
Emerging Trends in Agro-Processing in India

P. G. Chengappa*

PRELUDE

Agricultural transformation through creation of forward and backward linkages with industry is a recently emerging phenomenon. The liberalisation policy of the Government is complementing these efforts. Our farmers' efforts in using the Green revolution technologies are strengthening our food and income security, in addition to generating surplus production. While a part of the surplus production is stored in our buffer stocks, the remaining portion is yet to attract the value addition chain, the key for agricultural growth in the context of liberalisation. Thus, the predicament of market glut leading to price depressing effect can be slightly overcome by creating value addition opportunities in the domestic and international markets. This reduces pressure on the Government through market intervention schemes to some extent.

The challenge lies with the ways and means of improving the capacity of the agro-industries to harness forward linkages in agriculture and allied activities in order to efficiently convert part of the output to value added products acceptable to the domestic and international markets. In the process, this generates employment opportunities for different types of skills through food processing, packaging, storing, transporting, grading and distribution. This will transfer a sizeable portion of the margin to farmers through market backlash effect. Currently, food production and processing account for 26 per cent of India's gross domestic product and for more than 60 per cent of employment. India is the world's second largest food producer and the growth potential of food industry is enormous considering the vast consumer population. In this note, the current status, emerging trends and the key issues related to agro processing are analysed.

* Professor of Agricultural Marketing and Co-operation and Director of Instruction (Agri), University of Agricultural Sciences, Bangalore – 560 024.

Keynote paper on Subject III "Emerging Trends in Agro-Processing Sector" for the Annual Conference of Indian Society of Agricultural Economics held at Orissa University of Agriculture and Technology, Bhubaneswar on December 19-21, 2003. This keynote paper could not be included in the Conference Number (July-September 2003) of the Journal.

The author is thankful to N. Nagaraj, M.G. Chandrakanth, Lalith Achoth and Honniah, faculty in Agricultural Economics, for their suggestions in preparation of this address and Chitra Gopal, B.T. Sreenivasa and G.B. Lokesh, Ph. D students of the Department of Agricultural Economics, University of Agricultural Sciences, Bangalore for their assistance in preparation of this address.

Significance of Agro-Processing

Processing of farm products offers great scope for conversion of farm produce to consumer commodities and in the process reduces wastage, increases shelf-life resulting in value addition and higher income transfer to the farmers from different classes of consumers, as the processed commodities have wider market. The Government of India has also accorded high priority to agro-processing providing the necessary incentives to encourage value addition and boost trade. In this regard the CII-Mckinsey report (1997) comprehensively covers the prospect for modernising food processing and food chain through integrated development action including retailing. This report projects the total food market to be Rs. 2,500,000 million, of which value added food products account for an impressive 32 per cent. This development in food processing sector is expected to have a profound impact on the economy.

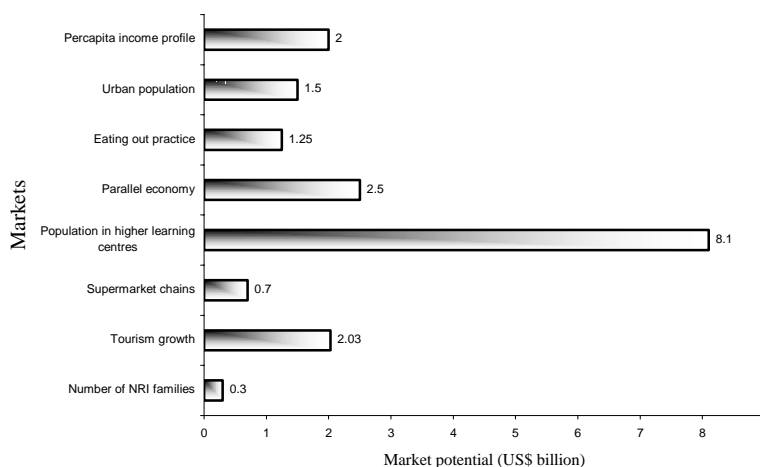
Considering the age cohort, an estimated 75 crores of young population will get added over the next 20 years who will exert different types of influence on India's food demand as they are more willing to experiment and accept change. This necessitates the need for enhancing the capacity of food processing industries to meet the diversified demand from the new class of population.

In India food processing is at a low level and yet to gain momentum to reach the stage attained in western countries. However, processed food has niche market(s) registering slower growth in rural India when compared to urban centres. Hence, the overall value addition to food is a meager 7 per cent as compared with 23 per cent in China, 45 per cent in the Philippines and 88 per cent in U.K. It is to be noted that the prospect for value addition to food should not be averaged for both urban and rural areas since this average hides emerging and vibrant niche markets for several ethnic food products. These niche markets offer impetus to entrepreneurs to invest in value addition activities. By 2005, it is expected that there will be at least ten food companies in India with an impressive turnover of Rs. 3,000 crores, with 50 lakh jobs created in food processing and related functions such as transportation, distribution, retailing and so on.

Potential of Indian Agriculture for Agro-Processing

India is a major producer and consumer of a wide range of farm and marine products. India is the second largest producer of fruits and vegetables, but only two per cent of the produce is processed. India is the land of spices contributing to about 25 per cent of the world production worth US \$ 900 million. India has a long coastline of 8,041 kms with immense marine product and processing potential. We have varied fish resources along the stretch of 28,000 kms of rivers and millions of hectares of reservoirs and brackish water. India is the world's largest producer of milk and about 15 per cent of milk is processed in the organised sector. India has the largest livestock population in the world, but just 1 per cent of meat production is converted to value-added products.

Consumption of processed food items forms an insignificant portion of the menu in rural areas due to poor economic access and preference for fresh produce. This is changing gradually, in semi-urban and urban areas due to rising real income, change in lifestyles, media and advertisement, urbanisation and increasing quality consciousness. Agro-processing sector thus, has immense potential to contribute to growth of our economy (Figure 1).



Source: Potty, 2003

Figure 1. Estimated Emerging Market for Processed Foods

PRESENT STATUS OF AGRO PROCESSING

Currently, agro-processing industry is concentrated in the unorganised sector with low science and technology and little or no standardisation and grading. The product mix is heavily weighted in favour of low value added products and unprocessed foods (Table 1).

TABLE 1. MARKET AND THE PRODUCT MIX

Produce (1)	Fresh/Minimally processed (per cent) (2)	Processed (per cent) (3)
Fruits and Vegetables	98	2
Cereals	73	27
Legumes	30	70
Oilseeds	25	75
Milk	50	50
Spices	91	9
Coffee	88	12
Tea	99	1
Cocoa	0	100
Eggs	100	0
Fish	85	15
Meat	98	2

Source: Potty, 2003.

Agro-processing is capital intensive and is yet to reach scale economy. The use of brands is yet to pick up in the domestic market. Some of the major industries, which have established their branded food products in the Indian market, are listed in Table 2.

TABLE 2. MAJOR BRAND OWNING INDUSTRY IN FOOD SECTOR

Multinational (1)	Indian (2)
Hindustan lever ltd	Parle Biscuits
Nestle India	Nutrine Confectionery
Cadbury India	Godrej Foods Ltd
Coca Cola India	Haldiram Foods Ltd
Pepsi Cola India	Parry Confectionery
Britannia Industries	Norton Confectionery
SmithKline Beecham	Amul(NDDDB)
Cargil India	Gits Products
ITC Ltd	Vadilal Ice creams
Kelloggs India	Dabur foods
International Best Foods	

Source: Potty, 2003.

The market predominance by the transnational companies in processed food products is largely due to their capital base and expertise in production and marketing (Table 3). In some of the processed foods, fortification with vitamins and minerals is the major attraction for consumers.

TABLE 3. MARKET SHARE IN PROCESSED FOODS

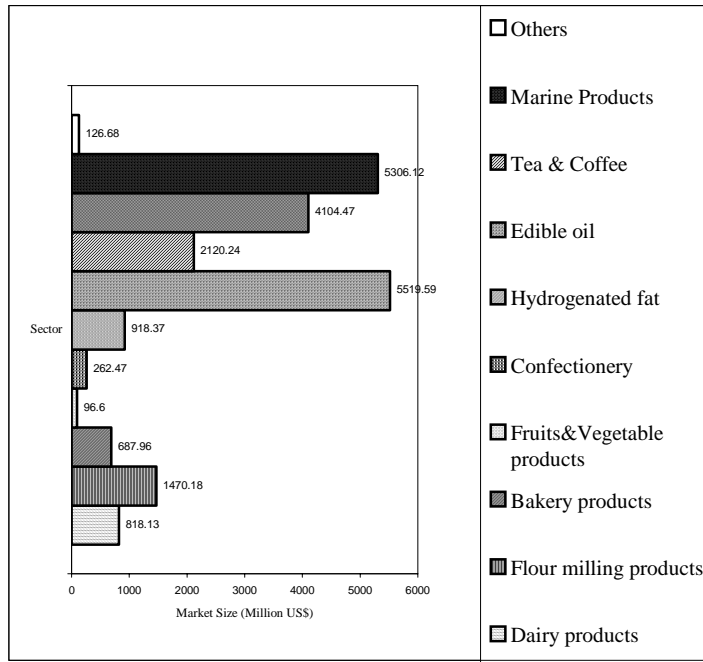
Industry (1)	Sector (2)	Market share (per cent) (3)
Nestle India	Infant milk food	54.02
	Coffee	11.85
	Noodles	88.32
Cadbury India	Chocolates	30.27
	Hydrogenated fat	13.63
Hindustan Lever Ltd.	Tea	20.40
	Ice cream	54.82
	Sauces/Ketchups/Jam	59.92
	Bread	46.95
	Biscuits	30.52
Britannia Industries	Biscuits	30.52
Frito-Lays India	Chips, wafers	56.73
Kelloggs India	Breakfast cereals	71.16

Source: Potty, 2003.

Professional management and corporate culture has just begun to creep in processing and value addition there in (Bhat, 2001). The size of processed food sector is around Rs. 1,440 billion (CII-McKinsey, 1997) and ranks fifth in size accounting for 6.3 per cent of the gross domestic product with 6 per cent of industrial investment. Currently, the processed food industry is small with an infrastructure of 820 flourmills, 418 fish processing units, 5,198 fruit/vegetable processing units, 171 meat processing units, 609 sweetened and aerated water (soft drinks) units, 266 milk product units, and so on. Processed food exports fetch Rs. 120 billion per annum, and

account for 18 per cent of total exports. The size of semi-processed and ready to eat packed food industry is over US\$ 1 billion and is growing at 20 per cent.

Figure 2, depicts the current profile of the processed food industry. The industry is dominated by edible oils, closely followed by marine products and sugar.



Source: Potty, 2003.

Figure 2. Processed Food Industry Profile

Investment in India’s Food Processing Sector

It is found that 48 per cent of the household expenditure in India is on food items and the demand for processed/convenience food is constantly increasing. With relatively cheaper labour, low cost of production, base for domestic and export markets could be set up. Processed products like packed polished wheat (*atta*) has widened the market, attracting multinationals like HALL and Pilsbury (a joint venture with Godrej). “Ready to eat” food and snacks are also slowly picking up. Agro-processing can be grouped as food processing and other agro processing like cotton, jute, etc.

The food processing is further classified into:

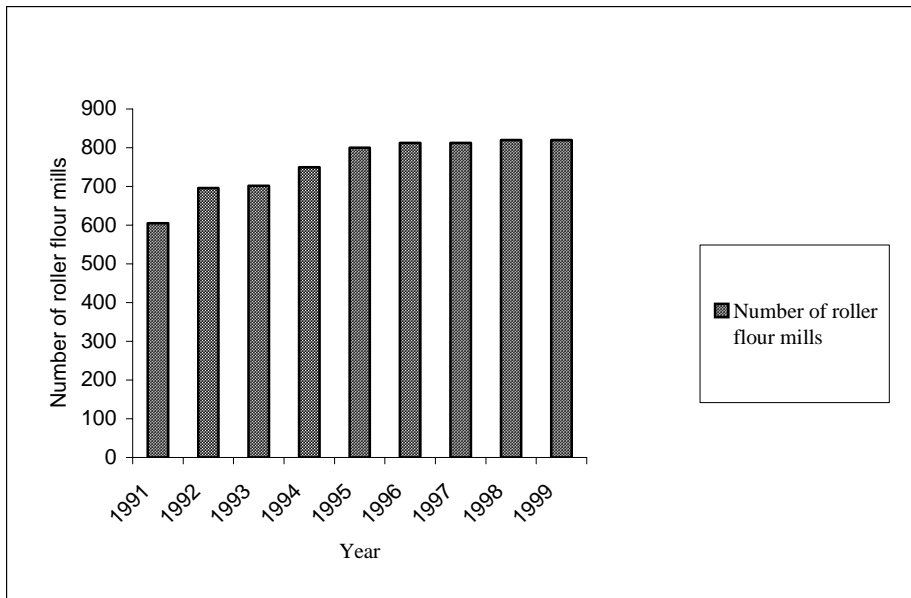
Food grains/Pulses milling	Meat and meat products
Fruits/vegetable processing	Aerated water/soft drinks
Milk and milk products	Alcoholic beverages
Beverages	Breakfast cereals, biscuits, confectioneries, etc
Fish, poultry products (eggs)	Edible oils/fats

In what follows, issues involved in agro-processing sector are discussed:

Food grains/Pulses Milling

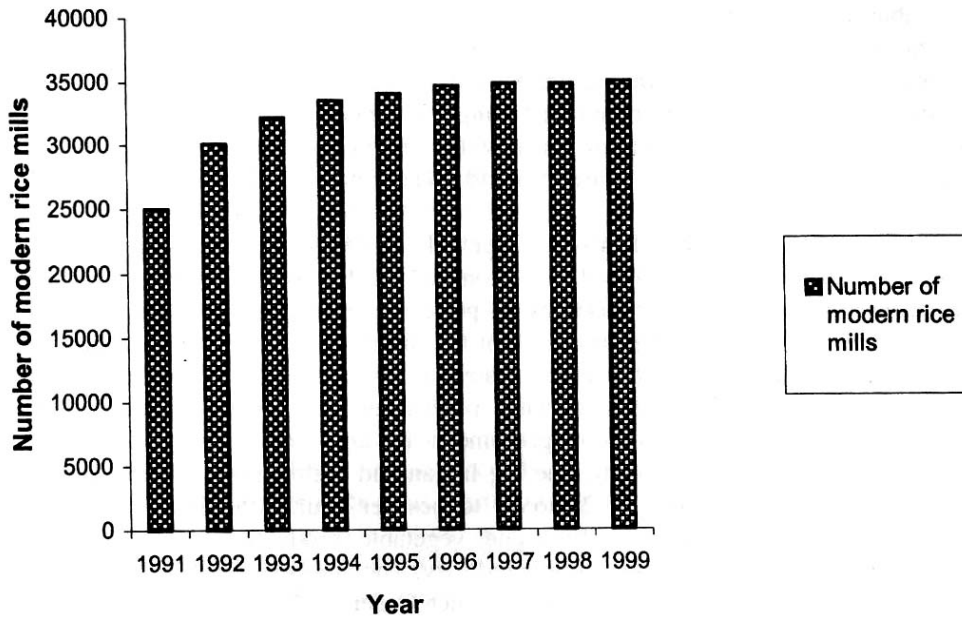
The most prominent activity in foodgrains processing is primary milling of paddy, wheat and pulses. There are 91,000 rice hullers and 2,60,000 small flourmills engaged in primary milling. There are 43,000 modernised rice mills/huller-cum-sellers. In addition to milling paddy into rice, oil is being extracted from rice bran amounting to 3.4 million tonnes (1999-2000). The number of modern rice mills increased from 25,000 to 40,667 between 1991 and 2003. In addition there are 946 roller flour mills producing quality flour required for the bakery industry and home consumption (Figures 3 and 4). Around 820 large flourmills in the country convert about 10.5 million tonnes of wheat into wheat products. Also there are 10,000 pulse mills, milling about 75 per cent of pulse production of 14 million tonnes.

Branded rice is becoming popular and is attracting significant corporate presence in the domestic and export markets. To promote exports, foreign direct investment has been allowed in this sector and ninety-four export oriented unit proposals have been approved in rice milling sector, with an investment of Rs. 949 crores. In addition, eight pulse milling units with 100 per cent export orientation have also been approved.



Source: Government of India, 2000a.

Figure 3. Growth of Roller Flour mills (for wheat)



Source: Government of India, 2000a.

Figure 4. Growth of Modern Rice Mills

Policies and Regulations

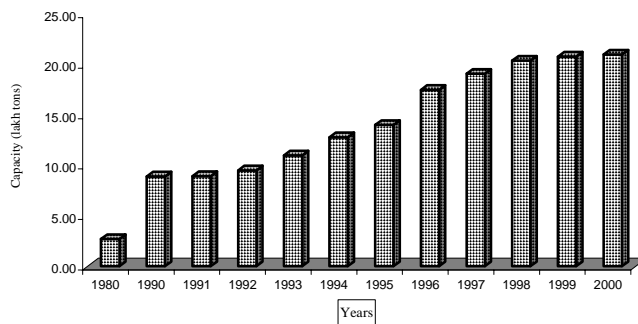
The Rice Milling Industry (Regulation) Act 1958 and Rice Milling Industry (Regulation and Licensing) Rules 1959 have been repealed from the 28th May 1997 as a policy towards liberalisation. Rice and pulse milling which were hitherto reserved for small-scale sector are now dereserved. Therefore, no license/permission is required for setting up a rice mill/pulse mill. Since liberalisation, there is no license requirement for setting up or for capacity expansion of roller flourmills. The mills can obtain their wheat supply from any source. Also there are no license requirements or price/distribution controls on manufacture of wheat products.

Fruits/Vegetable Processing

Production of fruits and vegetables in India is 70 million tonnes per year. It is estimated that nearly 35 to 40 per cent of the produce is wasted during picking, harvesting, packing, transportation, storage, marketing and consumption. In India, annually a mere 0.9 million tonnes of fruits and vegetables is processed. Fruits and

vegetables can earn 20 to 30 times foreign exchange per unit due to higher yield and better value than cereals in the international market. The development of fruits and vegetables is gradually moving out of its rural confines into urban areas and from traditional agriculture enterprises to the corporate sector. This trend has led to the adoption of improved technology, greater commercialisation and professionalism in the management of production and marketing. A number of export-oriented units are being established as joint venture firms with foreign collaborators. India has vast potential for processing, as its share in world trade of processed foods and vegetables is lower than 1 per cent.

The installed capacity of fruits and vegetable processing industries has increased from 2.7 lakh tonnes in 1980 to 21 lakh tonnes in 2000. The capacity of fruits and vegetable processing units increased by 34 per cent per year during the period 1980-2000 (Figure 5). However the utilisation of the installed capacity is increasing at 13 per cent per annum. This offers a wide potential for capacity utilisation in fruit and vegetable processing. Fruit and vegetable processing industry is decentralised as a large number of units are in cottage/home scale and small-scale sector, having capacity up to 250 tonnes/annum. The big Indian and multinational companies have large capacities in the range of 25 to 30 tonnes per hour. After liberalisation and withdrawal of excise duty on fruit and vegetable products, there has been a significant rise in the growth rate of this industry. The number of vegetable and fruits processing units licensed under Fruits Product Order exceeded 5198, inclusive of over 650 sweetened aerated water units. The estimated production of the industry stood at 9.80 lakh tonnes in 2000, whereas the installed capacity was 21 lakh tonnes.



Source: Government of India, 2000a.

Figure 5. Installed Capacity of Fruits and Vegetable Processing Units in India

There is a large concentration of processing units in Maharashtra, Uttar Pradesh and Tamil Nadu. This is influenced by the availability of favourable institutional support and infrastructure facilities and market demand rather than ready availability of raw material. As the structure of the industry alters and larger units enter, the

processing units are bound to emerge nearer to the sources of raw materials. The prominent processed items are fruit pulps and juices, fruit based ready-to-serve beverages, canned fruits and vegetables, jams, squashes, pickles, chutneys and dehydrated vegetables. Recently, frozen pulps and vegetables, frozen dried fruits and vegetables, fruit juice concentrates and vegetable curries in restorable pouches, canned mushroom and mushroom products have been taken up for manufacture by the industry.

Fruit based beverages being nutritious and healthy are gaining popularity. Juices and syrups based on *Syzygium cumini* (Jamoon), *Phyllanthus emblica* (gooseberry), *Withania somnifera* (Ashwagandha or sogadeberu), *Garcinia indica* (kokum), *Zingiber officinale* (ginger), and *Rosa alba* (rose) are being used as remedies in health-care. Dr. H. Sudarshan, President of The Vivekananda Girijana Kalyana Kendra in Biligiri Rangana Hills, and recipient of the Right Livelihood Award considered as the alternate Nobel prize, promoted small scale processing of gooseberry fruit juice, jamoon fruit juice and ashwagandha root juice from the produce collected by the Soliga tribes from the Biligiri Rangana Hills forests in western ghats of Karnataka. For instance the value addition in the conversion of gooseberry to gooseberry juice is at least 200 per cent. These too have a niche but growing market, as these processors lack professionalism in marketing. Before thinking of large scale processing, manufacturers need to be pragmatic in estimating the demand and consumer acceptance. Squash and syrup production units can be established in (rural) areas where there is a ready supply of fruits for processing. CFTRI has developed a process where fruits like banana, guava, apple, mango, jamoon, gooseberry and sogadeberu are processed to liquid form by using pectin enzymes. These liquid fruit products can be used as natural alternative to synthetic beverages and can be diluted and carbonated as soft beverages. India tops in mango and banana production and can reap rich benefits through value addition in the processed fruits market.

POLICIES AND REGULATIONS

Even though industrial license is not required for establishing fruit and vegetable processing (FVP) industry, establishing 100 per cent export-oriented units require government approval. This is regulated by Fruit Products Order of 1955 (FPO), under Essential Commodities Act. The Ministry of Food Processing Industry administers this order which lays down product specifications and quality control requirements on production-hygiene, re-labeling and marketing. Any processing unit is required to obtain a license under this order. Periodic inspection of units is also carried out. Consignments of fruit and vegetable products for export are subject to pre-shipment inspection. Recognised Export Houses and Star Trading Houses are exempt from this inspection. Items like pickles and chutneys, tapioca sago and tapioca flour are reserved for exclusive manufacture in the small-scale sector. Export of fruit and vegetable products is freely allowed. Many FVP industries are eligible for automatic

approval of foreign technology agreement and up to 51 per cent foreign equity participation. These include: tomatoes, mushrooms and other frozen vegetables, fruits, nuts, fruit-peels, fruit jellies, marmalades, fruit juices and vegetable juices.

Nagaraj *et al.* (1990) estimated economics of processing fruits and evaluated performance of the Karnataka Agro Fruits Ltd., under the Karnataka Agro Industries Corporation, Bangalore. Here, overhead costs formed 12 per cent of the total costs. In the processed fruit product, the cost of fresh fruits accounted for 48.5 per cent, followed by other material costs 12.5 per cent, labour cost 7 per cent, advertisement 6 per cent and taxes 5 per cent. The firm was operating at 40 per cent of the installed capacity, implying gross under-utilisation of capacity.

Milk and Milk Products

Annual production of milk increased by 6.3 per cent per annum from 38 million tonnes in 1983 to 81 million tonnes in 2001 (Table 4), due to the implementation of Operation Flood programme. The production of milk powder including infant milk food increased from 1.5 lakh tonnes in 1991 to 2.35 lakh tonnes in 2001. Production of malted milk food increased from 0.41 lakh tonne to 0.68 lakh tonne in the same period. Cheese production tripled during this period, registering the highest growth rate of 11.58 per cent (Table 4). Approximately, 12 per cent of milk per day is processed into value added products like casein, whey powder and whey protein concentrates and most of these products are exported. About 35 per cent of the 10 million tonnes of milk procured in the organised sector is used in value-addition. A part of the stock is kept for lean period while the rest is marketed in various forms and exported to Middle East, U.S. and so on. In the unorganised sector, over four million tonnes of milk are used for making traditional and non-traditional products.

TABLE 4. PRODUCTION OF MILK AND MILK PRODUCTS IN INDIA FOR THE PERIOD 1991-2001
('000 tonnes)

Year (1)	Milk production (million tonnes) (2)	Milk powder (3)	Malted milk food (4)	Condensed milk (5)	Cheese (6)	Total milk products (7)
1991	55.7	150	41	8.1	2.5	201.6
1992	58.0	165	41	8.4	2.9	219.3
1993	60.6	185	32	7.8	3.1	227.9
1994	63.8	195	44	8.1	4.0	251.1
1995	66.2	200	48	9.2	4.0	261.2
1996	69.1	210	53	9.3	4.0	276.3
1997	71.9	215	55	7.8	7.0	284.8
1998	75.2	222	65	9.0	5.0	301.0
1999	78.1	225	66	11.0	5.0	307.0
2000	80.1	230	67	11.5	7.5	316.0
2001	84.9	235	68	12.0	8.0	323.0
CGR	4.24	4.17	7.14	3.99	11.58	4.80

Source: Government of India, 2002.

Milk and Milk Products Order (MMPO) regulates production of milk and milk products. The order requires no permission for units handling less than 10,000 litres of milk per day or milk solids upto 500 tonnes per annum. All milk products except malted foods are covered in industries for which foreign equity participation up to 51 per cent is allowed. Ice cream, earlier reserved for manufacturing in small-scale sector, has now been de-reserved. No license is required for setting large-scale production facilities for manufacture of ice cream. Subsequent to decentralisation, exports of some milk-based products are allowed as long as these units comply with compulsory inspection requirements of National Dairy Development Board, Export Inspection Council, etc. The Bureau of Indian Standards has prescribed necessary standards for all milk-based products, to be adhered by the industry.

Constraints in the Dairy Processing Industry

Operation Flood, one of the world's largest dairy development programmes enabled to create a strong network of small milk producers, with processors and urban consumers. Commercial imports and exports of dairy products were banned and processing activity were controlled through licensing which favoured the co-operatives. We have two global trends in the milk market – health and food safety. The consumer has basic right to demand healthy food. Malpractices are controlled by implementing the HACCP (Hazard Analysis and Critical Control Points) used world over. Sharma and Gulati (2003) studied competitiveness of the Indian dairy sector in liberalised environment. The results of indicators of effective incentives such as nominal protection coefficients and effective potential coefficients suggest that, on an average, Indian dairy sector is competitive *only* if the export subsidies on dairy products by the developed countries in general and the U.S.A. and the EU in particular are reduced. In addition there is an apathy towards consumption of hand milked milk and India needs to address this issue seriously.

India has emerged as the largest producer of milk with a production of 80 million tonnes (Government of India, 2002a). Since early 1990s with liberalisation, the dairy industry was delicensed in 1991 and private sector including multi-national companies (MNCs) were allowed to set up milk processing and product manufacturing plants. In 1992, controls were brought back through 'Milk and Milk Products Order' (MMPO) to have 'orderly growth' of dairy sector. This opening of economy, exposed dairy sector to world markets, which are distorted by high subsidy support by the developed countries.

Fish and Poultry Products

With a coastline of 8,000 kms, 3 million hectares of reservoirs and 1.4 million hectares of brackish water, India has a vast potential for fishery from inland and marine resources. Fish production is about 56.56 lakh tonnes (in 2000-01) equally divided between marine and inland fisheries. However, in the last decade, corporate sector has increasingly involved in preservation, processing and export of marine

fish. India exported marine products worth Rs.4,368 crores in 1998-99 and stands first in total agricultural exports.

Processing of marine produce to canned and frozen forms is entirely for the export market (Table 5). There are 393 freezing units, 13 canning units, 160 ice-making units, 12 fishmeal units and 476 cold storage units. While marine fishery is increasingly being over-harvested resulting in ecological imbalance, India needs to tap the potential processing market based on a variety of inland fisheries thereby creating employment.

TABLE 5. EXPORTS OF MARINE PRODUCTS (QUANTITY EXPORTED AND FOREIGN EXCHANGE EARNED)

Year	Quantity (in '000 tonnes)	Value (Rs. in million)	Annual growth rate (per cent)	
			Quantity	Value
(1)	(2)	(3)	(4)	(5)
1980-81	75.6	2,348.4	-	-
1981-82	70.1	2,860.1	-7.2	21.8
1982-83	78.2	3,613.6	11.5	26.3
1983-84	92.7	3,730.2	18.6	3.2
1984-85	86.2	3,842.9	-7.0	3.0
1985-86	83.7	3,980.0	-2.9	3.6
1986-87	85.8	4,606.7	2.6	15.7
1987-88	97.2	5,312.0	13.2	15.3
1988-89	99.8	5,978.5	2.7	12.5
1989-90	110.2	6,350.0	10.5	6.2
1990-91	139.4	8,933.7	26.5	40.7
1991-92	171.8	13,758.9	23.2	54.0
1992-93	208.6	17,674.3	21.4	28.5
1993-94	244.0	25,036.2	16.9	41.7
1994-95	307.3	35,752.7	26.0	42.8
1995-96	296.3	35,011.1	-3.6	-2.1
1996-97	378.2	41,213.6	27.7	17.7
1997-98	385.8	46,974.8	2.0	14.0
1998-99	311.26	43,685.5	-19.3	-7.0

Source: Government of India, 2000b.

Meat and Meat Products

India has recorded an impressive growth in meat and poultry production. Aggregate meat production including beef, buffalo meat, mutton, goat meat, pork and poultry meat is 4.2 million tonnes in 1998 of which a mere 1 per cent is converted to value-added products like sausage, ham, luncheon meat, kabab and meatball. Meat exports were Rs. 845 crores consisting mutton and buffalo meat during 1999-2000. There are seven modern integrated poultry processing plants. There are many small poultry processing units engaged in the production of poultry meat products. A few egg-processing units are engaged in exporting egg products.

Breakfast Cereals, Biscuits, Confectioneries, etc.

This food segment is penetrating slowly but steadily in the domestic market. Rapid urbanisation and changing food habits have increased the demand for

processed and packed foods. This segment comprises bread, biscuits and other bakery products, confectionery, chocolates and cocoa products, soybean based products, ready to eat pasta products like noodles, cereal flakes, high protein foods and other processed foods/snack foods. This also includes, starch, glucose etc., required for food products.

Soya products industry, worth over Rs. 80 crores (US \$ 22.2 million), has been growing at around 10 per cent per annum and includes products like soya milk, nuggets, flour and texturised soya foods and snacks. Many large units have emerged due to their export potential. Soya food is also growing due to increased health consciousness.

The size of semi-processed ready to eat food segment is over Rs. 4,000 crores (US \$ 1.1 billion) with 60,000 bakeries, 20,000 traditional food and pasta food units. Large biscuits and confectionery units, soya processing units and starch/glucose/sorbitol producing units have also been established for domestic and international markets. In confectionery and cocoa based products, several MNCs have set up manufacturing units. Production of macaroni noodles is about 16,500 tonnes, pearl barley 1,240 tonnes and corn-flakes 600 tonnes. The annual production of bread and biscuits and other bakery products is about 30 million tonnes.

Cotton Textile Products

Cotton is the first largest agro-based-manufacturing industry with value addition of at least 100 per cent in successive stages of processing. Cotton after spinning to yarn is woven to fabrics, processed and converted to made-ups or ready-made garments. The value-addition by converting cotton to readymade garments is impressive through exports of various cotton products made out of one lakh bales of cotton (Table 6).

TABLE 6. COTTON TEXTILE PRODUCTS – VALUE ADDITION FROM RAW COTTON

Product	Value of the input (Rs. crores)	Value addition in Rs. crores	Value addition in percentage over Raw cotton (fibres)
(1)	(2)	(3)	(4)
Raw cotton (fibres) (C)	60	Not applicable	Not applicable
Cotton yarn (Y)	119	59 (C to Y)	98.33
Cotton fabric (F)	158	39 (Y to F)	163.33
Cotton made-ups (M)	190	71 (Y to M)	216.66
Cotton garments (G)	400-500	292 (F to G)	585
		331 (Y to G)	551

Source: Derived from Venkateswarlu, 2001.

Sugar Industry

Sugar is the second largest industry involving 450 lakh farmers and 5 lakh workers. Sugar industry comprises 493 factories of which 273 are in the co-operative sector, 153 in private sector and the remaining in public sector. Weaknesses of sugar industry are fragmented capacities, obsolete equipment, poor recoveries and inadequate utilisation of by-products. There is an urgent need to utilise the by-products for higher value addition to improve the viability of the industry. In sugar production, sugarcane cost accounts for around 80 per cent of raw material cost. Thus, sugar production is not as lucrative as the by products from sugar industry. In addition to improving the sugarcane productivity and sugar recovery, it is crucial to install capacity for cogeneration of power by utilising bagasse and in addition expand the ethanol extracting capacity from the molasses following Brazilian experience.

Value Addition - Few Case Studies

Value addition varies *inter alia*, with the produce, mode of preparation, stage of processing. Here we have made an attempt to indicate the value addition due to primary processing. As this estimation of value addition excludes value of raw material lost due to primary conversion, other costs of marketing *inter alia* packing, branding, labeling, grading, storing, transportation, the value addition reduces with successive inclusion of different market functions. When wheat is converted to flour, value addition is 54 per cent and when converted to bakery products or other ready to eat items, it varies from 92 to over 500 per cent (Table 7). In the case of rice, value addition varies from 130 per cent in rice flakes to 200 per cent in pappad-making.

Reasons for Low Volume Sales of High Value Addition Processed Foods

Value addition for many of the small scale/household scale processed foods is apparently impressive. However, the market for these processed foods is location and season/time-specific in addition to ethnic specificity. These seriously limit the width of the market as well as the large scale processing of the produce. Further, as these processed foods are appreciated and demanded by specific communities at specific periods, branding and associated market professionalism are lacking. Thus scale economies in the high value addition household processed foods are not emerging. However, companies which have made their name through their brands, for instance, can integrate through buy back arrangements with the producers/gatherers of amla, jamoon fruits and processing them to fruit juice and sell them with their brand name. Upon gaining experience, institutional arrangements can be developed to promote scale processing of ethnic processed foods made by millets, which are largely anti-diabetic.

TABLE 7. VALUE ADDITION IN SMALL SCALE/HOUSEHOLD LEVEL PROCESSING OF CEREALS, MILLETS, PULSES, FRUITS AND VEGETABLES IN KARNATAKA, 2003

Raw material (1)	Product (2)	Cost of raw material (Rs./kg) (3)	Cost of Processing/Preparation (Rs./kg) (4)	Market price of the product (Rs./kg) (5)	Value addition (Rs./kg of raw material) (6)	Per cent of value addition over value of raw material (7)
Rice	Rice flakes (Avalakki)	10	2	25	13	130
	Puri (Mandakki)	8	15	20	10.5	131
	Bhatthada aralu	10	4	25	15	150
	Pappad (Happala)	10	10	40	20	200
Wheat	Flour	13	3	20	7	54
	Maida	15	5	22	7	47
	Soji (Rava)	13	2	18	5	38
	Bakery items	13	5	25	12	92
Maize	Feed	6	2	10	4	67
	Soji	6	3	12	6	100
	Maize flakes	8	5	20	12	150
Bengal gram	Flour	20	5	30	10	50
	Dal	20	3	28	8	40
Red gram	Tur dal	22	3	36	14	63
Green gram	Green gram dal	28	3	32	4	14
Mango	Juice	25	15	80	40	160
Mango	Pickle	15	10	60	35	233
Lime Juice		20	15	70	35	175
Lime Pickle		20	20	80	40	200
Grape Juice		24	15	70	31	129
Mixed fruit jam		16	15	65	35	219

Notes: 1. Prepared based on interviews with small scale processors in Karnataka during 2002-03.

2. Cost of processing/preparation excludes the value of raw material lost due to primary conversion, packing, branding labeling, grading, storing, transportation and other marketing costs.

Annual value loss and wastage in food chain amounts to Rs. 50,000 crores. Developing efficient ways of sourcing by reducing wastage and reducing intermediaries in the system calls for bringing new skills and technologies by seed and agricultural input companies, farmer co-operatives, large commodity processors, value added/branded products and large retailers. They have a vital role in stimulating the food industry's growth. This can be facilitated by partnerships, collaborations and institutional innovations in addition to governmental support.

RECENT TRENDS

Vertical Integration through Co-ordination

In addition to diversification in the agro-industry, vertical co-ordination activities are increasing in sectors like poultry. In poultry, integrators provide chicks and associated inputs to contract farmers and buy back the eggs and birds. Contract farming is also emerging in many states for specialised agricultural activities, viz., gherkin, seed production of vegetables, fruits, medicinal plants, aromatic plants. Such

co-ordination efforts are desirable for agro-industrial processing, as there are institutional constraints for corporate farming. This would meet the quality standards required by increasingly specific and diversified consumer demand and at the same time minimises risk in marketing.

Supply Chain Management (SCM)

India has low per capita consumption levels for many value added products compared with many nations. Improving farm yields and efficiency in supply chain are the key issues in stepping per capita consumption. Efficient SCM facilitates growth of food processing industry in handling surpluses in food production. Here the key focus is on the requirements of the consumer and involves integrating procurement, operations and logistics, to meet consumer requirements in a cost effective manner. Dissemination of the right, correct and timely information is an integral part of SCM. Brazilian orange juice industry offers an excellent example for efficient SCM. Today, Brazil accounts for 80 per cent of the entire orange juice industry in North America, all of which has been led by Agri Service Centres, with all units functioning in a collaborative manner.

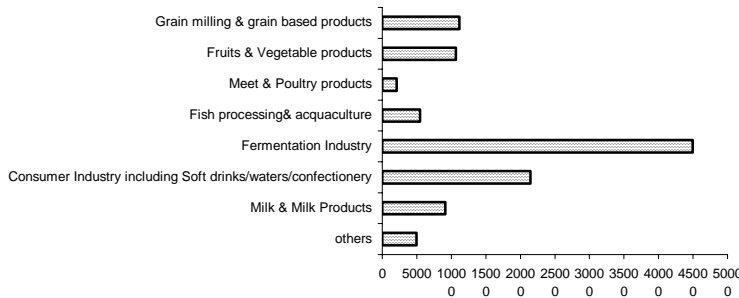
High Intermediation in India

There is a high level of intermediation across the supply chain in India. Disintermediation and reducing costs by way of direct procurement, with the resultant reduction in levies, fees, commissions will improve efficiency of supply chain and will give a boost to food processing industry (Welde, 2001).

Foreign Direct Investment

Foreign Direct Investment (FDI) is increasingly being recognised as a growth trigger. The challenge lies in attracting foreign direct investment and many countries are competing in the process. The growth in food chain industry in developing countries of Latin America, Africa and South East Asia, is triggered by FDI. This holds good for agro-industries as well. Constraints such as lack of infrastructure, archaic laws and regulations, which impede the flow of FDI need to be removed phasewise.

The major share in FDI in India (Figure 6) is captured by the fermentation industry followed by other industries. The net flows of FDI to developing countries rose from \$24.5 billion in 1990 to \$95.5 billion in 1995, while preliminary estimates for 1996 indicate a further increase to \$109.5 billion in 1996. Multinational enterprises in industrialised countries are the main source of FDI, accounting for more than 90 per cent of flows in recent years. The sectoral composition of investment flows towards developing countries is not so well documented.



Source: Government of India, 2001.

Figure 6. Foreign Investment in the Processed Foods Sector Since Liberalisation in 1991 (Rs. million)

Role of Defense Food Research Laboratory

Products ‘ready to eat’ or in ‘ready to reconstitute’ form are becoming popular in the market. Defense Food Research Laboratory (DFRL) has made available a variety of instant products to consumers like pulav mix, basmati rice, halwa mix, cooked vegetables, chicken soup and milk shakes. Through freeze-drying technology, DFRL has developed fruit juice powders from mango, pineapple, grape and mosambi. Canned upma and puff and serve chappathis are popular among busy families who are short of time and energy.

Import of Foreign Foods

Removal of quantitative restrictions and quotas on imported produce and products has resulted in imports of these items. Demand for imported processed food items is however modest due to exorbitant prices. The main categories of imported foods are confectionery, biscuits, cereals, juices, syrups, dairy products, fresh fruits, canned food, pasta, processed non-veg products, sauces and salad toppings. Their high prices and irregular supply are the main reasons for eroding the confidence of the large population of middle class Indian customers, who are the potential buyers. The high price is also due to import duty of 30-50 per cent.

Investment Opportunities/Strategies

The growth and development of the agro-processing industry in India calls for short, medium and long-term strategies in tune with the emerging consumer demands. The key strategies identified for investment (CII-Mckinsey Report, 1997) are as under:

- *Activate-high volume and high growth industries*

These would constitute 77 per cent of the food industry by 2005. Dairy, wheat and poultry sectors, which are mass-based, high volume, low margin

businesses belong to this category. Packaged atta is projected to grow to Rs. 15,000 crores and packaged milk to a Rs. 36,000 crores industry by 2005. The processed poultry and meat is estimated to grow to Rs. 9,000 crores industry. By then, consumers would be price sensitive and the local companies with right skills to develop profitable businesses at affordable prices are expected to emerge.

- *Consolidate- high volume and low growth industries*

The opportunity lies in consolidation of industry requiring substantial skills and investment. In India, several companies are operating with low capacity utilisation as for example sugar and oil industry.

- *Ruminate-small volumes but high growth industries*

These include processed fruit and vegetables including jam and ketchup, a Rs. 600 crore market. There are avenues for opening small to medium-sized units in fruit drinks, and this is expected to grow to Rs.2,000 crores by 2005. Similarly frozen vegetables will grow to Rs. 350 crores, and value added products as used in the west have the potential to reach Rs. 5,000 crores.

- *Large chain retailers*

With responsibility for catalysing procurement and processing, large chain retailers active in developing the food chain grocery chain stores and chain restaurants are emerging. Food World, Subhiksha, Nilgiris, Kamath, are a few examples. These retailer chains are also playing a key role in the food landscape.

- *Co-operatives*

Co-operatives are involved in procurement and processing of produce in India. Milk co-operatives, collect milk, and arrange for transportation process milk and market fluid milk and milk products to final consumer. By reducing the number of intermediaries the farmers' share of the revenues increased from 50 per cent to 75 per cent of the consumer price. Even though dairy co-operatives are responsible for a modest 15 per cent of India's production, they have been able to make a clear impact on the role of private sector in increasing the producer's share in consumer rupee by acting as price leaders in the market in most states under the AMUL pattern. In fruits and vegetables too, their presence is even smaller, but are making impacts similar to that in milk. It is in order to note that in India, co-operatives have been more successful especially in dealing with perishables (for example milk, vegetables and fruits) and high value crops (for example in Arecanut) than dealing with other produce. Such successes in co-operative movement are worth incorporating by other co-operatives to improve their performance.

Constraints Facing Agro-Processing Industry and Appropriate Policy Strategies

The agro-processing sector is facing the following constraints for addressing through institutions, markets and government support:

- Large price spread due to the presence of superfluous middlemen in fresh produce in the food chain.
- Low demand for processed foods is due to preference for home made and fresh cooked foods. The high cost of processed foods is due to non-availability of right quality and quantity of produce of the seasonal crops. Excessive spoilage, inefficient and costly transportation, high cost of finance due to high taxes and duties add to the predicament. Development of niche markets with generic promotional activities is crucial to promote value added goods. In addition, processed foods industries should totally avoid use of artificial/synthetic colours and preservatives, as they are proved carcinogenic, and consumers will be sensitive to these factors. They should instead shift to natural colours and preservatives.
- Effective linkage of R and D institutions, farmers and processing industries will facilitate in expanding the range and types of processed products and in standardising the post-harvest practices.
- Low margins, seasonality and high perishability are the features of this industry and hence, access to seed capital and working capital are not easy. Impediment in the flow of credit from financial institutions to food processing industry due to improper understanding of this sector needs to be rectified.
- Indian brands of processed food are yet to be established both in the national and international markets. Agmark standards need to be upgraded to Codex Alimentaris Standards to ensure the quality of products due to sanitary and phytosanitary standards. However, the caution is that Codex Alimentaris does not consider the externalities generated in production in *in-situ*, but lays emphasis only on the final product quality. Thus, the better standard is the one, which ensures 'organic' products as these impose standards at both the producer and consumer ends, thereby reducing and controlling externality. This shows that the standards are crucial not only in the final product stage but also in the production stage, covering the whole process. The International Federation for Organic Agriculture Movements (IFOAM) and other organic standards are the standing examples for this. Currently, the quality standards are shifting from grade to health standards.
- Revival of futures trading will safeguard the interests of the domestic processors to enter into contracts and trigger value addition activities to some extent. However, weak database and lack of market intelligence in this regard calls for effective co-ordination among APMCs and Farmer's

Associations and processors for promoting smooth movement of processed commodities.

- Establishment of backward linkages among farmers and processors is crucial to tide over impediments. As the producers are not integrated with the processors the former are oblivious of quality requirements of the latter and the processors have no control over the quality and quantity of raw material used. Promotion of vertical and horizontal integration among marketing co-operatives, farmers associations, SHGs and food chain stores through tax holidays and initial investment subsidies to foster value addition are vital.
- Multiplicity of laws and regulatory authorities are deterrent for growth of industry. This calls for concurrent monitoring for effective market regulation.
- Prevailing packaging system lacks requisite quality and shelf life due to ignorance of quality parameters and standards. There is dominance of small, unorganised players, who find it difficult to maintain quality hygiene standards.
- In the process of providing fillip to agro-processing, sufficient care and caution need to be exercised to promote the use of natural colours and preservatives, since many synthetic and artificial colours and preservatives have proved to be carcinogenic.
- India needs to capture the emerging trends in domestic and international niche markets for organically grown and processed produce.

REFERENCES

- Bhat, S.S (2001), *Development and Financing of Agrobased Industries*, Paper presented at the National Seminar on Value Addition in Indian Agriculture, July 20-21, 2001, Bangalore.
- Confederation of India Industry (CII) and Mckinsey (1997), *Modernising Indian Food Chain: Food and Agriculture Development in Action*, CII, New Delhi.
- Government of India (2000a), *Annual Report 1999-2000*, Department of Food Processing, Ministry of Agriculture, New Delhi.
- Government of India (2000b), *Hand Book on Fisheries Statistics, 2000*, Ministry of Agriculture New Delhi.
- Government of India (2001), *Annual Report 2000-2001*, Department of Food Processing, Ministry of Agriculture New Delhi.
- Government of India (2002a), *Annual Report 2001-2002*, Ministry of Food Processing Industries, New Delhi.
- Government of India (2002b), *Economic Survey 2001-02*, Economic Division, Ministry of Finance New Delhi.
- Nagaraj, N.; Lalith Achoth.; T.N. Prakash and J.V. Venkataram (1990), "Economic Analysis of Fruit Processing in Karnataka: A Case of Karnataka Agro Fruits Ltd.", *Mysore Journal of Agricultural Sciences*, Vol. 24, pp. 124-130.
- Potty, V.H (2003), "Indian Food Industry: Will the Sun Ever Rise?", *Indian Food Industry*, Vol. 22, No.2, pp.10-18.
- Sharma, V.P. and A. Gulati (2003), *Trade Liberalization, Market Reforms and Competitiveness of Indian Dairy Sector*, Discussion Paper No. 61, Markets, Trade and Institutions Division, International Food Policy Research Institute, Washington, D.C., U.S.A.
- Venkateswarlu, V. (2001), *Gross Domestic Product, Productivity Improvements, Value Addition and All that*, Paper presented at the National Seminar on Value Addition in Indian Agriculture, July 20-21, 2001, Bangalore.
- Welde, Rahul (2001), *Supply Chain Management in Indian Agriculture*, Paper presented at the National Seminar on Value Addition in Indian Agriculture, July 20-21, 2001, Bangalore.