goes for fungicide treatment. This treatment extends the shelf life of the product
- *Grading:* Then the lot goes through an automatic grading machine. Through this process the mangoes are sorted into different lots according to the weight of each fruit.
- *Washing/waxing:* As per the requirements of the buyers washing and waxing services to selected lots.
- *Packing:* The packing is carried out according to weight of fruits, and according to the buyer requirement of the number of mangoes in a carton.
- *Pre-cooling:* The entire lot is then moved to a pre-cooling treatment plant. Pre-cooling brings the fruits at a uniform temperature before it goes to the cold storage shelves.
- *Storing:* After the pre-cooling the packages are move to the specified locations in the cold storage.
- *Loading:* Whenever required to execute an export or domestic order, particular lots of these packages are loaded into containers for transportation to their destinations.

To expand into the banana business, they are planning to import modern technology in all aspects including farming, handling, and processing. They plan to spend about Rs.5.million for this purpose. Large scale banana farmers around Navsari and nearby areas in Gujarat have already been contacted. They have been offered the same benefits and guarantees offered to the Mango farmers. Many contact meetings with these farmers have already been taken place at different locations.

Since inception they have also started dealing with the green vegetables. The main vegetables they were dealing are: lady finger (okra), bitter gourd, bottle gourd, and marginally chilly, lemon and a few others. During the first year (2002) of this operation they bought this produce from the market but also purchased from the farmers in around the cold storage. As in the case of mangoes, vegetable exports were also through merchant traders initially. They exported about 40% of their procured produce through merchant traders. They sold the remaining in the domestic market and Mother Dairy was the major purchaser.

During this initial period, they convinced the farmers to have a tie-up directly with them on the same lines as with the mango farmers. Slowly the direct input arrival from the farmers has picked up. Farmers are required to sort their produce into A, B & C quality before delivery, and this is taken into consideration in fixing the prices. The purchase prices of vegetables are fixed slightly higher than the Surat APMC daily market prices. The payment is made to the farmers only on the next day after getting the exact market prices of Surat APMC.

In the year 2003 they have started direct export of vegetables to UK and Middle Eastern countries. Besides this they are still keeping up their the export business through merchant traders and in the domestic market through the Mother Dairy.

To maintain the quality of the products, they have devised a plan, which is also beneficial to the farmers in a great extent. The small and marginal farmers had been exploited to a great

extent by retailers in the supply of inputs such as seeds, pesticides and fertilizers. These farmers had also been exploited in selling the output to traders and commission agents. To liberate those farmers who have agreed to supply their produce to them, they have devised an innovative idea. The inputs such as seeds, pesticides and fertilizers are procured in bulk and are supplied to these farmers without any margin and on credit (without any interest burden to the farmers). The cost is adjusted against the payment for supply of the output.

During the year 2004 they have distributed about 3000 kg. seeds of lady's finger (okra). By supplying the seeds of lady's finger, bottle gourd and bitter gourd to them, they are assured that the output from these farmers would be of same good variety and of same quality. For lemon, chilly, beans and other vegetables they are not providing seeds, but a bulk purchase agreement has been made. In chilly alone this year they have had a business of more 500 tons. The weekly procurement of lemon is about 15 tons.

CFI AG has put in significant investments into Desai Fruits and Vegetables (DFV) (new name of Desai Cold Storage) (April 2006 onwards) to enhance its financial, operational and management capabilities. DFV has created multiple integrated pack houses for Banana and continues to invest in creating facilities at the farm and village levels. Since its inception, the Company has invested in R&D for agricultural practices and in developing long-distance transport protocols. These initiatives have helped the Company emerge as one of the leading exporters of high quality fruits and vegetables in India. ([http:// www.desaifv.com/html/howitstarted.htm](http://www.desaifv.com/html/howitstarted.htm))

DFV now supplies a wide range of high quality tropical fruits and vegetables. The product portfolio includes over 10 types of fruits and 30 types of vegetables. However, the key focus of DFV over the years has been on four key products: Banana, Mango, Pomegranate and Grapes. These flagship products contribute over 90% of the total sales.

Over 2500 small and medium sized farmers supply to DFV. DFV has a unique contract farming mechanism in which DFV controls the inorganic inputs, technology and work-practices at the farm level to ensure that the product is absolutely natural and safe. The model has been so successful that DFV has a wait list of over 800 farmers wishing to be included in its program. DFV works along with its customers to create specialized, customized solutions in order to deliver quality at reasonable cost. ([http:// www.desaifv.com/products](http://www.desaifv.com/products))

Desai ensures quality of every product that it supplies by controlling every step involved in the production process: right from the land preparation to logistics. The quality assurance system of DFV is based on the following principles:

- Process control: that is achieved through contract farming and technical control
- Farm Approval System: where extensive checks are conducted before any farm is approved for procurement for work practices, use of chemicals and quality of products
- Traceability: of the farm, inputs used, processing location and transportation
- Quality Checks: where a Desai product goes through a stringent quality process:
 - Quality control by supervisor at the point of procurement from farmer
 - Quality checks at the point of packing
 - Random checks of consignments
 - Random sampling at laboratories for residue analysis

Desai Fruits and Vegetables has been conscious of the importance of superior infrastructure from its inception. As a result, one of the most modern and state-of-the-art packhouses has been developed, innovative trailer designs have been created for smooth transportation, reefer vans have been bought and pre-cooling, cold storage and processing facilities have been enhanced. (<http://www.desaifv.com/html/infrastructure.htm>).

Comparison and evaluation of different models

How do the different models compare on the major questions of institutional performance of agro-industries in developing countries, as discussed above? The Table below provides a broad comparison, which is followed by more indepth discussion.

Table 6: Broad comparison of different models on institutional performance parameters

Agro Industry Model	Reaching large numbers of small farmers	Ensuring adoption of right technology and practices by farmers	Use of modern processing technology and meeting the capital costs	Delivering strong marketing effort	Effective management and control to meet needs of all stakeholders
AMUL	Strong	Limited	Strong	Strong	Strong
Nandini	Good	Limited	Limited	Reasonable	Reasonable
Nestle	Limited	Strong	Strong	Strong	Limited
Heritage	Good	Limited	Good	Good	Limited
Mother Dairy	Limited	Good	Good	Good	Reasonable
Suguna	Strong	Strong	Strong	Strong	Strong
Safal Market	Limited	Limited	Good	Limited	Limited
HPMC	Limited	Limited	Good	Poor	Poor
Pepsi	Limited	Strong	Strong	Strong	Limited
ITC e-Choupal	Strong	Limited	Strong	Strong	Limited
McCain	Limited	Strong	Strong	Strong	Limited
Desai Cold Storage	Reasonable	Good	Good	Strong	Reasonable

Production and procurement from small farmers by different models

Do different models reach out well to large numbers of small farmers?

Access or reach to large numbers of small farmers is a major problem for most models and is very important for cost effectiveness, quality and development impact. Small farmers often do not have the ability to connect on their own with the main stream of agroindustry development initiatives. The AMUL model, due to its huge membership of village cooperative societies is able to cover a huge number of small farmers. It is able to collect milk even from farmers having a single animal and who bring less than a litre of milk. Suguna model is also able to reach out to a large number of small farmers mainly because of its low capital requirement to the farmers who only have to feed and rear the chicks until they grow. ITC e-Chopal also reaches to large number of farmers even in remote villages through

the internet and setting up of web-linked e-Choupals run by local operators or sanchalaks. Nandini model, also a cooperative model like AMUL, also has a good reach but not as deep as that of AMUL. Heritage foods has also developed good reach in some rural areas by using the existing retail network for FMCG goods, but is a little constrained since does not have farmers' involvement. Desai Cold Storage has reach to small farmers in a small area of operation.

However, other models such as Nestle, Mother Dairy, Safal, HPMC, Pepsi and McCain, though successful in other aspects, are generally unable to connect with a large number of small farmers and expand their reach even though they may often indicate that they contribute substantially to their development. In some cases such as Nestle and McCain, this may be because of their stringent quality requirements and limited quantity requirements.

Do the different models try to organise production of raw material from small farmers?

AMUL leaves the milk production to the farmers but it promotes the organization of farmers into cooperatives for the collection and marketing of milk. It also helps the farmers in milk production through the supply of nutritious cattle feed, fodder seed, veterinary services, vaccination, artificial insemination services, and extension. Suguna too leaves rearing of poultry birds with the farmers but extensively provides technical inputs including the best breeds of day-old-chicks, quality feed, veterinary care, and extension guidance. The Pepsi model also works extensively with small farmers so that they use the best technology and the quality and quantity required by the company, and achieve good profits. McCain also follows this approach in alternative ways. Pepsico and McCain give technological advise and offer inputs to the growers. Pepsico has collaborative tri-party agreements with farmers and input companies as partners. McCain to give diggers, planters, advisory services and extension services to its growers. ITC has sanchalaks and web portal to provide some advise. Desai Cold storage also provides inputs and advisory services to its members. However, HPMC, Nandini, Heritage Foods, Mother Dairy and Nestle provide some extension but play a limited role.

Is the procurement activity organized efficiently? If yes how ?

Three critical aspects of performance are quantity, quality, and cost. AMUL stands out in quantity and cost. This is because it uses a cooperative model to access far out sources and shares the costs with the farmers through the village and district cooperatives. Nandini has a similar approach but is not as efficient. Mother Dairy is not owned by the farmers and therefore is unable to fully leverage this model. However, it helps the cooperatives in distribution and marketing hence become more viable. Heritage achieves good efficiency in procurement by using the existing retail network for consumer goods achieving a two way flow of goods. Suguna organizes procurement efficiently by a contracting arrangement with the farmers in which costs and risks are shared. ITC leverages internet to organize its procurement efficiently. Pepsico and McCain are not able to be as efficient on this count as they have a relatively loose link with the farmers.

Adoption of right technology and practices by farmers and performance on quantity and quality

Do various models able to get the adoption of right technology and practices by farmers?

Private players run models such as Nestle, Pepsi, McCain, and Suguna which are demand or market driven seem to do comparatively better in ensuring the adoption of good technology and practices by farmers. This seems to be because these companies are first concerned about selling quality products. Therefore, ensuring quality in the raw material is very critical to them. Due to this they undertake special effort to push the adoption of the right technology by the farmers and enforce this discipline through strict quality control in purchasing from the farmers. Desai cold storage is also focussed on the adoption the right technology since it is privately run and is engaged in export thus needs compliance with high international quality standards.

For farmer or supply driven models such as AMUL and Nandini make efforts but are often not able to do as well in ensuring adoption of right technology and practices by farmers. The adoption of right technology is not able to garner as much importance since there is inclination to accept the produce of the farmers who are ultimately the owners of the enterprise. However, for success, these models cannot ignore the market requirements. ITC e-choupal need focus on the adoption of right technology but its link with the farmers is more remote – through the internet and hence it cannot exert pressure. However, the price paid and the acceptance of the produce is linked strongly to quality and hence a signal is sent to the farmers. However, extension knowledge is delivered remotely through the internet only. Heritage Foods working through retail outlets is able to do little for adoption of technology, and Safal and HPMC are also not able to play much of a role.

Are the models able to procure high quantity and quality of output from the farmers?

AMUL does very well on quantity. It procures 7.4 million litres of milk per day from the farmers. It also maintains basic quality through local quality testing automated by milk testers, weighing machines and computers widely distributed to the village cooperatives. The model is able to achieve high quantity and satisfactory quality.

Nestlé, on the other hand procures much less at 1.1 million kg of milk per day (1 kg is slightly more than a litre for milk) during the peak season, but pushes very strongly for high quality through various measures such as training on good farm practices, auditing of farms, technical support to farmers to reach quality standards, and strict testing/ acceptance policies at the collection centres. This is driven by Nestle's high quality standards and requirements.

Suguna has achievements in both in quantity and quality. Suguna does business worth Rs 20.2 billion (2007) in live broiler chicken, frozen chicken and eggs by sourcing its products through about 12000 contract farmers in 15000 farms across 11 states. It has reduced middlemen in the poultry chain from 14 to 4. It aims for a turnover of Rs 30 billion by 2010 and a 20 percent market share in the Indian poultry industry. It maintains high quality through import of breeds, state of the art hatcheries, an advanced R&D Centre, feedmills, veterinarians, scientists, and professionals, assuring farmers the best quality chicks, feed and professional care. Its scientists and employees train the farmers in good management

practices. The system results in high quality poultry birds in quantity to meet the high quantity and quality demand.

For its limited quantity requirements, PepsiCo works closely with its contract farmers to produce the specific varieties and enhancing productivity. It employs a team of agricultural graduates to provide technical input and monitor the farmers in their specified area. McCain also works similarly to generate high productivity and quality of raw material for its processing requirements.

ITC depends on its internet enabled e-choupal network to obtain the quantity it wants from the farmers. It does well on reaching out widely and getting quantity. However, on quality, it works indirectly by making available high quality agri inputs at reasonable prices and making information about the agronomic practices available through the web portals. Thus, much quality improvements may not be achieved.

How cost effective are different models in procuring from the farmers?

A major strength of AMUL model is the cost effectiveness of its procurement. AMUL has shortened the milk supply chain and has made it very cost effective. Moreover, AMUL gives the benefit of this cost-effectiveness to the farmers who if linked to AMUL get about 80 percent of what the consumer pays. The ITC e-choupal is also highly cost effective as it uses internet network, thus reducing transaction cost substantially. The incremental income from the more efficient marketing process to ITC is about \$ 6 per ton, which is about 2.5% over the *mandi* system. Suguna is also cost effective mainly because of its efficient contracting arrangements and achievement of scale-economies in technology and technical services. The Pepsico model and McCain models are also more efficient than alternative channels and provide more margins to farmers as compared to traditional potato growing. But their high procurement costs prevent them from expanding widely. This is also true for Nestle. Besides, gains in procurement efficiencies would mainly go to the companies in Nestle, Pepsi, McCain and ITC models. HPMC, Safal Market and Mother Dairy lack in cost effective procurement.

Processing Technology and Capital requirements

Are models successful in having or promoting good processing technology?

AMUL has a good record of using modern state-of-the-art processing technology and adopting it innovatively to the local needs and conditions. This mainly because its leaders have always believed in having professional management which is highly empowered. A highly efficient procurement system and the need to find a market for the growing milk production of members have propelled the use of good technology. Private players like Nestle, Pepsico, McCain, ITC, and Suguna all have a good record of excellent processing technology and this has been driven largely by internal standards and markets. Pepsico and McCain have world class processing facilities for making various products such as chips and french fries. Desai Cold Storage uses good processing technology as its produce must meet high export standards.

For HPMC and Nandini have not done so well on this count. HPMC plants work at only 15-20 percent of their capacity which perhaps prevents them from upgrading much. They are neither highly market oriented nor highly farmer oriented, and have less pressure for generating return on investment.

Are the models able to meet the high capital requirement of agroindustry?

AMUL has been able to meet the high capital requirements of its dairy plants and processing technology because of its sound management, particularly, cost effective procurement and strong marketing. It has made use of credit which it could easily obtain, as well as government assistance and international aid which it could get given that it was a cooperative of the farmers serving high priority development objectives. ITC could tap the resources of its highly diversified and profitable parent business, Pepsi and McCain, the resources of its multi national parent organization. The capital resources at hand for Nandini, Desai and Suguna were more limited. HPMC and Mother Dairy could tap government resources.

AMUL could meet part of its working capital requirement delaying the payments for milk. The district milk union pay the village milk societies after 10 days. In McCain model farmers are paid for their produce 7-17 days after the procurements. This provides some working capital for the model. In ITC and Pepsico, payments are delayed by some days and help meet the requirement of working capital. Some working capital management is built into contracting in the case of Suguna. Additional requirements in all these cases have to be met through bank credit for which the basic soundness of the business models is very important.

Marketing and Product Innovation

Are the different models able to deliver strong marketing effort?

AMUL, Nestle, Suguna ITC e-Choupal, Pepsi, McCain, Desai Cold Storage show strong marketing performance, while Mother Dairy and Heritage foods can be rated as good. Nandini's marketing performance can be rated as reasonable while marketing performance of NDDDB's Safal as limited. HPMC is not very effective on this count.

The top tier of AMUL's three-tier structure, i.e. the state federation focuses on the marketing of milk and milk products. By insisting on an umbrella brand, AMUL skilfully avoided inter-union conflicts and also created an opportunity for the union members to cooperate in developing products. Nandini is not so effective on this count since much of the marketing is done by the district unions themselves and not by the state federation. AMUL products are available in over 500,000 retail outlets across India through its network of over 3,500 distributors. AMUL use very simple but highly effective advertisement campaigns as compared to star studded campaigns of Pepsico and Nestle. One can say that AMUL, Pepsico, ITC and Nestle models are highly successful in marketing strategies for their produce.

Pepsico has a strong soft drinks marketing network and the agribusiness division uses the same network to market its products under the brand name Frito Lays. ITC uses marketing channels and marketing experience of its FMCG divisions to good effect. McCain Foods India has strong institutional buyers such as McDonald's, KFC and Pizza Hut. Suguna has

also developed strong marketing with substantial retail reach. HPMC's marketing, though initially successful has not been sustainable, perhaps due its non-market orientation.

Are the different models able to develop new innovative products?

AMUL was earlier making only a few milk products and mainly concentrated on liquid milk, butter and milk powder. But it has now moved to whole range of products such as ice cream, srikhand, dahi, chaas, chocolates, flavoured milks and more. Pepsico is continuously innovating and has a huge number of products. McCain, ITC, Suguna, and Desai are adding to their products. The private players run models are generally way ahead barring exceptions such as AMUL. Private models are more proactive and create niches and innovative products and develop the necessary technology. Most cooperative and government run models are less market oriented perhaps due to bureaucratic and structural bottlenecks.

Suguna has launched a new category of home meal replacements - Suguna Home Bites and Suguna anytime - a range of ready-to-eat chicken products. Nestle, Pepsico, McCain and ITC also invest large sums on research and development to bring out innovative products.

Ownership and Control

Who has the major ownership in the model and how does it affect the performance?

The ownership of AMUL and Nandini is with the farmers. The farmers elect the top management: managing committees or board of directors of the village cooperatives, district unions and state federations on a representative basis. This leads to the concerns and needs of the farmers being given high priority in these organizations. Farmer ownership also brings loyalty and commitment to supply milk from the farmers. Particularly in the case of AMUL, however, below this level, professional management is appointed and empowered to handle the strategic and operational management. This leads to professionalism and excellence in the strategic and operational decisions. This gives business performance to the organization. But because of farmer ownership the organization continues to reinvest in the business and to offer a variety of necessary services and goods to the farmers to assist and improve their production performance.

In private models: Nestle, Pepsico, McCain, ITC, Heritage Foods, and Suguna the ownership and control remain is with the private company which report to their shareholders. Thus, the private profit motive and generating shareholder value would dominate. In the case of Pepsico, Mcain and Suguna, a partnering approach such as through contract farming models has been developed with the producers recognizing their critical role in production and supply. Thus, producer concerns may be brought into consideration. However, in the case of ITC and Heritage, partnering is not explicitly developed and the relationship remains mainly of procurement. In the case of government driven models of HPMC, Mother Dairy and Safal, the ownership and control remains with the government, and this helps them bring in substantial capital and government support, but their performance remains dependent on government management and commitment which may vary.

Is the management of the model professionalized?

Professional management is very important for success of most models. The top management of AMUL is largely not professional and consists of elected representatives of farmers. However, strategic and operational management have been strictly professional so far. This may be somewhat less so in the more decentralized Nandini model which may account for its lower success. In the government owned models of HPMC, Mother Dairy and Safal, administrative management is appointed by the government which may or may not be of the relevant professions, and it may tend to be reporting more to the government bureaucracy rather than producers, consumers or shareholders. Private models such as Nestle, Pepsico, McCain and ITC, do very well in hiring highly qualified professional management and also have the capacity to pay for such management. To economize, ITC also uses local non-professional sanchalaks and samyojaks after training. Other private players such as Heritage and Suguna are also into professional management but may not be able to pay as well and therefore attract the best talent.

Addressing the interests of various stakeholders: producers, consumers, investors and government

Producers

The AMUL model, given the ownership by producers and strong professional management, is perhaps best able to meet the interests of producers. In recent years, with significant market share and power at hand, AMUL appears to have enhanced the bargaining power of the producers, allowing it to often raise consumer prices in the interest of the producers. Suguna, Pepsico and McCain, through win-win contracting model with producers also claim to significantly meet the interests of the producers. Nestle, ITC and Heritage models appear to be focused more on reducing procurement and supply chain costs to the companies and share benefits with the producers to a limited extent but claim to provide them a better marketing channel.

Consumers

Nestle, Pepsico and McCain are focussed substantially on the consumers and aim at providing high or best quality products to the consumers. Suguna also tries to do the same. However, AMUL is not far behind. This is because in seeking to find markets for the increasing supply from the producers, it needs to deliver high quality to the consumers, serve them well, and keep offering new products which the consumer want. Government run models such as HPMC, Mother Dairy and Safal often lack in this.

Investors

Since cooperative shares are not traded and so do not have a market value, investor interest is not met through share value. However, the profits are often shared with the investors through their distribution as price bonus at year-end by AMUL. Private models such as Nestle, Pepsi, McCain and Heritage try to maximize benefits to shareholders through increase in share value. The government run models such as HPMC and Safal are usually not concerned about share values but in the present environment, the government does not tolerate loss making enterprises.

Government

The government gets involved in these enterprises mainly with social objectives. The social objectives are served well by AMUL since its activities substantially benefit a large number of producers who are all rural people and the government has high priority for their development. The government is also behind its other initiatives such as HPMC, Mother Dairy and Safal given that they are in critical activities which are ignored by the private sector. However, if they fail, they become a burden on the government. If the private models are successful in contributing to agricultural and rural development, they are also doing the government and the nation a service. In a more extensive way, ITC and Suguna seem to have shown such an impact. Nestle, Pepsico and McCain too have contributed but in limited areas and to limited number of people.

Concluding Observations

Agro-industries have been given significant priority in economic development in India. Mahatma Gandhi's emphasis on developing village-based agro-industries in the movement for independence marked the beginning of this strategic view. Is the priority given to agro-industries justified today? This analysis finds that the agro-industrial sector in India contributes a large share of the overall employment in industry, as well as in value addition and income generation. Its continued role in promoting development and reducing poverty will depend on its capacity to contribute to small farm income and rural employment, particularly among the landless poor.

Managerially, one of the major challenges lies in organizing sustained production and procurement from large numbers of small farmers. A partnering approach appears to be most promising in overcoming multiple constraints. It can be implemented either through building cooperative organizations, or by building confidence and trust through a mutually beneficial business relationship involving private enterprise and farmers. In both cases, and with other successful models, the government must play a facilitating role through enabling policies, regulations, financing options and research and development.

If the development objectives of agro-industrial growth are to be served, small farmers must benefit from this growth, and the landless should at least benefit indirectly. However, this depends substantially on the nature of the organization and the commitment of the agro-industry to their involvement as partners. It also depends on the bargaining power of the small farmers within the models and structures that are created. Cooperatives have often done better in bringing benefits to the rural poor, sometimes with the assistance of NGOs as intermediaries. Supply contracts with small farmers are rarely formal and thus mostly non-enforceable in India, as elsewhere in developing countries, remaining as morally based agreements in nature. Therefore, in order to make contract farming successful, much depends on the development of longer term relationships between agro-industries and farmers through transparent contract terms, fair pricing, effective extension, and good marketing. This is possible for private agro-industry firms, as shown by the PepsiCo model.

There is a need for new indigenous models to emerge for the organisation of agro-industries. Government models, alone, do not show a good record of performance. The AMUL cooperative model is one promising model which brings benefits to small farmers and gives them ownership of the enterprise. However it needs to overcome political, legal and

managerial limitations. The PepsiCo model that involves cogent backward integration by a private company to the farmers from a strong product market offers, another alternative. However, it requires long-term commitment and financial strength with limited scope for affecting large numbers of rural poor. It is critical that alternative agro-industrial models are encouraged to emerge and receive strong government backing, especially those models which contribute positively to rural employment, poverty alleviation and sustainable development.

References

1. Austin, J. (1981). *Agro-industrial Project Analysis*, Baltimore and London : Johns Hopkins
2. Bhalla, G.S. (2005). Globalisation and Indian Agriculture, *State of the Indian Farmer: A Millennium Study*, Volume 19, Academic Foundation, New Delhi, and Department of Agriculture, Government of India.
3. Boer, Kito de and Pandey, Amitab (1997). India's Sleeping Giant: Food, The McKinsey Quarterly, No.1.
4. Bowonder, B, Gupta, V. & Singh, A. (2002) *Developing a Rural Market e-hub: The case study of e-Choupal experience of ITC*. Retrieved April 17, 2009 from <http://www.google.com>.
5. Business Line. (2001), A Tale of Two Milk Districts (December 9). New Delhi Edition. Retrieved from <http://www.google.com>.
6. Candler, Wilfred and Nalini Kumar (1998). *India: The Dairy Revolution*, The World Bank, Washington DC.
7. CEPAL/GTZ/FAO (1998), *Agroindustria y Pequeña Agricultura: Vínculos, Potencialidades y Oportunidades Comerciales*, Naciones Unidas, Santiago de Chile.
8. Chandra, Pankaj and Devanath Tirupati (2002). *Managing Complex Networks In Emerging Markets: The Story Of AMUL*, Working Paper No. 2002-05-06,8-10, Indian Institute of Management, Ahmedabad.
9. CII-McKinsey & Co. (1997). Modernising the Indian Food Chain, Food & Agriculture Integrated Development Action Plan (FAIDA), CII and McKinsey & Co., New Delhi.
10. Deshpande, R.S. and M. Indira (2004). "Globalisation and Indian Agriculture: Performance Under A New Paradigm", Presented at Silver Jubilee Symposium on Governance in *Development*, Issues, Challenges and Strategies, December 14-19, Institute of Rural Management, Anand.
11. Dhankar, G.H. & Rai, L. (2002). Marketing Interventions in Shimla District, *Agriculture Marketing*, 45(1), 51-65.
12. Firodia, Arun (2006). "Back to Roots", Times of India, January 04, in <http://www.sugunapoultry.com>: http://www.sugunapoultry.com/about_suguna/overview.
13. Gaikwad, V.R. (1989). "Application of Science and Technology for Integrated Agricultural and Rural Development: A Farm-Industry Linkage Approach". In: *Agro-Processing: Strategies for Acceleration and Exports*, UK Srivastava & S Vathsala (Eds), Oxford & IBH Publishing Co. Pvt. Ltd., pp.11-21.
14. Gandhi, V.P.& Namboodri, N.V. (2002), Fruit and Vegetable Marketing and its Efficiency in India: A Study of Wholesale Markets in the Ahmedabad Area. Retrieved April 25,2009 from <http://www.google.com>.
15. Gandhi, V.P., Kumar, G. & Marsh, R. (2001). Agro-industry for Rural and Small Farmer Development: Issues and Lessons from India. *International Food and Agribusiness Management Review*, 2(3/4), 331-344.
16. Gandhi, Vasant P. and Mani, Gyanendra (1994). Agro-Processing for Development and Exports: The Importance and Pattern of Value Addition from Food Processing, *Indian Journal of Agricultural Economics*, Vol.50, No.3, July-Sept.

17. Glover, D., and Kusterer, K. (1990). "Small Farmers, Big Business: Contract Farming and Rural Development". In Gandhi, V.P., Kumar, G. & Marsh, R. (2001). *Agro-industry for Rural and Small Farmer Development: Issues and Lessons from India. International Food and Agribusiness Management Review*, 2(3/4), 331–344.
18. Glover, David and Kusterer, Ken (1990), *Small Farmers, Big Business: Contract Farming and Rural Development*, St. Martin's Press, New York.
19. Goldberg, R (2006). *Nestlé's Milk District Model: Economic Development For A Value-Added Food Chain And Improved Nutrition*. Case retrieved May 6,2009 from <http://www.google.com>
20. Goyal, S. K. (1994). "Policies Towards Development of Agro-industries in India". In G. S. Bhalla, ed., *Economic Liberalization and Indian Agriculture, Chapter VII* (pp. 241–286). New Delhi: Institute for Studies in Industrial Development.
21. Goyal, S.K. (1994), "Policies Towards Development of Agro-industries in India". In: *Economic Liberalization and Indian Agriculture*, G.S. Bhalla, (Ed.) Chapter VII, Institute for Studies in Industrial Development, New Delhi, pp.241-286.
22. Gulati, Ashok, Sharma, Anil, Sharma, Kailash, Das Shipra and Chhabra, Vandana (1994). *Export Competitiveness of Selected Agricultural Commodities*, National Council of applied Economic Research, New Delhi.
23. India, Central Statistical Organisation, *National Accounts Statistics, 1995, 1998*. Ministry of Planning and Programme Implementation, Government of India, New Delhi.
24. India, Ministry of Agriculture, *Area and Production of Principal Crops in India*, various issues, Government of India, New Delhi.
25. India, Ministry of Agriculture, (2003). *Agricultural Statistics at a Glance*, Government of India, New Delhi.
26. India, Ministry of Finance, *Economic Survey*, various issues, Government of India, New Delhi.
27. India, Ministry of Planning (2007), *Annual Survey of Industries 2005/06*, Ministry of Planning, Government of India, New Delhi.
28. India, Planning Commission (2008), *Eleventh Five Year Plan (2007–2012) Volume I: Inclusive Growth*, Government of India, New Delhi.
29. India, Planning Commission (1996), *Approach Paper to the Ninth Five Year Plan (1997-2002)*, Government of India, New Delhi.
30. Indian Express "Cargill should immediately quit India, says Research Foundation" (2000, August 14).
31. *Innovations in Rural Institutions: Driver for Agricultural Prosperity (2007)*, Policy Paper39. Published by National Academy of Agricultural Sciences, New Delhi.
32. Jha, D. (2001). "Agricultural Research and Small Farms", *Indian Journal of Agricultural Economics*, 56(1), pp.1-23.
33. Joshi, P K. (2005). "Crop Diversification in India: Nature, Pattern and Drivers", Paper presented at National Centre for Agricultural Economics and Policy Research (NCAP) Policy Retreat and Seminar on Agriculture, Food Security and Rural Development, Vol. 3, pp.1-34, November.
34. Kejriwal, N.M. (1989). *Performance and Constraints in Accelerating Production and Export of Fruits and Vegetables*, in Srivastava U.K. and Vathsala S. (eds.) *Agro-Processing: Strategy for Acceleration and Exports*, Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.

35. Kumar, S and Ali Jabir (2006), *E-governance Systems (E-choupal) and Decision making processes in Agriculture, Delivering E-government*, GIFT publishing, 252-261.
36. Kurien, V. (2003). "Successful Cooperatisation: The AMUL Story", Speech delivered at the Madras Management Association, Chennai, December 11.
37. National Centre for Agricultural Economics and Policy Research (NCAP) (2009) "Market Orientation for Potato Farmers Contract Farming – An Approach towards Improving Farm Economics". Retrieved May 3rd 2009 from <http://www.ncap.res.in/AKI%20Workshop/SESS-2/Pepsico.pdf>
38. Pal, Suresh and Dayanatha Jha (2004). "Public-Private Partnership in Agricultural R&D: Challenges and Prospects", Presented at Silver Jubilee Symposium on Governance in Development, Issues, Challenges and Strategies, December 14-19.
39. Prahalad, C.K. (2005). *The Fortune at the Bottom of the Pyramid*, Wharton School Publishing
40. Punjabi, M (2008), *Supply Chain Analysis of Potato Chips: Case Study of PepsiCo's Frito Lay in India*, A Draft submitted to United Nations Food and Agricultural Organization, New Delhi.
41. Rao, V.(1989). "The Anand Pattern-A Model for Dairy Development in India", Paper presented in Dairying as an Instrument of Progress: The Indian Experience organised by National Dairy Development Board, India at Anand from January 16-21.
42. Reardon, T., C.B. Barrett, J.A. Berdegue, J.F.M. Swinnen (2009), "Agrifood Industry Transformation & Small Farmers in Developing Countries" *World Development*; 37(11), November.
43. Reardon T., S. Henson, and A. Gulati, (2009). "Links between Supermarkets and Food Prices, Diet Diversity and Food Safety in Developing Countries", chapter 7 in C. Hawkes, C. Blouin, S. Henson, N. Drager, and Laurette Dubé edited, *Trade, Food, Diet and Health: Perspectives and Policy Options*, Wiley-Blackwell
44. Rello, Fernando and Marcel Morales (1999), "Eslabonamientos Productivos Agricultura-Agroindustria y Su Capacidad de Generar Empleo en Mexico", FAO, Santiago de Chile.
45. Revanna B. (2006). "Milk Marketing- Nandini way". Retrieved May 3rd, 2009 from ifmr.ac.in/cmfw/wp-content/uploads/2007/07/p.pdf
46. Sawhney, M. (2002). "Fields of Online Dreams", *The CIO Magazine*, October 15, www.itcportal.com.
47. Sethi, A (2007). Curious Practices, *Frontline*, 24(13). Retrieved April 28 from <http://www.google.com>.
48. Singh S (2007). Leveraging Contract Farming for Improving Supply Chain Efficiency in India: Some Innovative and Successful Models. Retrieved April 21, 2009, from www.globalfoodchainpartnerships.org/india/Papers/SukhpalSingh.pdf
49. Singh, R. and Bhagat, K. (2004) Farms + Corporate: New Farm Supply Chain Initiatives in Indian Agriculture, *Indian Management*, Feb 24, 76-77.
50. Singh, S (2000). Contract Farming for Agricultural Diversification in the Indian Punjab: A Study of Performance and Problems" *Indian Journal of Agricultural Economics*, 56 (3), 283-294.
51. Singh, S (2002). Contracting Out Solutions: Political Economy of Contract Farming in the Indian Punjab, *World Development*, 30(9), 1621-1638.

52. Singh, S. (2008). Marketing channels and their implications for smallholder farmers in India. In McCullough E., Stamoulis K. and Pingali P. (2008). *The Transformation of Agri Food Systems: Globalisation, Supply Chain and Smallholder farmers*. London: FAO and Earthscan.
53. Sridhar, G. and Ballabh, V. (2006). Indian Agribusiness Institutions for Small Farmers: Role, Issues and Challenges, *Institutional Alternatives and Governance of Agriculture*, 1-18.
54. Srivastava, U. K., and Patel, N.T. (1994). *Managing Food Processing Industries in India*. New Delhi: Oxford & IBH Publishing Co. Pvt. Ltd.
55. Srivastava, U.K. (1989). "Agro-processing Industries: Potential, Constraints and Tasks Ahead", *Indian Journal of Agricultural Economics*, 44, 3, 242-256.
56. Srivastava, U.K. and Patel, N.T. (1994). *Managing Food Processing Industries in India*, Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
57. Vaidya, C.S. (1996). *Strategy for Development of Agriculture in Himachal Pradesh with Reference to Economic Liberalisation Policy*, Agro-Economic Research Centre, Himachal Pradesh University, Shimla.

Internet References

58. heritagefoods.com: <http://www.heritagefoods.co.in/dairy/home.html>
59. <http://www.AMUL.com/activities.htm>
60. <http://www.AMUL.com/activities.html> (n.d.). Retrieved April 22, 2009, from <http://www.AMUL.com>:
61. <http://www.AMUL.com/business.htm>
62. <http://www.AMUL.com/business.html> (n.d.). Retrieved April 22, 2009, from <http://www.AMUL.com>:
63. <http://www.AMUL.com/organisation.html>
64. <http://www.AMUL.com/organisation.html> (n.d.). Retrieved April 19, 2009, from <http://www.AMUL.com>:
65. <http://www.business.outlookindia.com/inner.aspx>(nd). Retrieved April 23, 2009, from
66. <http://www.business.outlookindia.com/business.htm>
67. <http://www.desaifv.com/html/howitstarted.htm> (n.d.). Retrieved May 26, 2009, from
68. <http://www.desaifv.com/html/products.htm> (nd). Retrieved May 26, 2009, from
69. <http://www.desaifv.com/html/infrastructure.htm> (nd). Retrieved May 25, 2009, from
70. <http://www.desaifv.com/quality.html> (nd). Retrieved May 26, 2009, from <http://www.desaifv.com>: <http://www.desaifv.com/quality.html>
71. <http://www.desaifv.com>: <http://www.desaifv.com/html/products.htm>
72. <http://www.desaifv.com>: <http://www.desaifv.com/html/infrastructure.htm>.
73. <http://www.desaifv.com>: <http://www.desaifv.com/html/howitstarted.htm>
74. <http://www.dscl.com/retail.htm>
75. <http://www.dscl.com/retail.htm> (n.d.). Retrieved May 26, 2009, from <http://www.retail.com>:
76. <http://www.heritagefoods.com>: <http://www.heritagefoods.co.in/dairy/home.html>
77. <http://www.heritagefoods.co.in/dairy/home.html> (n.d.) Retrieved May 1, 2009, from <http://www>.
78. <http://www.hpmc.com/achievements.html> (n.d.). Retrieved April 24, 2009, from

79. <http://www.hpmc.com>: <http://www.hpmc.com/achievements.htm>
80. <http://www.motherdairy.com/aboutus.htm> (n.d.) Retrieved May 1, 2009, from <http://www.motherdairy.com/aboutus.htm>
81. <http://www.nandini.com/aboutus.htm> (n.d.). Retrieved May 2, 2009, from <http://www.nandini.com/aboutus.htm>
82. <http://www.nandini.com/kmfunits.htm> (n.d.). Retrieved May 2, 2009, from <http://www.nandini.com/kmfunits.htm>
83. <http://www.nandini.com>: <http://www.nandini.com/aboutus.htm>
84. <http://www.nandini.com>: <http://www.nandini.com/kmfunits.htm>
85. <http://www.nestle.com>: <http://www.nestle.com/AllAboutNestle.htm>
86. <http://www.nestle.com/AllAboutNestle.htm> (n.d.) Retrieved May 5, 2009, from <http://www.nestle.com/AllAboutNestle.htm>
87. <http://www.nposonline.net/AMUL.html>. (n.d.). Retrieved April 21, 2009, from <http://www.nposonline.net/AMUL.html>
88. <http://www.organicindia.com>: <http://www.organicindia.com/press-azamgarh.php>.
89. <http://www.organicindia.com/press-azamgarh.php> (n.d.). Retrieved April 2, 2009 from <http://www.organicindia.com/press-azamgarh.php>
90. <http://www.suguna.co.in/dairy/home.html> (n.d.) Retrieved May 1, 2009, from <http://www.suguna.co.in/dairy/home.html>
91. http://www.sugunapoultry.com/about_suguna/overview.asp (n.d.). Retrieved April 23, 2009 from http://www.sugunapoultry.com/about_suguna/overview.asp
92. [motherdairy.com: http://www.motherdairy.com/aboutus.htm](http://www.motherdairy.com/aboutus.htm)
93. [nposonline.net: http://www.nposonline.net/AMUL.html](http://www.nposonline.net/AMUL.html)