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**APPROPRIATE TECHNOLOGY
FOR
FOOD STORAGE AND PROCESSING**
.....

THE FOOD INDUSTRY IN INDIA
Background Paper

THE FOOD INDUSTRY IN INDIA

by

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Mysore, India

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1. Introduction

Over 50% of India's Gross National Product is derived from agricultural and allied activities. Development of agriculture has therefore always received priority in the next Five Year Plan. Over 40% of the financial resources has been allocated for those activities designed to improve agricultural production. The capacity of agriculture to provide employment is reaching a limit and already there is a surplus of human energy which has to be put to productive use. It is recognised that the surplus labour can be gainfully used in constructing dams, irrigation systems, road building etc., which in turn will result in increased generation of national income. The population distribution in India is such that almost 80% reside in relatively underdeveloped rural areas producing the nation's entire requirement of agro-products. Whereas majority of the rural population is gainfully employed at least partially, there is severe under-employment, especially during agricultural off-seasons. There is a genuine need to find alternate means of employment for unemployed or under-employed.

One of the most promising avenues of employment is development of agro-based industries which depend on agricultural raw-materials for their operations. These industries are to be based on economically sound, labour intensive and capital saving technologies using low energy levels that can harness human energies and manufacture products of required quality. In terms of employment, these industries provide occupation to a large number of persons on unit investment. Other advantages of establishment of agro-industries are:

- a. Considerable value is added to the raw commodity when processed.
- b. Farmers are assured of stable prices for their commodities which in turn will stimulate agricultural production.

- c. Agro-processing will ensure reduction of qualitative and quantitative losses.
- d. Establishment of agro-industries in the growing areas may create increased employment opportunities to rural population, thereby reversing the undesirable trend of urban migration.
- e. Production of value added materials and their export in place of raw produce will result in increased foreign exchange earnings.
- f. Growth of agro-industries can stimulate development of other industries which contribute component materials in the final products.

One of the methods attempted by many developing countries to achieve faster pace of industrialisation is to import technology from advanced countries. However, this has only a short-term advantage and often these technologies are obsolete and give unsatisfactory results. Imported technologies have not only involved high capital costs in foreign exchange but brought with them problems of pollution, export of royalties and profits in foreign exchange. In many cases under collaboration agreements, the export of products to the traditional markets of the foreign collaborator are not permitted. Most significantly the contribution of these technologies to solving the employment problem and using the large surplus of human energy is very limited. A systematic socio-economically oriented research effort is required to develop indigenously relevant labour intensive, capital saving and economically sound technologies. A beginning was made in India in this direction almost three decades ago and under a systematic technology development programme, India has been able to build a sound base in the field of post-harvest technology of agricultural raw-materials. Today most of the agriculturally based industries are operating using indigenously developed technologies.

2. Background of Rural & Urban Food Industries

Realising the need for systematic development of food industries in the country the consumer industries were also covered in the Industries Development & Regulation Act 1951, the principle objective being to enable the Government to implement its policy of preventing haphazard growth of the industry which has been taking place without due reference to the sources of raw-material and of the markets.

The first two Five Year Plans laid more emphasis on the development of heavy industries than the consumer goods industries. Only the fuller utilization of the existing capacities in agro-based industries was considered essential. Only during the Third Plan period more emphasis was laid on the development of agro-based industries on par with the development of agriculture,

The food industries showed considerable progress only during the last one decade. Presently it occupies a very important place in our national economy. According to the Annual Survey of Industries, the food industries (including sugar and gur) in the organised sector ranged second after textiles with an output valued over Rs.1750 million and claimed 17% of the total gross industrial output. Even the total labour employed by these sectors worked out to 10.92% of the total employment by 16 industrial groups covering more than 80% of the total industrial output. If the output of rural and small industries like rice, flour and oil-milling is also included the total value will go up higher. On this basis, the total capital invested in all these small units may run to million of rupees and labour employed may also come up to several millions.

Industries based on agricultural raw-materials account for about 45% weights in the index of industrial production in India. Food industries constitute an important sector among the agro-based industries and comprise all aspects of production, processing and storage of foodstuffs.

The food industries comprise units in village and small scale industries in the unorganised as well as organized sectors.

The village and small industries sector consist broadly of traditional cottage scale and household units and the modern large scale industries. As distinguished from modern small scale units, traditional cottage scale and household units are located mostly in rural and semi-urban areas. These involve relatively lower levels of investment and technology and provide largely part time employment. The non-factory unorganised sector accounts for 5% of the Gross National Product and 10% of the labour force in India.

The inadequacy of complete and up-to-date statistics for these industries, especially traditional units, is a handicap in assessing the physical progress of development in the unorganised sector.

The emergence of small scale industries as a predominant sector of India's industrial economy during the last decade is a significant phenomenon in the history of industrial development of the country. According to a recent survey, there were 7108 food processing units with an installed capacity of Rs. 244.5 crores. Their total out-put value was Rs. 156.9 crores. They employed over 1.4 lakh which formed about 8.3% of the total labour force in the small scale sector. Table 1 presents the sector-wise number of units, installed capacity and value of output.

A wide range of food products are being manufactured in the small scale sector. Important among them are: meat products, fruit and vegetable products, bakery products, cocoa products, sugar, confectionery, processed cashew, starch and animal feed.

In the organised sector, the food industries can be classified into:

- i) basic food industries covering cereals and pulses, milling, oil milling and cane processing units (Table 2); and
- ii) other processed food products including meat, fish, fruit and vegetable processing, biscuit, confectionery, breakfast foods, dairy products including infant foods, starch and derivatives, and malt products (Table 3).

Being basic necessities of life, processing of foodgrains, oilseeds, sugar and gur have been well established. Modern developments have percolated to this sector resulting in continuous improvement in quality and yield of products.

During the last two decades, India has emerged as an exporter of processed food products from a net importer. The contribution of processed foods which was only 16% of the total export earnings in 1965-66; increased to 28% in 1975-76 (Table 4).

3. Food Processing Industries in India - Sector wise status

i) Foodgrain Processing:

India's annual production of rice, wheat, coarse grains (maize, sorghum, pennisetum millet and ragi) and the legumes is nearly 120 million tonnes. 15-35% of this produce (depending on the particular grain) leaves the villages for consumption in the urban areas through the organized or unorganized marketing channel. The rest of the grain is used in the village itself for food and seed needed by the farmers

and other land-less workers. The main processing given to these foodgrains is primarily to prepare them for edible use and consists mainly in milling into grain, dhal (de-cuticled split pulse) or flour. In certain areas puffing or parching or flaking of some cereal grains is also practised for use at the local level.

The milling into grain or into flour used to be done by hand-pounding or hand-grinding till the early part of the century. With the introduction of electrically operated machines into more and more villages hand-grinding or hand-pounding practices are in diminishing use. Hand-pounding of paddy is, however, still favoured in certain areas where electric or diesel power is not available and because of the employment opportunities provided by it.

a) Rice: Out of a total production of about 45 million tonnes, rice about 15-20 million tonnes enter the commercial channel or organized marketing and processing in large sized mills (about 8000) of 1,2, or 4 tonnes capacity per hour. Modernization of the commercially organized sector of milling has been taken up and is enforced as a Government policy. In the rural sector about 30 million tonnes of paddy are processed into rice for local consumption. The milling is done in about 70,000 single unit huller machines of the Englborg type. These low capacity, low cost and sturdy machines give 4-5% less yields of rice than the large commercial mills. As both the hulling and debreanning are combined in this machine, bran obtained is not pure and is mixed with pulverised husk.

R&D efforts for improving the efficiency of rice milling for use at the rural level is receiving much attention in recent years. Attempts have been made in developing a low capacity but efficient rice mill with an out turn

equivalent to that of the commercial mill, and gives pure bran useful for feed purposes or for oil extraction, which can also fetch handsome returns to the farmers. Such low capacity mills called 'Mini Rice Mills' would be of great use for the villager as a replacement of the huller mill. Several versions of this mini mill are possible and have been envisaged, and some types are already under commercial production. Incentives are needed for popularising their use at the village level.

Parboiling of paddy prior to milling is of great practical significance in rice milling. The parboiling procedure greatly helps in loosening the husk and facilitates its shelling. It also hardens the grains and thereby sharply reduces breakage during shelling and polishing. The parboiling procedure is still practised in the household by many farmers and by labourers in the villages. The parboiled paddy is then taken to the huller mill for dehulling and polishing.

A simplified procedure and equipment for parboiling of paddy for use at the village level needs to be developed. The parboiling units may be installed in a central place where people can take their paddy and parboil it or get it parboiled by payment of nominal charges. The drying itself can be done in a central paved drying yard or in other improved drier. Such type of community parboiling-cum-drying facilities for villages would be very welcome.

The production of flaked rice from paddy which is being practised as a cottage scale industry in towns and cities needs to be set up in the village itself as it does not need much skill or capital and can provide employment opportunities to the local population. The product, after satisfying local needs, can be sent to the towns and cities

for marketing. Similarly, units for producing puffed paddy or puffed rice must also need to be set up in villages.

Wheat: Wheat is consumed mainly in the form of whole meal flour. The grinding is done in power-operated plate, emery or hammer type grinders, but hand-grinding, perhaps, is still practised in interior areas where motive power is not available. The provision of a sieving facility in the grinder unit would be advantageous as the whole meal atta is normally sieved to remove the coarse bran before consumption. Such type of sieving immediately after the grinding process would also help in mobilising efficiently bran resources for feed and other uses. Production of semolina from hard type wheat is a small scale industry that is becoming popular particularly in the areas of durum wheat production. Such units need to be popularised in the wheat producing areas, because they can produce semi-refined semolina or "Dholia" (coarsely ground grits) for local consumption. Partial debranning prior to coarse grinding, and suitable grading of the ground products are improvements that would help the status of this small scale cottage industry.

Coarse grains and Millets: About 25-30 million tonnes of coarse grains like sorghum, maize, bajra (Pennisetum) and Ragi (Finger millet) are produced particularly in low rain fall regions or in irrigated areas where relay cropping system is practised. These grains are mostly ground into whole meal flour and sieved for removal of bran and then used for making unleavened cakes or in the form of soft cooked dumpling or Mudde. Dehusking of these coarse grains prior to grinding would help in production of semi refined flours for habitual use and also for making newer variety of food products and in extending supplies of rice and wheat.

Production of graded semolina from these grains could cater to specific local needs. The technology and the machines for removal of the husk, bran, and other coarse portion of the grains have been developed and their utilisation at the village level is expected. The emphasis is on low capacity machines that would produce the flour and semolina for local use.

Pulses: About 10 million tonnes of pulses are produced in India. The major portion of pulses used after dehusking and splitting as dhal as whole pulse takes a very long time to cook. Dhal milling has become a very important commercial sized industry. Traditional technology for pre-processing of the pulse by wetting and sun-drying prior to splitting into dhal is time consuming, dependent on hot dry weather and entails loss as brokens and flour resulting in low dhal yields. Recent research work has resulted in the development of improvement technology which drastically reduces processing time and increases the yield of dhal, and based on it a new mill has been designed. Further study is required to apply or adopt the underlying principles of the improved technology for making low capacity dhal milling units for use at rural level.

Byproducts of Milling: The byproducts of milling of all cereal grains that would be available through setting up rural grain processing industries can be mobilised in production of compounded animal feeds locally for dairy, poultry or even for feeding draft animals.

Advances have been made in the processing and utilisation of foodgrains. Technology developed indigenously as also developed in other parts of the world are actually put to increasing use by the organized sector of the grain

processing industry. This knowledge needs to be adopted and, if necessary, modified to suit specific rural requirements such as being less sophisticated, less capital intensive and more labour oriented.

ii) Fruit and Vegetable Industry

Origin of the fruit and vegetable industry in India can be traced to World War II days when factories were started to meet the needs of the defence personnel. Over the years the industry has had a slow growth and at present there are about one thousand units processing different products spread in various parts of the country. Among the major products are those from tropical fruits like mango and pineapple in the form of pulp, juice, slices, pickles and chutneys. The production figures for different products in the country are given in Table 5.

India produces about 32 million tonnes of fruits and vegetables both of tropical and sub-tropical origin. Major ones among fruits are mango, banana, pineapple, papaya, citrus and apples. Among the vegetables and tubers are potatoes, onion, tapioca, tomatoes and number of leafy and non-leafy vegetables. Due to variety of reasons, such as the year round supply of a variety of fruits and vegetables, dieting habits, and socio-economic conditions in the country, only about 1% of the produce is processed while rest of it is consumed in the unprocessed form. Out of 55,000 tonnes of processed products recently about 15,000 tonnes were exported to middle east and European countries and 10,000 tonnes were utilised by the defence personnel. Out of the remaining, 10,000 tonnes were taken up by catering establishments, hotels and institutions, while only 20,000 tonnes were consumed in the various households mostly in the higher

income group. This low consumption in the domestic market has considerably hampered the growth of Indian fruit and vegetable processing industry.

The processing units of fruit and vegetable industry in India can be classified into two categories. One producing products like jam, jellies, juices, squashes, ketchup etc., which can be called modern sector and the other producing pickles, chutneys and dehydrated fruit and vegetables which can be called traditional sector. The former is capital intensive and well organised whereas the latter is spread all over the country including in rural areas and affords scope for introducing modifications.

Modern Sector: These units are well organised, able to produce quality products and are mostly located in the urban centres. About twenty such units account for more than 80% of the national fruit and vegetable processed products. Their production is mostly export oriented and also to meet the demands of the defence forces. Products manufactured in this sector do not have a strong expanding internal market because of which there is considerable unutilised capacity in the units. Production costs for these products are very high. About 30% is accounted for by raw material prices, whereas sugar accounts for about 16% and packaging materials about 30%. Products in this sector are mostly exported to markets in the Middle East and East European countries, which are registering a growth annually.

Traditional Indian Products: Traditional processed fruit and vegetable products are very popular throughout the country. These are mostly in the form of preserves and chutneys (sweet) and pickles (spiced). Vegetables dried in the backyard are also used in many households.

Till recently most of the products were locally prepared as the formulations vary from region to region depending on the local tastes. Many households have their traditional specialities. This had resulted in a sort of unorganised production of the commodities in rural areas. With a slow movement of rural population towards the cities and emergence of working women, a need for organised sector producing these products is felt and is being encouraged.

India is producing most of the plant and machinery required for the fruit and vegetable processing units in the country. These are mostly manufactured on order. The tin plate required for cans in the processing line is at present being imported in the country. Recent research and development efforts have shown that the indigenously manufactured tin plate meets the demands of the processing industry, and there are prospects that the imported tin plate will soon be substituted by the locally produced material.

A number of States are now setting up agro-industries complexes with a view to have an integrated approach towards production, processing and marketing of the processed products. Consideration is being given to division of processing operation in such a way that fruits can be processed in the growing centre upto the stage of pulp, pure or concentrates, transported in this form to the consuming centres to be further processed into final packed consumer products. These are being located as far as possible in the production centres so as to utilize locally available raw materials, assure good return to the growers and also increase employment opportunities in the region. International agencies like World Bank are also contributing towards this. An

apple processing plant has been set up with the World Bank aid in the Northern part of the country in Himachal Pradesh. With the Bulgarian Government cooperation tomato and pine-apple processing complexes are being envisaged in Karnataka in Southern and Bihar in Northern India.

iii) Dairy Industry

Dairying in India is basically a rural agricultural enterprise of millions of small farmers in the country. Dairy Development in India received a fillip after independence with industrialisation and public awakening warranted the establishment of organised milk collection, processing and distribution of milk to cater to the needs of expanding urban areas. During successive Five Year Plans, stress was laid on different facets of dairy development.

The National Dairy Research Institute has been enlarged and is rendering excellent service in research and training of personnel.

The National Dairy Development Board under the Ministry of Agriculture, was constituted in 1965 to speed up dairy development. Objectives of the Board cover different aspects such as production, milk procurement, processing, distribution, technical and engineering services. In 1970, Government of India set up the Indian Dairy Corporation as a corollary to the India-World Programme project. The State Dairy Development Corporations were set up in respective States to promote development programmes at State level.

The Planning Commission and the National Commission on Agriculture have reckoned the importance of cooperatives in organising collection, processing and distribution of milk.

The success of Kaira Co-operative Milk Producers Union at Anand, started in 1948, gave impetus to setting up of more such cooperatives.

A large dairy development project, perhaps the biggest of its kind in any country, known as "Operation Flood" was launched in 1970. One of the important programmes of the project was organisation of rural milk production through milk producers' cooperatives for supply of milk to large milk plants located in metropolitan cities.

"Operation Flood II" will be initiated in July 1978 as part of the Sixth Plan programme with a massive outlay of Rs. 483 crores. This envisages agglomeration of several district level milk producers unions into a cluster federation with 5-6 district level unions. The dairy plant will be owned by the cluster federation. There will be 25 such cluster federations covering 10 million milk producers. On the basis of Operation Flood I already in operation, Operation Flood II seeks to bring about self sufficiency with a well developed modern dairy industry.

Starting from a figure of 10 million tonnes in pre-independence period, India is producing 26 million tonnes of milk. The National Commission on Agriculture has projected the demand of milk as 44.17 million tonnes for 1985. In order to supply adequate wholesome milk to all major cities more conveniently and economically, a programme of a National Milk Grid has been envisaged. At present, there are 77 liquid milk plants including the ones at Bombay, Calcutta, Delhi and Madras. Besides, 7 milk product factories, 3 creameries and 43 pilot schemes all in public sector, are in operation. Dairy throughput of milk in all these plants is about 2.25 million litres.

Milk being perishable commodity, institutional arrangement is necessary to receive and transport milk from primary producers for purposes of processing as bottled milk, milk powder etc. The Kaira District Co-operative Milk Producers' Union Ltd., Amnd, Gujarat, which is a premier organisation in the field, maintains in each cooperative society, a milk collection centre and trained staff to receive milk from its members and make payments to them. Milk is received at the collection centre both morning and evening, measured and a sample is tested for quality and fat content, which goes on Society's records.

Each society keeps its milk for despatch at specified times. There are transport contractors who arrange to collect milk from the village and deliver it to the dairy factory at Amnd. The 780 societies are divided into 82 groups or transport routes and there is a truck to serve each route. Union bears the cost of transport from village societies to the factory.

The above procedure given in detail is to illustrate the collecting and testing procedures.

Private sector has also been encouraged to set up factories for milk products in potential milk producing areas in order to make the country self-sufficient in respect of milk products such as butter, cheese, milk powder, condensed milk, infant milk food and malted milk food. The country is almost self-reliant with regard to production of table butter, condensed milk, infant milk food and malted milk food. Other indigenous products from milk are "khos", "ghee" and "dahi".

The present utilisation of milk may be stated as follows:

Milk as such	45%
Milk as products	55%
Ghee	33%
Butter	6%
Dahi	8%
Khon	5%
Other products	3%

Annual productions of a few milk-based products are:

Baby food	26,000 tonnes
Milk powder (whole & skin)	18,000 tonnes
Condensed milk	5,000 tonnes
Malted milk food	15,000 tonnes
Table butter	15,000 tonnes

India is manufacturing a complete range of equipment for handling and processing milk and manufacture of milk products. There are three large scale manufacturing units set up with foreign collaboration and many units in the small scale sector. Together these can supply diverse types of equipment.

Milk is an article adulterated to a large extent. The percentages of adulteration varies from region to region and sometimes may even be as high as 80%. Similarly, adulteration in milk products is also quite common. The products which form the staple food of growing children should be available in pure and wholesome form. With this objective the Central Government has laid down standards for various types and designations of milk and milk products under Prevention of Food Adulteration Act 1954 and Rules 1955. These are minimum standards. Since composition of milk varies from region to region, different standards have been

laid down on regional basis.

Indian Standards Institution has laid down more than 41 standards for dairy products with a view to guide the industry. These include infant food, milk powder, condensed milk, casein, cheese, ice-cream, sterilised milk, malted milk food, "khoa", "rasagolla", flavoured milk. ISI has also standardised various types of equipment required for different purposes of dairy industry (glass milk bottles, rail milk tankers, guidelines for cleaning and sterilising dairy industry, etc.) for transport of cattle, cattle feed and cattle house.

There is a system in vogue for grading "ghoe" under the provision of the Agricultural Produce (Grading and Marketing) Act 1937. Directorate of Marketing and Inspection has a net work of laboratories to analyse samples of milk, ghee, butter and other products graded under AGMARK. The grading under AGMARK is voluntary but this has helped the producer of quality products in obtaining better prices.

In conclusion, India has made valuable advance in the field of dairy industry during the last 30 years. While implementing the programmes, interest of primary producer and rural economy have been the guiding factors. Urban markets developed through distribution of quality milk in public sector has helped in more production. A chain has been developed for movement of milk from the primary producer to processing establishments and ultimately to the consumers. India has now become self-sufficient in many dairy products. Yet there is a wide gap between the requirement and availability of milk, calling for a more aggressive programme for increased milk production.

iv) Animal and Fish-based products

a) Meat and Meat products: The total livestock population in India is of the order of 348 millions of which 50% are cattle, 15.8% buffalo, 12.4% sheep, 19.7% goat and 1.4% pig. From among these animals 0.5% of cattle, 1.5% of the buffalo, 29% of sheet, 42% of goat and 33% of pig are slaughtered annually for meat. Of late slaughter of buffaloes is on the increase because of the fillip received by export of buffalo meat to Middle-Eastern countries.

Most of the meat is sold to consumers as fresh meat. Only a small portion is converted into processed products. The average per capita consumption is 14 gram of meat per day as against the recommended allowance of 34 gram. The demand for meat will increase with improved economic status of the consumers. The availability of meat could be increased by better practices in animal husbandary like breeding and propagation of meat-breed animals, selected from different agro-climatic regions.

The production of ham, bacon, sausages and other comminuted products including canned products like curried meat is being carried out at present to cater to defence and civilian requirements. The know-how for the production of sausages and comminuted products with taste and flavour profiles of indigenous meat preparations, concentrated meat gravies, strained baby foods and meat tenderisers, for curing of ham and bacon have been developed. Some of these products have export potential in addition to local appeal.

The primary requirement for developing the meat trade and export is the modernisation of slaughter houses to produce wholesome meat for consumption and processing into products. The Regional Bacon Factories at **Baringhata**

(West Bengal), Aligarh (Uttar Pradesh), Bombay (Maharashtra), Ranchi (Madhya Pradesh), Alwar (Rajasthan, Gannavaram (Andhra-Pradesh) and Koota-thurkulam (Kerala) were established to produce cured pork products. These factories have facilities for slaughter and dressing. A modern abattoir is now working at Deonar, Bombay and more are being set up in different parts of the country. The Deonar abattoir is catering to the fresh meat requirement of Bombay city as also export. The modern abattoirs have facilities for recovery and utilisation of all the byproducts for better economic returns.

If the country has to make a break through in the export of meat and meat products, concerted efforts have to be made to raise livestock of the required quality in selected zones free of diseases like foot and mouth disease (FMD). Kenya has increased its exports of meat by establishing disease free zones.

Raising of livestock is essentially an activity of rural bias. Under-employed labour in villages could be deployed for this purpose. Small Farmers' Development Agency (SFDA) and like agencies could be entrusted with this task. State Governments have started work in this direction.

b) Fish and fish products: India with a coastal line of about 4000 km has an annual catch of about 2.3 million tonnes of fish. Total exports of fish and fish products during 1976 was about Rs. 180 millions. India has emerged as one of the leading shrimp processing and exporting countries in the world. Frozen prawns valued at Rs. 160 million were exported during 1976.

Our export of marine products is expanding every year. But this is mainly based on prawns. A quick increase could be effected in the overall availability of prawns. One thousand kg. of prawns of large size and 2000 kg of fish

have been harvested per hectare of brackish water under controlled conditions. "Bekti" fish can also be increased this way to produce more than 2000 kg. per hectare. There is considerable scope for increase in production by adopting method of inland fish culture.

A substantial and increasing part of our marine fish catches consist of oil sardines and mackerels. The landing centres are not adequately equipped for careful handling and storage of such large catches of fish. Rampant and Seine nets may bring tonnes of these fish in one catch. A fair percentage of these fish therefore decays and disintegrate before reaching markets and processing factories ashore. As such, immediate measures are required to chill these fish soon after catch.

Canned fish: At present canning is mainly for the sardines in oil, tuna in oil and shrimp in brine. Scabbroid fishes are important part of the marine fish landings in the Indian ocean, tuna and mackerel being the most important. These delicious types of fish and oil-sardines could be profitably utilized for canning both for internal and foreign markets. Aluminium can for canning of fish should be introduced as the metal is indigenously available and the cans are easy-to-open type and they do not affect the product.

Separated meat from inexpensive fish: There is an increasing awareness in development of new products from inexpensive varieties of fish. Development of products in the form of farinaceous type or separated meat in frozen blocks as a base material for various preparations is called for.

Salting and drying of fish: Due to lack of refrigeration facilities, a substantial percentage of fish are at present being processed into salted and cured products. The method employed for curing fish are crude and primitive and the

products are unattractive and defective. This method of preservation has to be put on scientific lines to get proper return from fish. Pickling with salt, vinegar, sugar and spices is also widely employed for fish curing. Preparation of high quality spiced pickled products on the lines like marinated herring, is another line of work to develop new products.

Fish meal and oil: Fish meal is an important ingredient of poultry feed. The processing of fish meal and oil in India is less organised and is still mostly carried out as cottage industry. The meal is dried depending on the vagaries of weathers. It gets contaminated with sand, bacteria and infested by rodents, etc., thereby yields low grade products. Processing operations required to be mechanised to obtain better quality products.

Utilisation of fish wastes: Entrails from fish and prawn waste are an excellent source of biochemical and pharmaceutical products and must be profitably utilised. Waste utilisation from freezing and canning operations and fish curing yards play an important part in the economics of successful plant operation. There is plenty of raw material, valuable information could be disseminated to the fish processing industry as to the great potential of by products and the waste material for industrial progress. Important products are chitosan and bactopeptone from squilla and shrimp waste which have many industrial applications. The sea-weeds yielding agar, algin and carrageen are very important and are abundant in our coast. Also they could perhaps be diverted as a protein food for poultry feeding.

c) Poultry and Poultry Products: The value of poultry production is estimated to be Rs. 5,600 million for 1979. The cost of feed represents more than half of the total expenditure on raising poultry. Cattle and poultry feeds are produced by a number of plants in the public sector and by small scale feed manufacturers. In 1974 there were about 33 feed manufacturing units in the organised sector. There are 23 manufacturers who have formed a Compound Livestock Food Manufacturers' Association (CLFMA). The CLFMA figures of production for poultry feed in 1979 are about 3 million tonnes and 4 million tonnes of cattle feed.

We have well developed poultry industry which is expanding at a rapid rate. It is in this context that the development of industries, based on eggs as raw material for the production of egg powder and egg albumin flakes, offer potential future. While the production of food-grade egg powder seems to have limited scope in view of its high cost and acceptability problems, the production of egg albumin flakes appears to have a very good future. Its annual requirement is estimated to be nearly 50 tonnes which is met by indigenous production and partly by import. Egg yolk which is the byproduct could be profitably utilised for tanning of leather while the egg shell finds use in a number of industries.

Due to inadequate facilities for refrigeration, large quantities of eggs perish before reaching consumers. Eggs preserved with coating oil can be stored at ambient temperature for a longer time.

The meat from culled bird is tough in texture. Processed products such as chicken sticks, chicken sandwich spread, sausages and chicken soups with attractive profiles

have been successfully prepared from this type meat. Convenience type products such as canned chicken biriyani, curried chicken, etc., offer good scope for export market to Middle East countries.

An emerging new trend in the poultry industry is increasing popularity of raising chicks for meat. A farmer can raise five crops of broilers in a year. The efficiency of broiler production has resulted in poultry meat being produced at a comparatively cheaper price. The cockerels that are usually destroyed in millions every year could be utilised for table purpose by raising them on cheaper feeds.

An efficient method of curing and smoking, has been developed for dressed poultry which could be stored at ambient temperature for about a week with minimum loss of its flavour and lustre.

Conditions have been standardized for processing of a superior quality tandoori chicken. Ingredients essential for imparting taste and flavour to the poultry could be marketed in the form of a ready-to-mix type product.

d) Quality Control: In dealing with perishable foods such as fish, meat and poultry, it is important that very high standards of personal hygiene, plant sanitation and control measures be maintained. Unless proper steps are taken to control spoilage of these perishables, the material becomes unfit for human consumption. This means loss to the producer and in case of exportable products, the loss reflects on the trade. Indian Standards Institution (ISI), Export Inspection Agency (EIA) and Meat Products Order (MPO), have formulated standards for the raw material and important processed products from these to ensure their quality to avoid any health hazards.

v) Plantation Products Industry

The overseas trade of Indian plantation products like spices, coffee, tea and cashewnut has been a major source of foreign exchange for the country. The importance of plantation products to Indian economy can be seen under the Table 6.

a) Spices

Commercial crops of the tropical spices like pepper and cardamom are produced in the Southern regions of the country and of temperate spices like celery and fennel produced in the Northern regions.

The cured dried spices are marketed mostly as such locally and also exported. For export, certain amount of cleaning and "garbling" are done to meet the Agricultural Marketing (AGMARK) specifications.

Due to increase in production costs and insufficient control over quality of products, the country has lost some of the ground in foreign markets to competitors. Poor yields due to unsatisfactory cultivation conditions, failure of rains, increased labour costs, etc., have been responsible for abnormal increase in the production costs. Some diseases due to viruses, insects, fungi, etc., have affected the quality. Intensive scientific cultivation methods and production of disease free and high yielding strains of plants by hybridization and mutation techniques are being tried to combat the defects.

There is need for improving the processing methods to get better quality products. Sun-drying of spices has many disadvantages like contamination, variation in flavours, etc.

Natural convection or forced draft dryers can advantageously be used to avoid such problems as well as dependence on the vagaries of weather. Pneumatic cleaners for removing dirt and debris from the dried spices, vibrating graders and destoners using principles of air classification and vibratory conveyance on inclined decks are some of the new equipment that can be installed in spice pooling centres to get very clean and high grade spices which could be used direct for grinding or extraction. Some of the exporters are already using such purification procedures.

Air-cooled or jacketed water cooled fixed beaters, double roller or cage and hammer mills have to be used to grind the spices, avoiding flavour loss due to excessive heating during grinding. This also is being gradually implemented, especially by manufacturers of curry powders.

Spice oils and oleoresins: These concentrated spice products have a very good market abroad for use in the processed food industry. Until a few years ago the know-how for producing these concentrated spice products was not available in the country. The know-how has been developed now as a result of recent researches and is available to industry. At least two big firms are producing sizeable quantities of spice oils and oleoresins now and are exporting them.

Dehydrated green pepper: A green dry pepper which reconstitutes easily in hot water has been developed recently. This has found a good market in Europe.

b) Tea:

India produces about 450,000 tonnes of tea, and exports some 207,000 tonnes. This is mostly in the form of fermented and dried black tea. Processes for making hot and cold water soluble instant teas from green leaf and

instant green tea from green leaf have been developed indigenously. The products are mostly meant for export. One commercial unit is already functioning.

(c) Coffee:

India produces about 90,000 tonnes of coffee and exports some 45,000 tonnes. Both plantation and cherry coffee are produced. Arabica and Robusta are the chief varieties. Standardised methods of fermentation and curing are used.

Processes for the manufacture of soluble coffee, coffee concentrates and ready mix coffee beverages have been developed. There are several manufacturing units in the country for the production of soluble coffee. The process is mainly one of preparing a strong brew, concentrating it under vacuum and drying the concentrate in a spray or vacuum shelf-drier.

(d) Cocoa

India is importing about 1000 tonnes of cocoa beans annually. Over the past few years, concentrated efforts have been made to promote production of cocoa within the country which resulted in an annual production of about 150 tonnes of dry cocoa beans. This is increasing rapidly, and the country may soon be in a position to produce all of its requirements.

Commercial units for production of cocoa powder, drinking chocolate and milk chocolate are functioning in the country now.

(e) Cashew:

India is producing some 235,000 tonnes of raw cashew nuts (world production - 650,000 tonnes). The nuts are roasted and deshelled and the kernels dried. About 60,000 tonnes of kernels are exported. Cashew shell liquor is a by-product. A very large number of units are functioning all over the South-Western coastal areas, producing the valued kernels. While the roasting and drying are done mechanically, the deshelling is done mostly manually. Mechanical deshelling results in too much broken kernels.

vi) System of Quality Control for Foods

In India the system of ensuring quality control standards of food is the responsibility of several Government departments. These departments have been bringing out specifications for the purposes of operations of both voluntary and mandatory requirements of the various Acts which are enumerated as under:

<u>Act or Order</u>	<u>Operating Authority</u>
1. Agriculture Produce (Grading and Marking) Act, 1937	Directorate of Marketing & Inspection (Ministry of Agriculture & Irrigation)
2. Prevention of Food Adulteration Act, 1954 and Rules 1955	Directorate General of Health Services (Ministry of Health)
3. Fruit Products Order, 1955	Food & Nutrition Board (Ministry of Agriculture & Irrigation)
4. Sugar (Control) Order, 1966	Directorate of Sugar (Ministry of Agriculture & Irrigation)

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|---|--|
| 4. Sugar (Control) Order, 1966 | Directorate of Sugar
(Ministry of Agriculture
& Irrigation). |
| 5. Technical Standardisation
Committee (TSC), 1944 | Army Purchase Organization
Department of Food, Ministry
of Agriculture & Irrigation |
| 6. Vanaspati (Control) Order,
1975 | Directorate of Vanaspati
(Ministry of Civil Supplies
& Cooperation) |
| 7. Meat Food Products Order,
1975 | Directorate of Marketing &
Inspection (Ministry of
Agriculture & Irrigation.) |
| 8. Export (Quality Control &
Inspection) Act, 1963 and
Rules 1964 | Export Inspection Council
of India (Ministry of
Commerce) |
| 9. Indian Standards Institu-
tion | Indian Standards Institution
Department of Industrial
Development (Ministry of
Industry & Civil Supplies) |

The role and operational system of some of the above referred Acts is narrated briefly in the succeeding paragraphs.

Agriculture Produce (Grading & Marking) Act, 1937: This Act is administered by the Directorate of Marketing & Inspection with Agricultural Marketing Adviser as its Chairman. A number of grading standards on raw agricultural produce were brought out by the Directorate of Marketing & Inspection. Some of the Agriculture products to which this Act applies are ghee, butter, spices, essential oils and vegetable oils. Under this Act, the Director of Marketing & Inspection operates a scheme of certification of agricultural (raw and processed) products for protection of consumer. Any organization or producer who wants to use AGMARK has to apply to the authorities for the same. The authorities after inspection and ensuring that the necessary facilities in respect of

equipment, laboratory, etc., are available, allows them to use AGMARK symbol. Most of the foods designed for export are compulsorily to be Agmarked to ensure that the quality standards prescribed are complied with before they are exported.

Prevention of Food Adulteration Act 1954 and Rules 1955:

Prior to the enactment by the Central Government of the Prevention of Food Adulteration Act in 1954, most of the States had their own Food laws to deal with problems of food adulteration. These food laws varied in many respects, with even different standards for the same foods, and hence were not conducive to free inter-State trade in foods. The Prevention of Food Adulteration Act 1954 has laid down broad general principles of control, giving the Government powers to frame rules which can be adopted to meet frequent changes that may become necessary on account of developments in technology.

The Act lays down the definition of adulteration, food, misbranding, sale, food health authorities and other relevant terms. It empowers the Government of India to specify qualification, authority and duties of Public Analysts and Food Inspectors who are key officials in the administration of food laws. It also lays down the procedure to be followed by a food inspector in taking and sending samples for analysis.

The Act also empowers the purchaser to act as Food Inspector for the purposes of taking a sample and getting the same analysed. During 1964, the Act of 1954 was amended when it enjoined the manufacturers, distributors or dealers to give a warranty of the quality of food to the retailer which can safeguard them later in the event of the food being found adulterated. The Act provides for penalties for various

offences and gives powers to the judiciary to enforce the penalties.

The Central Government has been given powers to make rules for defining the standards of quality; control over production, distribution and sale of articles of food; restricting packing and labelling; defining conditions of sale or licensing; prescribing lists of food additives; and exemption from provision of the Act or Rules to any article of food, etc.

Central Committee for Food Standards: The Act provides for the constitution of a Committee called Central Committee for Food Standards consisting of representatives from all States, experts in food technology, nutrition, medical profession, Indian Standards Institution, Agriculturists and others in addition to representatives of the consumer associations. The Committee has to be consulted in all matters regarding the administration of the Act and can advise the Central and State Governments in all matters of administration of Act, whether technical or otherwise. For convenience and to obtain expertise available in the country on various steps, the Committee has constituted about 10 Expert Sub-Committees each dealing with a particular subject of specialisation. While considering the suggestions received, the CCFS or its sub-committee may give a hearing to the party/parties concerned, if desired.

Central Food Laboratory: In accordance with the provisions of the Act, four Central Food Laboratories under the control of the Government of India, have been established at Calcutta, Ghazisba, Poona and Mysore and their main functions are to analyse the appeal cases from the courts. The opinion given by the Director, Central Food Laboratory, is considered final and conclusive and supersedes the report of the Public Analyst.

Imports of all foods are subject to inspection by Port Health Authorities and samples are tested at local laboratories and at the Central Food Laboratories for a final opinion.

Prevention of Food Adulteration Rules: Under the PFA Act, the Government of India has promulgated the PFA Rules, 1955, which lays down in detail the qualifications, duties and functions of Public Analysts, Food Inspectors and the Central Food Laboratories, etc. The method of taking samples and the procedure for sending these to the Public Analyst or the Central Food Laboratory have been laid down. The use of food colours, anti-oxidants, preservatives, emulsifiers and other food additives have been regulated under the PF. Rules. The tolerance for contaminants, pesticide residues and other pollutants have also been laid down. Specifications for identity and purity for various foods have been laid down.

Infra-structure enforcement: The enforcement of the PF. Act in the country is by and large in the hands of the local bodies i.e., Municipalities. Very few State Governments have taken initiative to have separate enforcement machinery. The local bodies have not been very effective in controlling the menace of food adulteration in the country and they have appointed Sanitary Inspectors as Food Inspectors. Performance of this dual role by them has not been found to be satisfactory.

Laboratories: One of the most important factors in the implementation of food laws is the need for well equipped laboratories with qualified and trained technical staff to man these laboratories. There are approximately 85 food laboratories in the country at District/Regional or State level. About 1/3 of these laboratories are under the

administrative control of the local bodies whereas the remaining are under the administrative control of the State Governments. Most of these laboratories need the latest sophisticated instruments like gas chromatograph, spectro-photometer, atomic absorption spectrophotometer for quick and reliable results. The Central Government, keeps in view the need for the development of such laboratories and to strengthen the analytical facilities for food and provide financial assistance to some of the State/local bodies for the purchase of equipment.

Quality parameters, both statutory and voluntary, have been laid down by the Government of India for various food products under the Prevention of Food Adulteration Act, 1954, Fruit Products Order(FPO) of 1955, Meat Products Order (MPPO) of 1975, Sugar (Control) Order of 1966, Technical Standardisation Committee (TSC) of 1944 on behalf of Army Purchase Organisation (Foodstuffs), Vanaspathi(Control) Order 1975, Export (Quality Control & Inspection) Act, 1963 and Rules 1964, and Indian Standards Institution (ISI).

The Indian Standards Institution is a premier institution constituted under the Act of Parliament which deals with standardisation of various articles including food. Agriculture Food Division Council (AFDC) deals with standards of foods. This organization prepares national specifications on various foods in consultation with experts in the country. Formulation of standards at the national level describing the quality requirements of food is entrusted to a series of committees functioning under the purview of the AFDC. The certification scheme under the Indian Standards Institution is a voluntary one and any manufacturer who wants to use the ISI mark on his food product applies for the same to the authorities. The authorities after inspection and ensuring that the manufacturers have the necessary technical know-how,hygienic

conditions and other facilities available, grant them a certificate of ISI mark on their products. Random sampling of food products bearing ISI certification mark are tested by the ISI Inspectors after drawing samples at the manufacturing places or from the market. Under the provisions of PFA Act, it has been made compulsory that coal tar colors permitted for use in some of the foods will be sold under ISI certification mark.

From the above, it will be seen that in India, we have a well developed national standardising body with all its expertise and know-how for the preparation of standards at the national level which is ISI and on the other hand there are departmental standards which are operating as food laws in the country, both in the form of voluntary as well as mandatory standards. However, the purpose of the standards are to ensure that the consumer interest is safeguarded and at the same time the food manufacturers are able to produce food product conforming to prescribed standards.

4. Processing Technologies and their Indigenous availability

In early fifties, availability of indigenous technologies for processing of foods had been a limiting factor in the establishment of organised food industries in the country. The enlightened policy of the nation in encouraging indigenous efforts in this area right from 1950 progressively reduced the dependence of food industry on imported know-how and machinery. As in other sectors, technology import over the years has been progressively reduced in the case of food processing also and to-day, India is practically self-sufficient in almost all the requirements both in terms of technology and machinery (Table 7). Some of the areas where full scale technology are available include rice milling,

pulse milling, maize milling, oilseed milling, flour milling, solvent extraction process, fruits/vegetable products, spices processing, spice oils and oleoresins, meat, fish and poultry based products, alcoholic and non-alcoholic beverages, food enzymes, coffee, tea and cocoa processing, nuts and nut based products, infant and baby foods protein rich products, bakery goods, insecticides and pesticides, packaging of foods etc.

5. Research and Development Inputs

Lack of technological research could be a stumbling block to modernisation and improvement of the food industry. In fact investment on R&D efforts calculated as a percentage of Gross National Products of a country is indicative of its relative position in the scales of industrialisation. As for India, this works out to less than 0.3% while advanced countries spend as much as 1% of their GNP for technological research. Large majority of the small scale units are not in a position to undertake research and development programmes on their own due to limited financial resources. Under such circumstances it becomes the prime responsibility of the Government to bridge this gap by providing the necessary inputs. Such investment on R&D even though do not show any direct return, will have multiplier effect and eventually will be reflected indirectly in the form of generation of income and employment. However, Government can consider levying a small cess on the industry to be ploughed back for expenditure towards developmental research. This may lead to a better appreciation of the work carried out by various R&D agencies and also result in continuous interaction between the industry and the development organizations.

Indigenous research has already created a reservoir of technologies to be exploited by enterprising entrepreneurs and various industrial development organizations. To mention

a few we have today a complete range of know-how for the manufacture of a variety of processed food products as well as effective utilization of agro-b-products. In the field of food machinery also indigenous expertise is of very high order. To-day India is in a position to offer even turn-key plants in areas such as processing of foodgrains, processing of fruits and vegetables, processing of various plantation products such as coffee, tea, spices, edible oil extraction from different sources and their refining, manufacture of infant foods and high protein products, production of yeast, food enzymes and alcoholic beverages, animal based products, fish processing, poultry and poultry products and pesticide chemical manufacture. Indigenous expertise is also available in the spheres of quality control and standardization as well as packaging of food products.

6. National and Regional Policies for Food Industries

Generation of employment is one of the principal goals and a necessary means of development. There is an urgent need to choose the right pattern of development and create appropriate supporting institutions and infrastructure. The aim should be to lessen the widening disparities among different classes of the rural population, different regions as well as between rural and urban areas by creating dispersed productive employment and facilitating better income distribution. The food industries can play a pivotal part in achieving this aim. The State policy must be to force the pace of development in rural areas and achieve higher rate of growth in rural incomes. The policy of increasing rural employment opportunities and incomes requires to be vigorously pursued if the social objectives of development have to be realised in the foreseeable future.

Diversification of the rural economy intimately linked with agricultural development appears to be the most sound means of diversifying employment and relieving the pressure of a huge labour force seeking unsuccessfully to draw its sustenance from agriculture. Oil extraction, fruit and vegetable processing, sugar, jaggery and confectionery, dairying, processing minor forest produce, in addition to milling of cereals, millets and pulses, are examples of food industries which can conveniently be located in the rural areas for increasing non-agricultural rural employment and income. Developing, improving and sustaining the traditional rural activities of producing food materials and products also constitute important elements in the policy package for the diversification of economic activity in the rural areas. The development of these industries, however, demands an improvement in their technology based on which the productivity of rural artisans can be enhanced, their markets widened and the employment and income prospects increased. The development of new industries whose markets are primarily in the rural areas, while creating opportunities for local employment will also promote local entrepreneurial skills. As in Punjab, the new industries will lead to the growth of various servicing industries.

Processing and marketing facilities, which are the heart and soul of food industries, at present concentrated in urban areas, operate to the detriment of the rural sector. In the face of imperfect and monopolistic nature of the marketing services provided, the benefit of the price spread between the rural producers and the ultimate consumers is mostly appropriated by the exploitative urban market mechanism. In the approach to social justice, this aspect should, therefore, be examined carefully and efforts made to shift the benefit of the price spread to the rural areas. This is

possible if processing of agricultural produce and its marketing are undertaken in rural areas themselves. It will be necessary for the State to develop adequate infrastructure to facilitate the growth of food industries in the rural areas.

The industrial policy of the Government covers all types of industries including agro-industries. It will be directed particularly towards increasing the growth rate of per capita national income, overcoming unemployment, rural-urban disparities, investment stagnation, industrial sickness and inconsistent cost-price relationship. The main thrust of the industrial policy will be an effective promotion of household, cottage and small scale industries scattered widely in small towns and rural areas.

The main objective of the new Five Year Plan (1978-83) have been stated as removal of unemployment and significant underemployment, improvement of living standards of the poorest strata of population, and provision of some basic needs of people by the State in a period of ten years. The following policy guidelines have been laid down for achieving the plan objectives:

- a) Special attention to be given to small scale industrial units in tiny sector, i.e., those with investment in machinery and equipment upto 1 lakh of rupees situated in towns with a population of less than 50,000 and villages;
- b) Introduction of legislation to protect cottage and household industries providing self-employment;
- c) Financial assistance to tiny units and cottage scale industries;

- d) Review of the list of items exclusively reserved for small scale sector, every year, to ensure efficiency in production of consumer goods;
- e) District service centres will be set up throughout the country to help small scale and cottage industries during the new plan period. These centres will provide all types of assistance needed by entrepreneurs on data relating to raw materials and resources, information on machinery and equipment, availability of credit facilities, marketing and quality control;
- f) A separate wing in the Industrial Development Bank of India to deal with the finances of small, village and cottage industries and also to coordinate and monitor the credit facilities offered by other Governmental institutions.
- g) Support for standardization, quality control and market services for items manufactured in small scale sector. Preference will also be given by Government departments and public sector undertakings in purchasing products made in small scale sector;
- h) Development and application of small and simple measures/ devices for improving the productivity of small scale sector will be an integral part of the new industrial policy.

Development of indigenous technology through R&D will have adequate scope. The best available technologies in high priority areas will be purchased (where indigenous expertise is not available) for ultimate adoption to country's need. Foreign investment necessary for industrial development in the country will be allowed only on the basis of national interest.

Licences will not be given for starting industries within certain limits of large metropolitan cities having a population of more than one million and in urban areas with a population of more than 5 lakhs. State Governments and financial institutions will be requested not to permit starting new industries which do not require licences, in these areas. The Government will also assist large industries desiring to shift to approved locations in industrially backward areas.

Incentives will be given by the Government at the centre and facilities offered by the State Governments to ensure balance regional development. Special tax rebate for industries in backward areas and promotion of the medium entrepreneurs for fuller utilisation of capacities in certain agro-based industries are two such incentives. In achieving a sustained growth, there are a number of constraints on development causing disparate growth in output and income among different regions. Motivational factors play an important part in the use of all the facilities which the State has created. The human attitude and ingenuity contribute significantly to the growth of a region. While it is for the State to create the necessary supporting services, development of the food industries will not take place unless the population gets adequately motivated to take the advantage.

Table 1: Industry-wise classifications of small scale units

Sector	No. of units	Instal- led capacity	Produc- tion	Fixed Capital	No. of persons employed
		(Million Tonnes) (Rs. in mil.)			
1. Meat products	6	3.9	7.8	9.7	91
2. Dairy products	277	45.9	23.9	14.5	2117
3. Fruit and vegetable products	277	192.5	106.2	10.2	4377
4. Fish processing	133	630.4	289.3	55.4	4149
5. Bakery products	2595	484.2	260.0	29.2	20060
6. Cocon products and sugar confectionery	232	71.4	33.1	3.9	1742
7. Other sugar products	384	35.2	59.5	8.0	3208
8. Cashewnut processing	188	244.1	406.3	7.5	71121
9. Manufacture of ice and cold storage	1541	145.1	67.1	143.6	11399
10. Manufacture of animal feed	125	106.0	69.4	3.9	1153
11. Starch manufacture	119	50.8	46.7	5.3	2153
12. Beverages	309	167.5	45.6	10.1	2268
13. Other processed foods	922	269.1	153.7	28.3	12819
Total Food products:	7108	2445.0	1568.7	320.9	136657
% to total SSI	(5.0%)	(5.0%)	(6.4%)	(6.0%)	(8.3%)

Source: Census of Small Scale Industries, 1977, Vol. I & II, Development Commissioner, SSI, Government of India.

Table 2: Dimension of agro-based food industries

Sector	No. of Units	Instal- led capacity	Estima- ted pro- duction	Estimated value of output	Estimated capital investment
		(million tonnes)		(%. in crores)	
<u>A. Basic Industry</u>					
i) Rice Mills	<u>81,968</u>	<u>175.6</u>			
Hullers	70,362	147.8	28.0-30.0	6000.0	2170.0
Modernised mills	11,606	27.8			
ii) Dal Mills	-	30.0	6.1	2040.0	816.0
iii) Oilseeds processing (power driven)	15,000	13.5+ ++(5.4)	2.6	1560.0	624.0
iv) Sugar	271	4.7	4.8	960.0	700.0
v) Gur & Khandasari	-	-	8.5	1044.0	418.0
vi) Cashew processing	240	0.40	+ 0.072	135.0	54.0

Table 3: Dimension of Processed Food Industries

Sector	No. of units	Instal- led ca- pacity	Estima- ted pro- duction	Estimated value of output	Estimated capital investment
		(000 ⁰ tonnes)		(Rs. in crores)	
1. Bakery products	48	187.00	150.00	53.50	21.30
2. Cocoa products & Sugar confectionery	33	42.50	18.80	10.60	4.24
3. Dairy products	40	111.00	65.00	146.70	91.00
4. Roller flour mills	158	4990.00	1474.60	221.25	88.50
5. Fish products	300	575.00	60.00	125.00	50.00
6. Fruit & vegetable products	1094	100.00	53.00	27.00	11.00
7. Starch and its derivatives	18	279.50	110.00	35.70	14.30
8. Soft drinks	34	1731.00	730.00	21.20	8.50
9. Solvent extraction units	1260	2800.00	720.00	8.00	3.20
10. Cottonseed oil processing	86	1300.00	73.00	31.40	12.60
11. Vamspati	85	1260.00	480.00	480.00	192.00
12. Miscellaneous foods	30	60.00	30.00	35.85	14.00

Table 4: Trend in Export of Processed Foods

Name of the product	1965-66		1975-76	
	Qty. (Tonnes)	Value (Rs. lakhs)	Qty. (tonnes)	Value (Rs. lakhs)
1. Canned and bottled fruits and vegetables including dehydrated vegetables	2367	43.4	8775.7	481.0
2. Pickles, Chutneys and condiments	2438	41.7	5373.0	277.8
3. Canned and frozen meat and poultry products	694	41.82	5497.0	499.0
4. Butter and ghee	7	0.7	63.6	11.0
5. Other milk products (including malted milk foods)	40	0.8	22.8	1.7
6. Canned and frozen fish and other sea foods	15295	70.6	47952.0	12533.7
7. Biscuits	988	2.5	2214.0	174.6
8. Confectionery	499	0.8	185.0	12.7
9. Papads	531	1.1	983.2	5.2
10. Cashew Kernels	51266	274.0	43206.0	8019.9
11. Walnuts	4885	18.4	4003.1	323.9
12. Cocoa products	202	0.2	595.4	51.5
13. Gum arabic and meal	-	15.7	26890.8	1135.0
14. Starch and derivatives	-	-	2978.4	43.3
15. Instant Coffee	-	-	577.1	318.4
16. Spice oils and oleoresins	-	-	65.1	61.6
17. Instant Tea	-	-	483.1	193.6
18. Other processed foods	-	1.3	-	72.6
19. Coffee	26371	1294.0	58919.2	6412.0
20. Tea	14738	11483.7	212296.0	83681.0
21. Spices	60525	2559.0	31182.3	7096.0
22. Sugar, honey, etc.	53006	1183.8	125962.6	47475.0

Table 5: Category-wise output of processed products from some important fruits of India in 1970

Qty: Tonnes
Value: Rs. in million

Particulars	Mango		Pineapple		Citrus fruits		Apple	
	Qty.	Value	Qty.	Value	Qty.	Value	Qty.	Value
Juice	7613	15.90	1570	3.90	814	1.71	362	1.99
RFB Beverages	1902	3.58	358	0.60	33	0.71	-	-
Squashes	317	1.08	210	0.88	3906	11.96	-	-
Nectar	689	2.41	-	-	-	-	-	-
Canned slices	716	2.71	1566	4.29	-	-	-	-
Pulps	806	3.26	90	0.14	-	-	12	0.02
Preserves	25	0.07	-	-	-	-	981	3.10
Chutney	1050	3.33	-	-	-	-	-	-
Pickle	3256	6.51	-	-	1129	2.01	-	-
Jams, jelly & Marmalades	208	0.91	403	1.99	352	1.87	21	0.09

Source: Fruit and Vegetable Processing Industry in India - A study, Indian Food Packer, 31(1), 1977.

Table 6: Production of plantation products in India

Product	Production (tonnes)	Exports (tonnes)	Export value (Rs. in crores)
Tea ...	450,000	207,000	157
Cashew (whole nuts)	240,000 (60% imported)	60,000 (kernels)	100
Coffee	90,000	15,000	50
Cocon	100	--	--
Spices	800,000	46,000	45

Table 7: Indigenous processing technologies available in India

Industry	Raw materials	Processing operation	Products	By-products
Rice milling	Paddy	Shelling Polishing	Polished Rice	Husk Bran
Maize milling	Maize	Debranning Degerming Grinding	Maize grits Maize soji Maize flour	Husk Germ
Dal milling	Pulses	Dehusking Splitting	Dhals	Husk Brokens
Oil milling	Oil seeds	Expeller Solvent extraction	Oil	Husk Cake
Vanaspathi Sugar & Jaggery	Refined oils Sugarcane	Hydrogenation Crushing Concentration Crystallisation	Vanaspathi Sugar Gud	- Bagasse Molasses Sugarcane wax
Flour milling	Wheat	Crushing Bran&Germ separation Grinding	Soji Flour	Bran
Dairy	Milk	Chilling Skinning Concentration Drying Baking	Milk powder Skim milk powder Baby Foods Condensed milk Bread Biscuit	Casein Butter Ghee
Bakery	Wheat flour			
Confectionery	Sugar	Syrup boiling	Sweets	-
Meat	Animal meat	Freezing Canning Drying	Frozen meat Canned meat Dehydrated meat	
Fishery	Marine and fresh water fish	Freezing Canning Drying	Frozen fish Canned fish Dried fish	Trash fish Fish bones Fish meal
Egg powder	Eggs	Drying	Egg powder	Shells
Fruit and vegetable processing	Fruit and vegetables	Canning Pulping Freezing Drying Miscellaneous processing	Canned product Pulps and Juices Frozen products Dehydrated pro- ducts	Peels Trins Stones
Alcoholic beverages	Fruit pulp Molasses Cereals	Fermentation Brewing	Wines Beers Hard liquors	Spent yeast
Coffee and Tea	Coffee seeds Tea leaves	Special processes	Coffee powder Tea leaves and dust Instant coffee&Tea	Spent coffee & tea
Spices	Spices	Drying Grinding Special processing	Dried whole spices Spice powders Spice oils Spice oleoresins	Low grade Spices

We regret that some of the pages in the microfiche copy of this report may not be up to the proper legibility standards, even though the best possible copy was used for preparing the master fiche.

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