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AGRO-PROCESSING INDUSTRIES: POTENTIAL, CONSTRAINTS AND TASK AHEAD*

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An agro-industry is an enterprise that processes bio-mass, *i.e.*, agricultural raw materials, which include ground and tree crops as well as livestock and fisheries, to create edible or usable forms, improve storage and shelf life, create easily transportable forms, enhance nutritive value, and extract chemicals for other uses.

As the products of agro-industries are both edible and non-edible, the agro-industries can be classified as agro-food industries (or merely food processing industries) and agro-non-food industries.

The agro-industry provides the crucial farm-industry linkage which helps accelerate agricultural development by creating backward linkages (supply of credit, inputs and other production enhancement services) and forward linkages (processing and marketing), adding value to the farmer's produce, generating employment opportunities, and increasing the farmer's net income. This in turn motivates the farmer for better productivity and further opens up possibilities of industrial development. The agro-industry generates new demand on the farm sector for more and different agricultural outputs which are more suitable for processing. An agro-processing plant can open up new crop and livestock opportunities to the farmer and thus increase the farm income and employment (Austin, 1981).

Derived from the raw material processed by them, agro-industries display unique characteristics of seasonality, perishability and variability (Srivastava, 1981). The ground and tree crops, fisheries, and livestock undergo a reproductive cycle. Therefore, agro-industries have to procure raw materials only in the season (or there are wide fluctuations in the availability between the seasons), while the processing operations continue for a longer period and the demand for the products is round the year. The raw materials processed by the agro-industries are often perishable (at least in the food processing industries), and therefore greater speed in handling, storage, and processing is required. Unlike as in the case of non-agro-industries, the raw materials obtained and processed by the agro-industries are often of varying quality.

These characteristics make the procurement sub-system for raw materials the crucial determinant of the performance of these enterprises. Agro-industries are amenable and more viable to be located nearer to the source of raw material allowing spatial distribution of industries (reducing the regional disparities in industrialisation). Agro-industries also have a large export potential.

This paper analyses the present situation of the agro-industry and identifies issues for discussion. It is divided into four parts. Part I presents the ways of assessing the available agro-processing potential. Part II presents a profile of the agro-processing industry and the recent trends in India. Part III analyses the constraints on acceleration of production and exports of agro-based products. Finally, Part IV sums up the analysis and presents issues for discussion.

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*Keynote paper.

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I

POTENTIAL FOR AGRO-PROCESSING

The potential for agro-processing can be viewed in two ways: (*i*) The degree of processing of primary raw material, and (*ii*) the degree of processing of all the by-products under the commodity system.

Degree of Processing

The degree of processing of various raw materials varies from cleaning and grading of apples to milling of paddy and cooking, mixing and chemical alteration that create instant and ready to eat foods (Table I). It may be noted that as the transformation of raw materials moves from category I to IV, the value added as well as the price of finished products also rises. For example, the shrimp exports from India have been normally in the block frozen form (after being de-headed, de-veined and shelled). More recently, the effort has been to export the shrimp after processing it through instant quick frozen method. These exports are expected to fetch 50 to 70 per cent higher value than in block frozen form (Srivastava *et al.*, 1989). Similarly, tea exported in branded tea packets fetches additional value. By the higher degree of processing in leather, value is added as illustrated in Table II. Subsequent secondary and tertiary processing of semi-finished leather raises the value of index to 500.

TABLE I. CATEGORIES OF AGRO-INDUSTRY BY LEVELS OF TRANSFORMATION PROCESS

I	II	III	IV
Manual-mechanical* (1)	Mechanical* (2)	Mechanical-chemical* (3)	Chemical* (4)
	Types of processing activity		
Cleaning Grading	Ginning Milling Cutting Mixing	Cooking Pasteurisation Canning Dehydration Freezing Weaving Extraction Assembly	Texturisation Chemical alteration
	Illustrative products		
Fresh fruits Fresh vegetables Eggs	Cereal Grains Meat Spices Animal feeds Jute Cotton Lumber Rubber	Dairy products Fruits and vegetables Meats Sauces Textiles and garments Oil Furniture Sugar Beverages	Intant foods Textured vegetable products Tyres

Source: Austin (1981, p. 4).
*This classification has been added by the author.

TABLE II. THEORETICAL VALUE ACCRUED TO HIDES AND SKINS WHEN PROCESSED INTO DIFFERENT STAGES

(value in Rs. crores)

Hides and Skins	Available (1986) (million pieces)	Value (at national prices)	Value of semi-tanned leathers	Value of finished leathers	Value if all finished leather is converted into products	Value if 75 per cent of the finished leather is converted into products
	Value addition index		(100)	(150)	(225)	(500)
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Cattle hides	22	193	290	434	965	723
Buffalo hides	16	134	201	302	670	503
Goat skins	75	375	563	843	1,875	1,405
Sheep skins	31	1,555	233	349	775	582
Total	144	2,257	1,287	1,928	4,285	3,213

Source: Rao (1989, p.243).

As we move from the preliminary degree of processing to the higher degree of processing, capital investment, technological complexity and managerial requirements also go up. Therefore, it has to be examined for each commodity as to what level of transformation is to be encouraged in the light of the present status and profile of the industry, technology options available, investment required, purchasing power of the target group in the domestic market, and specification of the international markets (Srivastava, 1989).

Degree of Processing of All the By-products

The agro-industrial potential becomes manifold when the processing possibilities of the entire commodity system are taken into account (Sah and Srivastava, 1985). For example, a farmer cultivates a paddy plant, and these plants produce the following: straw (about 50 per cent by weight), husk (about 10.5 per cent by weight), bran (about 3.5 per cent by weight), rice kernel (about 36 per cent by weight). Recent studies (Gaikwad, 1986; Gaikwad and Gupta, 1987) have indicated that with an initial investment of Rs. 2 to 3 crores, each block of 10,000 hectares under paddy crop with two paddy seasons in a year and 4 metric tons/ha of production has a potential of supporting a complex of processing industries (rice mills, solvent extraction plant for rice bran oil, processing of husk for a variety of products, and straw paper/board mills). This yields 107 per cent net value added on the raw material price. Such exercises can be done for all commodity by-product systems.

Similarly, in animal - based products we get the following raw materials: meat, blood, bones, hides, skins, glue stock, horns and hoofs, wool, hair, feathers, glands and casings (Mann, 1978; Bhat, Menon and Srivastava, 1989). Processing of all these raw materials opens up large value addition possibilities. In remote rural areas, the farmers have been able to recover only hides and skins, and the opportunity for processing of other by-products is lost.

By-products influence the price of meat (main product) and the price paid to the producer for the livestock depending upon the extent of utilisation of all the potential. For example, 150 deep sea trawlers at Visakhapatnam throw 1,30,000 tonnes of fish back into sea (Srivastava *et al.*, 1989) for economic reasons. The fish hold of trawler is 40 tonnes. The ratio of fish prices to prawn prices is 4 : 50 to 60. Therefore, every trawler prefers to keep the

hold empty for prawn catches, except for the fish caught in the last fish haul on the return trip. Prawns catch is not more than ten tonnes. Had this fish caught been brought to the shore and processed into edible products like fish keema, sausages, fish cutlets, and fish balls, high value products could have been produced and the overall value added from the activity would have gone up substantially. Technology exists at least on pilot scale to achieve the high value product (Govindan, 1985; Srivastava *et al.*, 1989).

II

AGRO-PROCESSING INDUSTRIES PROFILE AND RECENT TRENDS IN INDIA

Profile

In India substantial portion of net value added from the agro-industry is derived from unregistered and cottage scale units. Only 42.6 per cent of the value added, as shown in Table III, was derived by the registered units in 1986-87. Between 1970-71 and 1986-87, the percentage share of unregistered units in the value added has gone up from 47.8 to 57.4. This is contrary to the usual observations on the process of industrialisation.

TABLE III. NET VALUE ADDITION FROM REGIS"ERED AND UNREGISTERED UNITS

Years	Percentage share of net value from	
	Registered units	Unregistered units
(1)	(2)	(3)
1970-71	52.2	47.8
1980-81	49.9	50.1
1984-85	51.3	48.7
1985-86	42.7	55.3
1986-87	42.6	57.4

Source:- Government of India (1989 *a*).
Note:- These units include commodities like food products, beverages, tobacco and tobacco products, textiles, wood and wood products - furniture and fixtures, paper and paper products and leather and fur products.

For example, agro-food processing industries in the cottage and unorganised sector include 79,000 rice hullers, 2,66,000 flour *chakkis*, 10,000 *dal* mills, 2,20,000 oil mills, 50,000 bakeries, 5,000 pasta goods units, 15,000 traditional food units and 2,000 *poha* making units. In all these cases, 88 to 90 per cent of the total value added comes from only primary processing. Secondary and tertiary processing account for only a very small portion of the net value added (Government of India, 1989 *c*, 1989 *d*).

As shown by the Annual Survey of Industries 1985-86 (Government of India, 1989 *a*), agro-processing units account for 39 per cent of all factories, 12 per cent of all fixed capital, 23 per cent of working capital and 15 per cent of the total capital employed in the industry in the organised sector. This 15 per cent of capital investment generated 36 per cent of total employment, 26 per cent of output, and 21 per cent of net value added (Table IV).

The fixed capital investment per factory is only Rs. 18 lakhs in the total agro-based industries as compared to the average fixed capital investment of Rs. 86 lakhs per factory in the non-agro-based industries (Table V). This indicates that the bulk of the units in the agro-processing sector are very small and that they were set up mainly for primary product

TABLE IV. KEY VARIABLES OF AGRO-INDUSTRY IN RELATION TO TOTAL INDUSTRY

Description	Number of factories	Fixed capital (Rs. lakhs)	Working capital (Rs. lakhs)	Invested capital (Rs. lakhs)	Total persons employed (Number)	Total emoluments (Rs. lakhs)	Total inputs (Rs. lakhs)	Value of output (Rs. lakhs)	Net value added (Rs. lakhs)
	N	FC	WC	K	L	EML	I	O	NVA
1. Agro-food industries	18,179	2,36,568	28,55,462	5,21,930	10,25,424	79,223	11,72,811	15,81,136	1,94,301
2. Agro-non-food industries	21,258	4,62,414	3,51,661	8,14,075	17,39,516	1,99,683	11,85,339	15,67,770	2,97,964
3. Total agro-industries	39,437	6,98,882	6,37,123	13,36,005	27,64,940	2,78,906	23,58,150	31,48,906	49,92,265
4. Non-agro-industries	61,579	5,30,642	21,65,534	74,75,176	48,19,067	8,29,207	68,90,689	88,66,634	18,34,382
5. Total industries	1,01,016	60,08,524	28,02,657	88,11,181	75,84,007	11,08,113	92,48,839	120,15,540	23,26,647
6. Percentage of agro-food industries to total industry	18.00	3.94	10.19	5.92	13.52	7.15	12.68	13.16	8.35
7. Percentage of agro-non-food industries to total industry	21.04	7.7	12.55	9.24	22.94	18.02	12.82	13.05	12.81
8. Percentage of total agro-industries to total industry	39.04	11.63	22.73	15.16	36.46	25.17	25.50	26.21	21.16

Source: Government of India (1989 *a*).

Note:- 1. It includes manufacture of food products (200 to 219) and manufacture of beverages (220 to 224).

2. It includes manufacture of cotton textiles (230 - 231), wool, silk and synthetic fibre textiles (240, 241 and 249), jute, hemp and mestha, textiles (250 - 253 and 259), wood and wood products (furniture and fixtures, paper and paper products (280-283), leather and leather products, and rubber and rubber products (300-302).

TABLE V. KEY STRUCTURAL AND TECHNICAL RATIOS OF AGRO-INDUSTRIES

Code No.	Description of industry	Fixed capital per factory (Rs. lakhs)	Percentage of working capital to invested capital	Fixed capital/ Net value added	Capital-labour ratio	Capital productivity	Labour productivity	Share of emoluments in value added	Net value added to total output
(1)	(2)	FC/N (3)	(4)	FC/NVA (5)	FC/L (6)	NVA/K (7)	NVA/L (8)	EML/NVA (9)	NVA/O (10)
A									
20-21*	Total agro-based food industries	13.008	54.69	1.217	0.230	0.821	0.1894	0.4077	0.122888
B									
23 to 30*	Total agro-based non-food industries	21.752	43.19	1.551	0.265	0.644	0.1712	0.6701	0.190055
A+B	Total agro-based industries	17.721	47.68	1.419	0.252	0.704	0.1780	0.5665	0.156328
C	Non-agro-industries	86.224	28.96	2.894	1.101	0.345	0.3806	0.4520	0.206885
A+B+C	Total industries	59.480	31.80	2.582	0.792	0.387	0.3067	0.4762	0.193636

Source: Government of India (1989 *a*).
* As per the details explained in footnote to Table IV.

processing.

Other observations on the profile of agro-industries vis-a-vis non-agro-industries are as follows:

1. The working capital as a percentage of the total capital employed is about 48 in agro-industries as compared to about 28 in non-agro-industries.
2. The ratio of fixed capital to net value added is 1.4 for the total agro-based industries as compared to 2.9 for non-agro-industries.
3. Capital-labour ratio is only 0.25 in the total agro-based industries as compared to 1.1 in the non-agro-industries, indicating the labour intensive character of the agro-based industries.
4. Capital productivity of agro-based industries is almost double (0.7) that of non-agro-based industries (0.35).
5. Labour productivity in agro-based industries is less than half of the labour productivity in non-agro-based industries.
6. However, the share of total emoluments in the value added is 57 per cent in agro-based industries as compared to only 45 per cent in the case of non-agro-based industries.
7. The ratio of net value added to total output in agro-based industries is only marginally lower than that of the non-agro-based industries.

The agro-industries at present have been contributing between 35 and 40 per cent of the total exports (Table VI). The bulk of the exports are still accounted for by primary commodities. For example, 50 per cent of leather exports are in the form of semi-finished leather, instead of value added products. Similar is the case of various products from agro-based food commodities as well as agro-based-non-food commodities. As in almost all commodities, there is a supply constraint after meeting the needs of domestic market. The emphasis has to be placed on larger unit value realisation by exporting value added, branded, and packaged products.

Recent Trends

The process of agro-based industrialisation is already on in our country in response to increasing demand for various agro-based products for direct consumption, industrial use, and export. There is already a shift from the early mechanical engineering-based agro-industries to chemical-based industries. For example, in addition to the traditional agro-industries (rice mills, sugar mills, cotton ginning, spinning and weaving factories, jute factories, oil mills, etc.) in recent years many new agro-industries have established plants for solvent extraction for oilseeds, modern dairies for producing bottled milk, butter, cheese, chocolate, milk powder, etc., factories for producing a variety of paper and boards from paddy straw, bagasse, banana stems for producing alcohol, acetone, acetic acid and other chemicals from molasses and cassava, for producing medicines from medicinal plants, roots and tubers, for producing starch, glucose and a variety of products from maize and cassava, for fruit and vegetable products, fish and meat products, wines for export and man-made fibres from forest plantations. Fresh water, coastal, and deep sea fishery industries are getting increased attention (Gaikwad, 1986, pp. 65-66).

TABLE VI. EXPORT OF AGRO-BASED COMMODITIES FROM INDIA

(value Rs. crores)

Commodities	Exports of agro-based industries		
	1985-86	1986-87	1987-88
(1)	(2)	(3)	(4)
Total agro-based exports	4,308.8	4,943.87	5,511.80
Total exports	10,894.6	12,452.40	15,741.20
Percentage of agro-based exports to total exports	39.5	39.7	35.0

Sources: Government of India (1989 *b*). Government of India. Monthly Statistics of Foreign Trade of India, Vol. I, New Delhi, March 1984, 1985, 1986 and 1987.

Note:- Total agro-based commodities include agro-based food commodities (coffee, tea, cashew, kernels, spices, sugar and molasses, rice, fish and fish preparations, meat and meat products, fruits and vegetables and others) and agro-non-food commodities (oilcakes, tobacco, raw cotton, cotton yarn and fabrics, coir yarn and jute manufactures, leather and leather products, natural silk and wool and woollen textiles).

During the last six years, there has been a significant increase in investment in plant and machinery for mechanised and highly automated production of pasta products: instant noodles, vermicelli, and ready to fry snacks. These products have been backed by intensive advertising and promotion. Similarly, some major investments are in process in fruit and vegetable industries, biscuits and confectionary industries, and other snack foods. Some major investments have been made even in setting up of integrated paddy-rice processing complexes.

The trends in the growth of agro-processing can be summed up as follows:

1. By-product processing of major agricultural commodities has opened up the vast potential of agro-industrial growth in the rural areas in recent years.
2. The degree of processing has been considerably intensified and modernised by the growth of processed food industry which is based on cooking, mixing, and chemical alteration producing a textured vegetable food.
3. The development of agro-processing industries has attracted higher capital investments, enhanced technological complexities, and managerial requirements. Many companies have also found the agro-processing and processed food as lucrative avenues for diversification.

In agro-based non-food sector more investments have been made to improve the product designs and product diversification into more value added products. It is this trend of converting the potential of processing of main products as well as by products which has to be accelerated in future years (Srivastava and Vathsala, 1989).

III

CONSTRAINTS ON ACCELERATION OF PRODUCTION AND EXPORTS OF AGRO-BASED PRODUCTS

The constraints on acceleration of production for domestic market or exports can be identified from the systems framework right from the input supply to the farmers and production of raw materials to output processing and marketing (Figure 1).

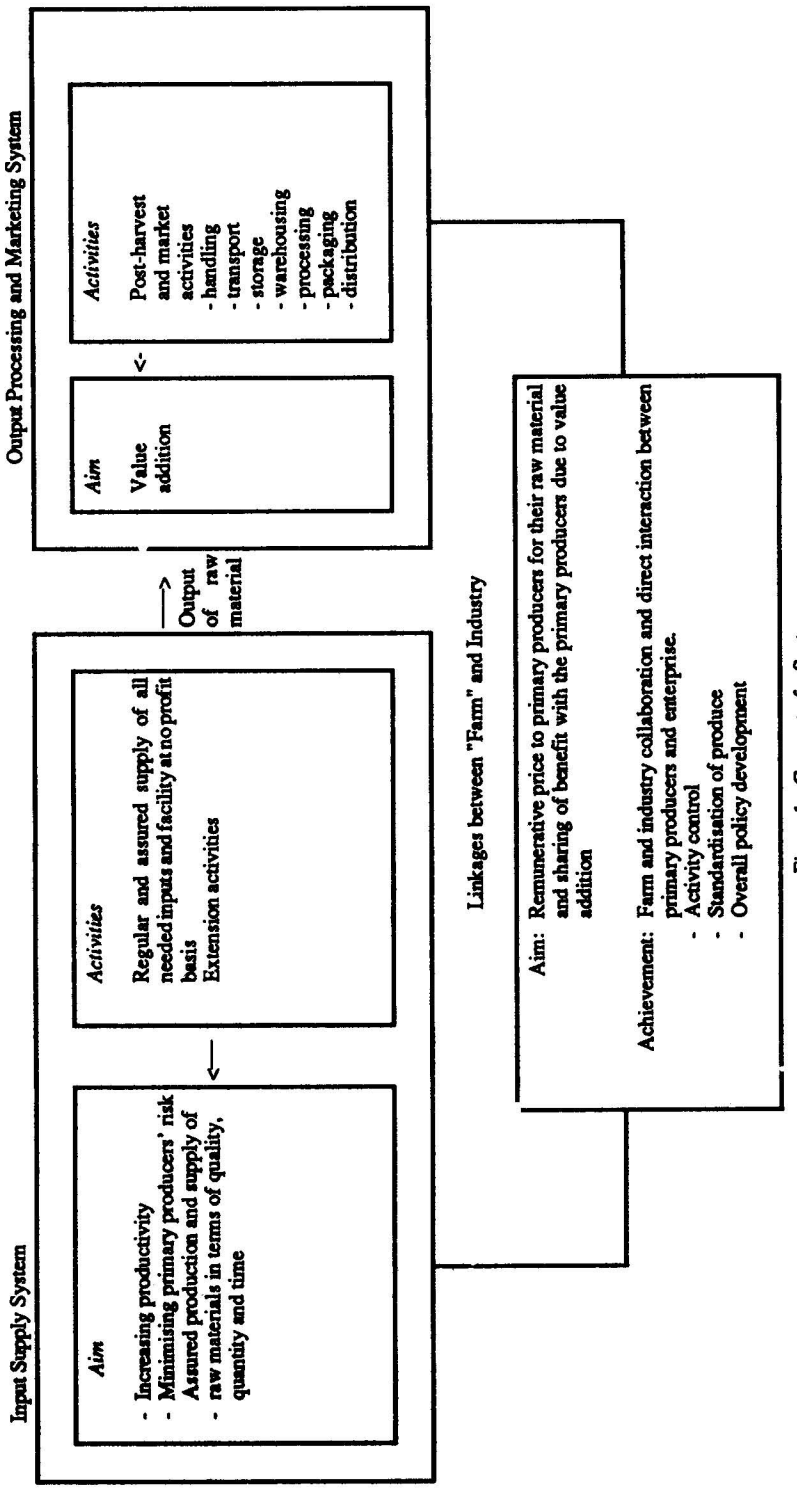

Figure 1 - Concept of a System

The input supply and production system exercises the major constraint on processing and marketing of products (Kulkarni and Srivastava, 1985). Similarly, the functioning of the processing system and the policy environment also exercises a restrictive influence on the development of markets (both domestic and international) for the value added and processed agro-based products.

Constraints of Raw Material Supply

In India one of the major problems in agro-processing is the inadequacy and suitability of raw materials. The yields per hectare are much lower than the world average. Thirty per cent of our fruits and vegetables are getting lost in the process of handling and marketing. At the same time, there is under-utilisation of the existing capacity.

Recently, Chadha (1989) has observed the following constraints on the fruit and vegetable processing industries: (*a*) Non-availability or paucity of processing varieties of fruits and vegetables, (*b*) short periods of raw material availability and (*c*) excessive costs of raw material.

Another estimate recently illustrated the situation as follows: If we consider an increase in yield of only 50 per cent (as against the order of magnitude of increases possible), it would lead to (*i*) a minimum gross value of output of Rs. 12,000/ha (four times the average gross value of output in agriculture), (*ii*) a minimum net income of Rs. 3,000/ha (four times the average in agriculture) and (*iii*) a minimum employment of 500 man-days/ha (three times that in agriculture) (Prahlad, 1989).

The above situation obtains despite the fact that only 1.5 per cent of the fruits and vegetables are being processed in India. Similar situation obtains even in agro-based-non-food commodities. For example, CLRI (Central Leather Research Institute) survey made the following two observations on the availability of raw materials:

(*a*) Annually India is losing 9 million pieces of hides and 9 million pieces of skins together valued at Rs. 35 crores due to non-recovery for a host of reasons.

(*b*) If alls the carcasses available in the country are recovered and converted into economic products, the additional value would be Rs. 584 crores (Rao, 1989).

These observations indicate the need for the industry to develop appropriate linkages with primary producers for productivity enhancement and increased availability of raw materials. Johl (1989) observed: (*i*) To produce quality processed products at low cost, processing plants should produce/acquire seeds of appropriate varieties, distribute these seeds to the producers themselves and enter into definitive contracts with the farmers for buying the produce at the remunerative/competitive/incentive prices. (*ii*) Producers should be helped by the processing plants in respect of input supplies, extension of modern production technology and quality control.

Constraints on Processing and Marketing

The constraints on processing and marketing relate to technology, market development, and financial aspects.

Technology: As a substantial portion of production takes place in the cottage and small sector, the technology is often obsolete (Srivastava, 1989) and gives sub-optimal yields, energy over-utilisation, lack of scale economies in production, and increased marketing costs (Government of India, 1989 *c*, 1989 *d*). For example, there is a difference of at least 4 per cent in yields of rice between hullers and modern rice mills. In livestock products,

slaughter houses are extremely obsolete, unhygienic, and unequipped for recovering the by-products. As the units are very small, they have very little surplus in modern equipment to make high quality products and processing of by-products for exports. The new technologies available have been designed to increase the recoveries through such processes as a reverse osmosis, counter current extraction, etc. Investment is required in balancing equipment and improved technology at several key stages in agro-food processing industries-sterilising, concentration and packaging. In exports, international standards are very exacting, particularly where mixing, homogenizing, de-acrediting and pastuerisation are involved. Perhaps, ways have to be found to integrate (by various processes of mergers, amalgamation, etc.) smaller units with larger and more modern units where smaller units can supply intermediate products for final conversion into end-products. Also, more and more integrated agro-processing complexes need to be encouraged which can serve as an anchor for forging forward and backward linkages. This question assumes special significance in the context of our exports to unified Europe after 1992. The kind of technology and product sophistication required may come from larger companies (Magee, 1989).

Marketing: Value added products from intensive processing require larger expenditure on market development. This problem is further compounded because processed and packaged products in India become extremely expensive. Normally it is expected that the cost of processed products must be such that these can be sold at lower prices than those of the fresh corresponding products at least in the off/lean seasons. Therefore, a large number of units have to be enabled to join together to promote the products. Packaging material manufacturers, for example, do not cater to small orders from such units or charge higher prices than for larger units because of scale. If the SSI and cottage scale units have to keep large inventory of packaging materials, the cost of packaging, which is already high, will further go up (Srivastava *et al.*, 1989; APEDA, 1989).

Financial and fiscal constraints: The fixed capital per factory is relatively very small but the working capital is substantially larger for agro-industries than for non-agro-industries. Therefore, agro-industrial units not only require term capital for modernisation and rehabilitation but also face a higher rate of interest on working capital from commercial banks.

Therefore, the working capital needs of agro-industries, both in terms of cost as well as margin money (for core working capital), will have to be looked at rather differently than for non-agro-industries. An analysis of sick units in the agro-processing sector indicates that in a large number of cases, the cost and management of working capital have really brought the sickness.

In India, the processed/packaged food products have been considered luxury items, and therefore, they have been subjected to high tax incidence at various stages of processing. Various studies (Government of India, 1989 *c*, 1989 *d*) have shown that the incidence of taxes amounts to 30 per cent to 60 per cent of ex-factory cost. The taxes and the packaging cost together constitute the bulk of the price of processed products. For illustration, the element of taxes in green peas and tomatoes are indicated in Table VII.

The processed products, therefore, have to be made cheaper so that they acquire a large consumption base in the domestic market. Taxation policies on processed products and custom duties on plant and machinery need to be thoroughly examined (Government of India, 1989 *c*, 1989 *d*).

TABLE VII. COST COMPONENTS IN WHOLESALE PRICES

Sr. No.	Cost items	Green peas		Tomato	
		Post-mod-vat situ-ation	Complete exemption of all taxes	Post-mod-vat situ ation	Complete exemption of all taxes
(1)	(2)	(3)	(4)	(5)	(6)
1.	Raw material	43.25	43.25	23.27	22.89
2.	Processing charges, breakage loss	20.16	20.16	11.12	11.10
3.	Packaging	96.07	62.00	21.39	20.52
	Total	159.48	125.41	55.78	54.51
1.	Interest 15%	11.96	9.41	2.51	2.45
2.	Selling expenditure	25.72	20.23	8.75	8.52
3.	Excise on finished product	19.72	—	6.71	—
4.	CST 4%	8.67	—	2.95	—
	Total	225.55	155.05	76.70	65.48
1.	Average freight	12.00	12.00	4.00	4.00
2.	Token duty	19.00	—	6.46	—
3.	GST 6%	20.52	—	6.96	—
	Wholesale price of manufacture	277.07	167.05*	94.12	69.48†

Source: Government of India (1989 *d*, p. 48).
* Element of tax is 40 per cent. † Element of tax is 27 per cent.

IV

ISSUES FOR DISCUSSION

In the initial stages of growth agro-processing is confined only to primary processing of main product and value addition from secondary and tertiary processing of all the by-products has only a small contribution in value addition. With the development, availability of technology and opening up of markets, by-products processing becomes a much larger component to the value addition, generation of employment, and net incomes of the producers as well as processors.

There is an immense potential for accelerating the agro-processing for domestic as well as export markets (Shah, 1989). But this potential will be realised only by strengthening the backward linkage for increasing the yields of crops and livestock, supporting investments in more recent technologies and balancing equipment, streamlining the tax structure on finished products, and developing the market for processed and value added products.[1]

The following major issues, therefore, need to be discussed and researched.

1. Organisational Patterns for Agro-Processing

At the primary processing stage where raw material accounts for the bulk of cost, the farmer's interests have to be safeguarded. Thus in all such agro-processing enterprises (whether in private, public, or co-operative sector), this appropriate backward linkage has to be encouraged and nurtured (even at times of falling prices). In view of this, co-operative

agro-processing complexes acquire special significance. The farmer's processing enterprises have been observed to provide adequate incentives for increasing production. In higher levels of processing and processing of some of the by-products, where the weightage of the raw material is smaller, perhaps this question is not very important.

2. R & D Inputs and Technology Upgradation

Large number of units require technology upgradation. But as adequate level of technology and balancing equipment is not always available, it is necessary to further liberalise the import of technology in selected areas, particularly packaging and machinery for food processing. Policy issues on import of technology, its adaptation, and indigenisation need to be discussed. Preferential treatment to the development of packaging industry also needs to be given attention.

3. Market Development

As the trend for producing and exporting more value added products accelerates, it will be necessary to promote and establish Indian brands in national as well as international markets. Several successful efforts have already been made by agro-based units. The recent effort of the Tea Board to promote Darjeeling tea and tea bags is one such example. The Marine Export Development Authority has also taken up the promotion of products for direct consumer sale in the importing countries. Therefore, the role of various export promotion agencies in developing international markets needs to be examined (Jasol, 1989).

4. Concessional Finance and Larger Margin Money for Working Capital

As the units are small, cost of term capital is higher and also working capital has to be raised from commercial banks at 18 per cent rate of interest. More liberal financial assistance needs to be devised for accelerating production of agro-based products.

5. Tax Incidence

With the creation of a separate Ministry of Food Processing Industries, the need for acceleration of agro-food industries has been recognised. It is in this context that the high tax incidence on processing food products and their adverse effect on market development has to be discussed.

6. Linkage of Agro-Industry with Planning for Agro-Climatic Regions

The Planning Commission has demarcated 15 agro-climatic regions: Western Himalayan region, Eastern Himalayan region, Lower Gangetic region, Middle Gangetic Plain region, Upper Gangetic Plain region, Trans-Gangetic Plain region, Eastern Plateau and Hill region, Central Plateau Hill region, Western Plateau and Hill region, Southern Plateau and Hills, East Coast Plain and Hill region, West Coast Plain and Ghat region, Gujarat Plain and Hill region, Western Dry region and Island region. The question to be discussed is as to how a

linkage of agro-processing activities is to be brought about with the crop and livestock specialisations. Location and capacities will have to be linked with economic zones and emerging urban demand centres.

7. Strengthening of the Data Base

As the bulk of the units are in cottage and small-scale sector, the data base on their working is not very strong. There is large time lag in the availability of even limited data. For the organised sector, the Annual Survey of Industries is a very important and comprehensive source; but here again there is the time lag in the publication of data and sometimes the data are not made available by the units surveyed. Therefore, the ways of upgrading the data base and putting all the available information for policy and planning purposes without any time lag need to be examined.

8. Need for Further Research

As the bulk of the units in agro-processing sector are small and data base is very weak, it is necessary to prepare comprehensive case studies of selected units in each major sub-sector so that the problems at what is called the cutting edge level are understood and recommendations for policy formulation can be made. In this context, there is also a need for comprehensive industry studies for various agro-based sub-sectors. These studies also should make inter-firm comparison within the industry. We should also examine the possibility of networking of various institutions involved in the study of agro-processing sector.

NOTE

1. In view of this, The World Bank has recently initiated comprehensive Sector Studies on the following to identify project ideas for India: (*i*) Fisheries; (*ii*) Edible Oils; (*iii*) Fruits and Vegetables; (*iv*) Sericulture; (*v*) Meat and Meat Products; (*vi*) Leather; and (*vii*) Packaging.

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