AGRO - INDUSTRIAL DEVELOPMENT IN SRI LANKA

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BACKGROUND

The need to "Modernize Agriculture" in Sri Lanka was stressed by Sri Lanka's President in his speech at a recent seminar held to commomerate the golden jubilee of the Land Development Ordinance. The Land Use Commission of 1967 in its report (Sessional Paper No. XI of 1968) made a significant remark on agro industries when they said " Though land use does not cover aspects of crop utilization for industrial purposes by activity which will ensure the farmer a more remunerative price for his produce, as, for example, the setting up of small scale agri-industrial ventures in the area that will use these raw materials, should be considered as contributing to sound land use, and hence a measure to be encouraged. This policy is particularly suited to Ceylon's conditions where agricultural workers in rural areas are only partially employed. We warmly endorse this policy" (p.74) The Land Commission of 1958 in their report (Sessional Paper X of 1958) made passing remarks on land use with reference to agro-based industries with no recommendations except for what they thought land alienation policy should be (pp. 64-82). A Presidential Commission on Land Policy (Govt.Gazette Extraordinary 342/5 of 28.3.1985) is now looking into "the strategies for conservation and development of land and related natural resources" which obviously would cover agro-based industrial development. The recurrent cycles of agricultural surpluses creating problems of marketing have given some food for thought regarding agro-processing. The Budget proposals of the Minister of Finance and Planning (1983-1984 Budget speeches) have elucidated several incentives for the creation of a climate for investments in agro-industries. The completion of the Headworks in the giant Accelerated Mahaweli Development Programme, including irrigation and settlement implementation in the command areas, together with the need to create off farm employment for the second generation settlers in the various Mahaweli Systems, in the Walawe and Gal Oya Systems and in the 103 Major Irrigation schemes, has attracted the attention of entrepreneurs to go into investments in river valley zones like the Mahaweli. The Minister of Lands and Land Development and Mahaweli Development has also stressed the need to attract an investment flow into the Accelerated Mahaweli areas. The Minister of Agricultural Development and Research and Food has also expressed the need to process agricultural produce to enhance value in production areas and has hence invited the private sector to play its part.

The Problem of Definition

Agricultural based industries is a broad term, which includes industries related to agriculture, that is inputs, transport, storage and infrastructural requirements on the one hand, and the industrial processing of the agricultural raw materials on the other. Agro-industires can be defined as " not merely industries based on agricultural raw materials nor does the term refer to the suppliers of such auxiliary materials as pesticides, fertilizers, and agricultural machinery. Agro-industry is a much wider concept involving the integration of marketing, processing and agricultural production under a comprehensive management responsible for the production, harvesting, processing and marketing of the products by the most direct means. Thus, from the very inception, agro-industrial production is a highly planned and streamlined process serving a common interest, ie. the production of marketable goods from minimum inputs to obtain maximum outputs" (UNIDO).

This from of production involves either a high degree of specialization or a wide range of products, a characteristic feature being the utilization of all by-products by other sections in the integrated enterprise or association of enterprises. A further advantage of an agro-industrial system is the close relationship it establishes with the various markets.

Planning Agro-Industries in a Developing Country

The establishment of an agro-industry does not start with an analysis of agricultural production nor with the underutilized production capacities in the relevant industrial branches. The only admissible first step is an exact analysis of existing and potential markets at home and abroad of possible commodity range. Thereafter, a survey of agronomic conditions and capacities, size of holdings, mode and level of production etc. is needed. Thirdly, an industrial survey will have to be carried out of the existing and potential establishments to establish the profile of the factories needed to meet the demands of the target markets analysed.

This stage is then followed by agricultural considerations in depth and of the selection on of agricultural branchs as raw material suppliers to the planned programme. Whereas this market oriented approach would inevitably reject certain items, new products would be introduced on the basis of improved utilization of by-products, land or human resources and capacities. A second market analysis would be necessary to confirm the suitability of the programme selected and by means of regular checks an optimum agro-industrial development programme can be elaborated for both limited and broader areas of application.

This close correlation between marketing, industrial processing and agricultural production or importation of raw materials does not end with the establishment of planned methodology. Given below is a brief summary of other major problems which have to be resolved for the promotion of agro industrial development.

Long range agro-industrial development planning

Agro-industrial development should be planned carefully in order to achieve:

1. Rapid economic results;
2. Rapid rural development;
3. Large scale settlement of unoccupied developable areas;
4. Optimum utilization of capital intensive irrigation facilities both in large/village irrigation schemes, including the Mahaweli, Walawe, Gal Oya and the 103 Major irrigation schemes in Sri Lanka. Solution of socio-economic and political problems including creating employment amongst second generation settlers and providing off farm seasonal employment in the major and minor irrigation schemes; if any;
5. Minimizing post-harvest losses;
6. Achieving best export results.

Careful planning is also necessary to avoid:

(i) competition with on going economic and or political measures;
(ii) dissatisfaction with existing industrial and agricultural sectors;
(iii) economc failures.

Planning could be effected stepwise and limited to one region at a time. Furthermore, it must be adapted to the political structure or administrative organization prevailing in each region, for example, Integrated Rural Development Projects (IRDPs), Mahaweli areas in Sri Lanka, etc.

Agro-Industrial Engineering Techniques

Agro-industires are characterized by the very close relationships in terms of time, distance, economic interests and management between marketing and industrial processing on the one hand, and between processing and agricultural production on the other. Such relationships constitute the most significant advantage of the integrated process. Yet to derive maximum benefit, appropriate techniques and engineering must be applied.

It is an undisputed fact that in a fully integrated sugar cane enterprise agricultural production, havesting activities and processing can be timed and coordinated in such a manner as to ensure minimum quantitative and qualitative losses. Therefore, in an efficiently integrated agro-industry certain crops will have to be harvested and transferred to the processing line in a short time. Furthermore, a fully integrated agro-industry closely observes market behaviour at all stages of operation so as to be able to derive the greatest and/ or short term benefits . Consequestly, particular importance has to be attached to the discussion of appropriate techniques and the engineering approach to be adopted in the distribution, processing and prodution sectors of agro-industry.

Agro-Industrial Management

There are numerous management problems peculiar to agro-industrial production, Special accounting systems are needed for the precise price structures of each operation and for each management unit in the production, processing and marketing sectors. Such systems must meet the requirements of the various participants in the integrated process contributing to the effectiveness of their contribution.

In most cases, profits are to be seen at the end of the long process that is, on the markets themselves. Hence, the profit redistribution systems are very important. Other management problems are:

a. the establishment of common services in the agro-industrial enterprises;
b. the position of quality control throughout the processing line;
c. upgrading of participant skills;
d. private farmers and their cooperation with agro-industry;
e. establishment of checklists and time schedules throughout;
f. the planning of balanced comprensive investment programmes;
g. the introduction of modern mangement systems into agro-industrial enterprises.

Agro-Industry and Rural Development

Agro-industry has a major influence on the regional development of backward areas in need of industrial and agricultural assistance. Certain aspects of integrated agro-industrial enterprises which have an impact upon rural development are:

a. the raising of regional economic standards;
b. labour intensity,
c. the bankability of projected investments;
d. the time needed for such projects to materialize;
e. pre-investment and production costs;
f. infrastructural requirements.

Agro-Industry and the Cooperative System

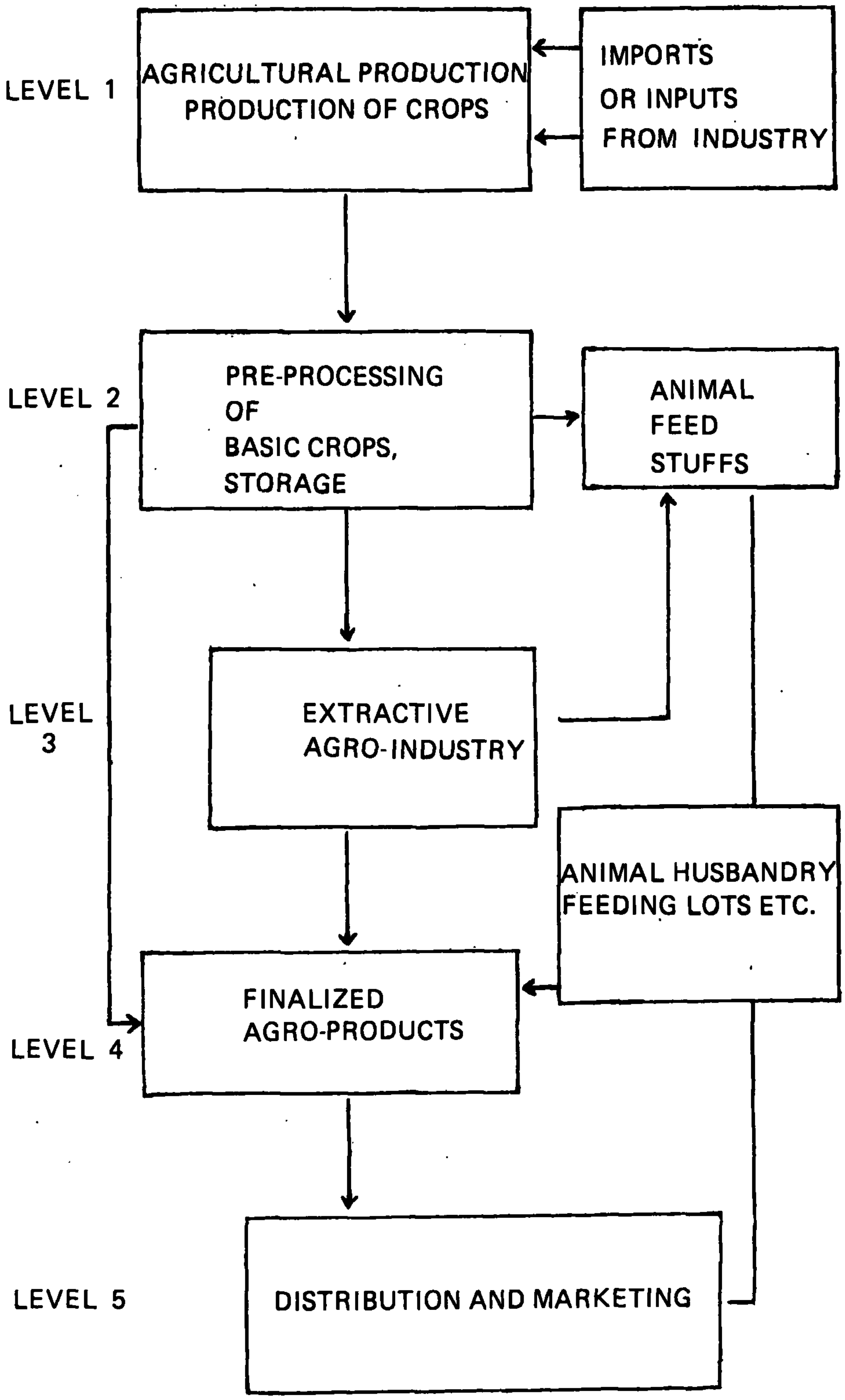
The need to establish farmer cooperatives with a view to rationalize production, providing their members with low priced imputs, and improving current distribution and marketing systems are vital areas to be studied. The need and possibilities for the Cooperative Movement to be restructured into larger associations and cooperative organizations which could in turn contribute significantly to the establishment of their own independent industrial enterprises and distribution network using the Cooperative Wholesale Establishment (CWE) and the Sri Lanka Cooperative Marketing Federation (Markfed) needs careful analysis.

This stepwise integration can of course, be planned as a single operation in areas where the cooperative system is more desirable than any other organisation of an integrated agriculture.

Planning an agro-industry on a cooperative basis, as a possible alternative to ownership of the land by the industry in cooperation with private farmers has specific features and advantages which are worthy of analysis in a specific case and for a specific area.

The integrated structure as a criterion for agro-industrial planning

The technological process of an integrated agro-industry has a very specific structure which is normally sub-divided into the following five levels.



The following problems arise from an evaluation of this flow diagram.

a. Is the stepwise development of an integrated structure such as this possible ?

b. At what level should one start, 1 or 5, and under what circumstances is it preferable to start at level 5?

c. How are the different levels interrelated?

Undoubtedly from the point of view of the network analysis level 1 and 2 have to be established together and it is quite clear that capital flow can be more easily obtained for investments at level 4 than level 3.

d. At what level should central planning and management be introduced?

Higher Forms of Agro-Industrial Integration

An agro-industrial system is often not large enough to take over a whole settlement programme, establish factories and national marketing networks or to compete in foreign markets as a serious supplier and exporter. Moreover, the merging of agro-industrial enterprises with different social structures and production programmes from different regions, raises several problems.

BENEFITS TO BE DERIVED FROM AGRO–INDUSTRIAL DEVELOPMENT IN SRI LANKA

The rich land and water resources bestowed on Sri Lanka by nature, the strategic location in relation to target markets, the availability of trained human resources at comparatively cheaper rates, the availability of infra-structure including energy resources from the Mahaweli headworks, and the new development possibilities in the Trincomalee region as a future development centre, obviously makes agro-industrial development an important area of development. The investment climate and adequate investment opportunities are available in the country due to governmental policies. Agriculture is the most important sector of the economy accounting for a major contribution to the GDP,a major share of the total national employment and a substantial slice of export income. Even in the manufacturing sector agricultural processing represents a major part of the national manufacturing output in that food , beverages and tobacco constitute a high proportion of domestic industral out put, producing for local and export markets.

The benefits to be dervided by establishing agro-industries in Sri Lanka may be listed as follows:

a Agro-industrial development projects can be established in only a few years;
b. Agro-industrial projects are bankable
c. Agro-industial projects can be implemented in regions which are at different stages of development
d. Agro-industrial projects could raise long term employment levels higher than any other rural development scheme;
e. Agro-industial projects need not be permanently subsidized as they can be made self sufficient and are conducive to the creation of domestic and foreign markets;
f. Agro-industrial projects could solve marketing problems in glut reasons and absorb all surpluses for value added processing in producer areas;
g. Agro-industial projects have forward and backward linkages and create markets for other auxillary industries like cold storage, packa ging, marketing etc.;
h. The increased industrial processing of agricultural raw materials generates employment opportunities as they are invariably labour intensive, earn increased foreign exchange and could also meet the domestic requirements of consumer products; and
i. Agro-industries whilst adding value, value, produce convenient foods which would save time, effort, labour and energy and obviously create more time for people to spend on other productive efforts and leisure. It could thus, bring about more sophisticated consumer tastes and preferences, whilst upgrading the quality of life.

EXISTING AGRO BASED INDUSTRIES IN SRI LANKA

Tea

The three primary commodities exhibit quasi-characteristics of agro-based industries. The tea industry is a good case of an agro-industry which is integrated from production to marketing. The industry whilst concentrating on the production of bulk tea for export markets has not kept pace with the new innovations in other countries and hence, obviously lost its position to other competitors.. An examination of the present cost of production structure of tea reveals that 40 percent and packing and 30 percent field costs. There are other aspects the most obvious of which is to bring out a product which a changing market will demand. For instance there are tea bags. However, decaffinated tea, instant tea, flavoured teas and herbal teas are goodpotential in the highly competitive beverage markets and have to be taken up for product development. If the industry is not working from the stage of markets it may be too late for Sri Lanka to enter the race.

Rubber

The rubber industry is a case of an agro industry which is semi-industrialized, in that only 12 per cent of the total rubber production is locally processed in industry; while 88 percent is being exported as a primary commodity in semi-processed form. Rubber seeds are a base used for producing rubber seed oil and alkyd resins in the paint industry. Similarly rubber wood is used in the construction and the furniture industry. It must be noted that we are importing Rs.300 million worth of rubber products to a country growing and exporting natural rubber mainly as a primary commodity.

Coconut

Coconut is the other major industry where there is a certain amount of industrialization even though the level of technology is low. The Dessicated Coconut industry (69 mills) has technology which is village built, needs technology modernization and rationalization of units. The coir industry (600 mills) is yet another case for modernization. The coconut oil industry (64 mills) also uses a low level of technology.New innovations have occured in products of coconut wood and the coconut shell beyond charcoal, activated carbon, vinegar, coconut cream, soap and margarine, whereas there are many other possibilities. There is a need to bring the coconut industry too under a rational and systematic agro-industrial development programme instead of orienting it towards the shipping and the brokering interests of the coconut trade.

Paddy/Rice

Paddy/Rice milling is yet another

major agro-industry prevalent in the country. There are 4,370 custom mills or hullers at village level in Sri Lanka. There are 28 mills owned by the Paddy Marketing Board, and 920 commercial mills in the country. The mills can be classified into traditional,semi-modern and modern types. The traditional type of mills consists of minimal machinery for rice milling, that is, one or more steel hullers which perform both nulling and polishing operations. Nearly 80 percent of the rice mills in the country are of the traditional type and have several disadantages associated with them. They are broadly:

a. Since both hulling and polishing are performed by the same machine a high pressure is exerted on the grain resulting in grain breakage and high milling losses.
b. These mills can process only rice in parboiled form
c. The rice produced by these mills is of poor quality with a high degree of discolouration and uneven bran removal.
d. The processed product has a high level of impurities since cleaning of grain is not done at any stage in these mills.
e. The by-products obtained,especially of rice bran, are of inferior quality
f. För operation of a steel huller a high power requirement of 15-20 Hp is required. However, they are popular because of low investment costs.

The second type of rice mills are the semi-modern type. These mills have the following characteristics:

a. the dehusking operation is performed by a seperate improved machine called the rubber roll sheller and the polishing operation is done by one or two steel hullers.
b. prior to milling the paddy is subjected to a cleaning operation using a cleaner which seperates impurities by sieving and air-aspiration.

Therefore, they have the following advantages over the traditional type

i. Since dehusking and polishing are done by seperate machines the grain breakage and milling losses are low
ii. Contamination of the by-product rice bran with husk is less than the traditional mills
iii. The level of impurities in the final products is low since the paddy is subjected to a pre-cleaning operation.
iv. The power requirement for the rubber roll sheller is 5-7 HP. Thus, the power requirement for this mill is approximately 30 per cent less than the traditional type of mill. The investment and operational costs of a semi-modern mill is higherthan the traditional mill.

The Modern Rice Mill is the third type of mill. Here the rice mill has a number of machines each specialising in a specific operation.They are:

i. Pre-cleaning
ii. Dehusking by a rubber roll sheller
iii. Seperator seperates unhusked grain from brown rice
iv. Brown rice is then polished by a series of abrasive type polishers
v. Polished rice sent through a sieve aspirator which seperates any particles adhering to the grain.

The Modern Rice Mills are mechanically handled by elevators and thus save labour. In the traditional and semi-modern type of mills grain handling is done by manual labour. Another advantage of modern mills is that polishing is performed by a series of abrasive polishers which exerts a very low pressure on the grains and therefore grain breakage and milling losses are minimal.Moreover unlike the steel hullers, there is less of a temperature build up within polishing machines and therefore, grain discoloration is less. Furthermore, in the modern mills there is an even polishing of grains.

Thus, it is obvious,that although the investment cost of a modern mill is higher, the high milling returns compensate for that high investment cost together with high quality rice and the rice by-products produced.

Nearly 70 percent of the total paddy production in Sri Lanka is subjected to the process of parboiling. Parboiling is in fact a pre-treatment given to paddy so as to make the parboiled rice grains harder than raw rice and hence build resistance in order to minimize breakage during milling.Parboiling in simple terms is soaking paddy for a heat treatment and causing the geletinizing of the starch within the grains, by drying, to lower the moisture content to a level suitable for milling. Parboiled rice is reputed to be nutritionally superior to raw rice.

There are few areas for technological innovation in paddy milling.
They are:

a. Improving the traditional method of parboiling which is time consuming and resulting in uneven parboiling and giving colour to the grains;
b. Modernize the existing mills by lowering investment costs and lowering high-energy consumption
c. The need to introduce cleaning devices to completely remove impurities from rice, including destoring. There is a need to fabricate a low cost destoring machine locally;
d. The need to improvise low cost boilers to be used for improvement of the parboiling operations;
e. The need to introduce more efficient mechanical driers than the present mechanical dryers which are suitable for drying parboiled paddy only;
f. The introduction of low energy usage by developing a husk fired furnace for efficient use of the by-product paddy husk as a fuel and
g. The introduction of new innovations and technology for new products.

Sugar

Sugar is another agro-based industry that is being developed in Sri Lanka. The annual consumption or sugar at present is about 270,000 to 300,000 tons annually while local production is only 45,000 tons, showing a gap of around 225,000-255,000 tons per year. The acreage under sugar cane in 1985 was as follows:

Kantalai	- 6,000 acres
Hingurana	- 9,000 acres
Sevanagala	- 5,000 acres
Pelawatte	- 4,000 acres
Private Growers	- 6,000 acres

(Koslanda, Haldamulle,Moneragala and Buttala areas)

There are three sugar mills and two mills are to be commissioned in 1986 (Jan) and March, 1986.

The capacity and production of these mills is as follows:

	tons cane per day	Sugar Production
Kantalai	1,200	20,000 tons
Hingurana	2,000	30,000 tons
Moneragala	2,000	43,000 tons
Pelawatte(March'86)	28,000	47,000 tons
Sevanagala (Jan'86)	1,200	27,000 tons
		167,000 tons

Thus, even with these anticipated developments there is yet a short fall of 103,000 tons. The industry employs about 25,000 workers.There are two important aspects to be noted.

1. At Hingurana factory only50 per cent of capacity is utilized. If it is fully utilized with cane supplies there would be a 40 percent cost reduction and the COP per kilo will be Rs 7-8 compared to Rs 11/50 at present. With a wholesale price of Rs.11/50 and a retail price of sugar at Rs.13/25 per kilo the return in the industry becomes very marginal. Hence, economies will have to be found to keep the industry viable without depending on subsidies.

ii. Sugar yields at present are 2½ tons to3 tons per acre under irrigation and 2½ tons per acre under rainfed conditions. There are only a few varieties grown locally. The average cane yields in the two state plantations are approximately 58 tons per hectare; well below the technical potential for the lands. The local cane cultivation is mainly based on the use of one major variety.(CO 775). Dependence of the industry on a single variety and few minor varieties is faught with serious commercial hazards. The most productive cane can be grown in the dry zone. However, in the dry zone land is comparatively scarce and cane must compete with rice and other irrigated crops for these resources.

The non traditional commercial crops namely, the spices, beverages and oil grass crops known together as Minor Export Crops are potential several agro-based industries. Cinnamon based cinnamon bark and leaf oil using steam distillation stills, citronella oil distillation units, cardamom and clove essential oil and oleoresin manufacturing units, cocoa fermentation units,coffee grinding units, cashew decortication and roasting, units, sericulture based natural silk weaving units, palmyrah and kitual based units are important agro-based industires having much potential.

The total acreage under minor crops is 165,000 and about 200,000 people are dependent on it. At present minor crops earn 5 percent of the country's total foreign exchange earnings and exports are mainly as commodities or raw materials. There is immense scope for development of agro-industries in this sub-sector.

Fruits and Vegetables

Sri Lanka now grows many varieties of fruits and vegetables, and its climate and growing conditions are suitable for many othervarieties There are 500,000 to 950,000 private small holder units growing fruits and vegetables in about 500,000 acres and employing approximately 250,000 additioanl for labourers. At primary (farm) level there are around 50,000 private traders, assembly agents, and commissions agents serving the small holders. There are 15 private processing firms and one state owned processor with two plants, producing approximately 5,000 metric tons of processed fruits annually. There are private wholesalers operating principally in the Colombo, Jaffna and Kandy markets, controlling almost 100 percent of the fresh fruit and vegetable trade. There are a large number of private stall holders retailers and pavement vendors selling to consumers at market centres, village and urban fairs and roadside stalls. There are about 105 private shippers or processors who control virtually the entire fruit and vegetable exports. These include what is termed subsidiary food crops (soya, groundnuts, black gram, sesame, ginger, turmeric, chillies, spice seeds, pulses, onions etc.) The fruit and vegetable industry suffers from a lack of understanding of the market and marketing requirements, a lack of scheduling of processing with production and sufficient techical support for the industry (like an extension seryice, inadequate quality control laboratory support, inadequate R & D support, inadequate food processing expertise), and lack of quality standards and grades and a liberalized import policy without sufficient protective measures to enable the local processor units to remain viable. A further shortcoming is inadequate packaging technology.

Dairy Industry

Another agro-industry that exists in Sri Lanka is the dairy industry. The dairy sector is an integral part of the overall livestock sector of the Sri Lankan economy, contributing about 2 percent to the Gross Domestic Product (GDP). Livestock contributes an estimated 8 percent to the gross value of agricultural production. The actual contribution could be considerably higher if the value of manure,hides, and skins and animal draft power is taken into account.

More than 95 percent of the cattle are located on farms of less than 4 hectares and many farmers keep 1to 3 cows to supply milk for personal needs and small quantities for sale. Processing of imported powdered milk and imported butter fats to ice cream,. youghurts, curd, butter milk, tanning of hides and skins are some of the many existing small scale agro industries. The present milk production is estimated at 216,000 litres per day and at present 60 percent of the milk collected originates from the Hill and Mid-country areas, where only 13 percent of the cattle are located. There are two major feed mills in the country producing 7,000 metric tons of feed or 85 percent of all feed used. There is one modern milk food plant in the country in the Lanka Milk Foods Ltd. and three groups - National Milk Board, Nestle and Lanka Milk Foods Ltd. control the dairy sector. Several smaller groups process milk into ice cream, yoghurt and cheese. The largest of these is Ceylon Cold Stores. The existing processing capacities in the National Milk Board is 440,000 litres per 16 hour day with a present production of129,700 litres. (Narahenpitiya 160,000 litres, Pallekelle 40,000 litres, Ambewela spray dry - 240,000).They have planned capacities for an additional 30,000 litres (per 16 hour day) (Kilinochchi - 20,000 litres and Galle 10,000 litres). Nestle's have an exsiting capacity of 50,000 litres a the Polonnaruwa Condensary with a present production of 26,800 litres and has a planned capacity of 240,000 litres at Pannala Plant. Lanka Milk Foods has a repacking Plant capacity of 1,120,000 litres in Colombo and has a production of 375,000 litres at present. The others have an exsiting capacity of 75,000 litres with a present capacity of 50,000 litres. This means, the existing total capacity is 1,685,000 litres and present production is 581,500 litres and the planned capacity is 270,000 litres. Thus there is a need to increase milk production in order to meet existing capacities. At present condensed, powdered, or sterilized milk products, ice cream, bottled/pasteurized milk,butter, yoghurt, ice cream, cheese or ghee are being produced through all these items and are also being imported. Imports of Milk Powder and other milk based products amounted to Rs. 656 million in 1984.

Meat, meat products, eggs and poultry are other agro based industries that exist in Sri Lanka but have much greater potential.

Wood Industries

Forestry and forest based agro-industries are another important sector in Sri Lanka. There is no private forestry and forest management in Sri Lanka (except that of a minor Ceylon Tobacco Co. Ltd forestry project).The Forest Resources (1956) Survey estimated that 32.2 million acres or 44 percent of the nation's land cover,was forest cover. At present, due to rapid deforestation, indiscriminate felling, fires and planned agricultural projects,the forest cover has declined to about 25 percent of the nations total end area. Reforestation has expanded to a level of 17,300 acres per year in 1982 when it should be 30,000 acres a year if total timber demand is to be met. Total demand for industrial Foods is expected to double from 1 million cubic metres at present, to 2 million cubic metres by the year 2000. Approximately 42 percent of the timber is used by the State Sector and 35 percent by the construction industry with 19 percent used by the furniture and 4 percent in other manufacturing industry. It is estimated that Sri Lanka will have a deficit of 200, 000 cubic metres of industrial round wood by the year 2000.

Other existing agro industrial projects include agriculture and floriculture and the growing and exporting of medicinal herbs.

Existing Climate for Agro-Industrial in Sri Lanka

The agro-industrial sector had to date been hampered by a series of impediments including:

a. a relatively lower rate of return on investment compared to trade commerce and urban property development;
b. a restrictive land policy that inhibited economies of scale;
c. high import duties on certain essential inputs;
d. libralized trade which does not offer significant protection to local industries;
e. high input cost of services eg. electricity for cold storage;
f. fairly high risk rating attached to this from of investment by both bankers and enterpreneurs;
g. shortage of technological know how, regarding processing techniques;
h. lack of information on incentives, market opportunities, alternative technologies, etc.
i. lack of differential incentives for higher risk areas like agro-industries to attract entrepreneurs away from other tax protected areas like tourism etc.
j. inadequate marketing and distribution network, including lack of price support schemes;
k. dependence on high cost technologies when low cost appropriate technologies in other Asian countires were not available.
l. lack of soft investment credit windows;
m. lack of a policy package for agro-industrial investment;
n. procedural and administrative bottlenecks for potential investors in this sector and multiplicity of official agencies dealing with the sector;

o. Agro-industrial development has not been the responsibility of any one Ministry. The Agricultural Ministry concentrated on production and research. Other Ministries attended to specific aspects of cultivating, processing and trade. The Agency Houses and plantations: concentrated on the colonial production process and catered to demand in the industrial centres not needing any significant innovations. The primary objectives of developing the sector has always been lost sight of;

p. Credit institutions tailored their credit policies to import-export trade rather than to agro-processing industries.

Issues, Conclusions and Recommendations

A predominantly agricultural country like Sri Lanka has several agro-based industries. Tea, rubber, coconut and spices and beverage crops have been developed as export oriented agro-based industries.Even in tea there is scope for new product possibilities like tea seed oil, caffene,tea 'cola in place of coca cola. In the cocout sector, the complete range of agro-based industries have not been utilized. In spices, beverage crops and oilyieldinggrasses Sri Lanka is yet a raw material supplierand with the exception of cinnamon, Sri Lanka is not a significant exporter. Even in cinnamon where Sri Lanka is the largest producer in the world, the country has not attempted to develop new products from this commodity through R &D but has been satisfled with being a mere raw material supplier. So is the case with medicinal herbs. Hence whilst supplie s is a major constraint to any agro-based industries; the lack of a national agro-based industrial development policy in itself is one of the fundamental reasons for the unsystamatic development of this sector.

Secondly, there is a lack of an integrated national technology policy towards the food processing sector. In a predominatly agricultural country there are no specific Institutes for Food Technology nor higher degrees for areas such as agroindustries or food sciences. The largest food sector is not developed as an industry as is clearly evident from a study of the country's paddy sector. Hence, its potential is not fully utilized. The development of new innovative commodity utilization technologies is now becoming more urgent as markets for primary commodities are less remunerative and the country's agricultural sector is moving towards self sufficiency in rice and secondary crops (due especially to the Accelerated Mahaweli Programme). If new markets are to be opened, appropriate technology for processing and marketing of new products based on agro raw materials must be identified and developed. Moreover with rising living standards product acceptance and convenience will become important elements in consumer decision making, Well-aimed research and development efforts should pay serious attention to the question of possible new uses for existing crops, the functional and quality characteristics of food crops, and the development of feasible processing and marketing systems for new products. There is thus, a need to centralize in one existing research agency for instance (CISIR) all R & D activities.

The Food Technology Division of the Department of Agriculture could also be expanded to carry out food product research whilst R & D is being carried on elswhere or within the same agency. At present, responsibility for food science and food technology is dispersed over several public sector agencies. For instance, the Paddy Marketing Board's Rice Processing Research and Development Centre (RPRDC) located in Anuradhapura is responsible for postharvest technology development for rice. It has existed since 1976 but its success in technology and product development has so far been limited because: (a) the rice sector is not developed as an industry, (b) subordination of RPRDC to PMB which is not in a position to provide technical guidance to RPRDC's researchers, (c) lack of effective incentives for the improvement of their performance.

Two other public institutions involved in agro-industrial research are the Soyabean Food Research Centre administered by the Department of Agriculture at Peradeniya and the Central Agricultural Research Institutes's Food Technology Research Unit (FTRU) at Gannoruwa, Peradeniya. The former has developed a dehydrated soya milk product and is working on several other food additive uses of soyabeans. The FTRU is conducting research into methods of preparing nutritious foods from such crops as green gram, finger millets etc. but has not yet obtained any significant results. The following factors have acted as contraints to the effective performance of these institutions:

a. lack of national food and agro-industrial policy and strategy,
b. lack of staff at all levels,
c. inadequate finacial resources
d. poor inter-agency cooperation and cordination,
e. lack of a dynamic interaction with private sector agro-industries.

There is a strong case for strengthening and reorienting the agricultural research system towards the building of an efficient and modern food technology research system for the proper development of agro-industries in Sri Lanka. This factor is of much importance today since there is a growing emphasis towards greater agricultural diversification and more efficient utilization of both domestic and export market potential. A Food Research Institute linking RPRDC,FTRU and the Soyabean Foods Research Centre would be more appropriate for better coordination and cooperation.

In addition the Food Products Division of the CISIR conducts research into specific areas of agro-industries while specialised institutions like the TRI and CRI conduct research into their own special products.

There has been no proper and systematic sector indentification, and locational analysis of possible agro-industries linked to a crop development programme; which has been a major issue and constraint to the systematic development of an agro-industrial sector in Sri Lanka.

The many problems in the supply of commodities or raw material to feed installed capacities in industries (eg. fruits, vegetables, maize, soya) has been a severe contrainst to their development because of the past-harvest problems in transport and storage. There are large quantities of fruits and vegetables being produced in the glut season in different rural areas which are under-utilized or go waste. A planned programme of development of suitable processing technologies for preserving these raw materials for use in the off season or establishement of regional cold rooms could give good dividends. For instance, many chena farmers could be encouraged to high quality vegetables if they had a ready market and just returns. This is where R & D could help the CISIR's successful experiments on dehydrated vegetables are a good example.

Another reason for the slow growth in agro-industrial development in Sri Lanka was the lack of adequate incentives to attract private sector investors. Tourism, urban development, import-export trade and gemming became more lucrative than agro-industries under the liberalized trade and economic policies. No special banking credit packages were available. There was also the problem of finding land for cultivation. The incentives suggested that for a period, development of agro-industries include concessional credit, tax, exemptions, facilities for import of necessary machinery and materials, land leases on a long term basis, minimum official control and interference, provision of infra structure facilities particularly roads, housing, and transport. To accelerate the process, the government could consider a package of incentives by extending facilities for infrastructure, concessional credit and exemption from tax expenditure on R & D and imports of necessary machinery and material.

Another reason for the uneven development of agro-industries in Sri Lanka is the limitation of the vision to a mere satisfaction of local market demand. There has been no concerted effort to boost crop development except in the case of rice. Sometimes a particular crop received a fillip as a result of a temporary, import shortage, but as soon as the crisis passed the situation has reverted back to its earlier position. Under these circumstances the cultivators themselves were baffled and uncertain of their future and therefore agro-processing industries could not develop out of such a background. Hence it is not suprising that whatever agro-processing industrial development is visible in Sri Lanka is confined to crops with a policy commitent - a commitent to export or a commitent to self reliance.

Another area is the pricing of agricultural commodities. It is a truism that probably anything can be exported provided the price is right. "Right price" means the price of the crop will have to be the price appropriate for the quality of the product. Therefore any commodity will have to be produced in such a manner that it can be attractively priced while giving a reasonable profit. The object should be to keep productivity high and cost of production low in order to get a reasonable margin though this depends on several scientific, technical and industrial policy decisions. However, the more important and complicated aspect is organization and management of the production system.

Any strategy towards the development of agro-processing industries in Sri Lanak requires amongst other things:

a. A market oriented approach, particularly for export oriented industry;
b. Selection of industrial technology consistent with product quality and packaging;
c. Import of appropriate technology;
d. Research and Development of indigenous technologies where appropriate as regards capacity; mechnization etc.

There is a need also to cross pollinate ideas and bring better coordination for agro-industrial development by inviting the private sector to participate in the national effort. There are a large army of resource personnel in the private sector with adequate industrial experience who could be cooped appropriately to reduce research time and costs and minimize the gap between technical viability and commercial feasibility of a project. There is also a need to link universities to industry in the field of agro-industrial research. Moreover, R & D in the private sector should also be encouraged by granting such activity tax free or taxholiday status.

In conclusion, it is important to repeat that agro-industrial development is a means to modernize agriculture in Sri Lanka. It is complementary to the development of agriculture. It plays an important supporting role for agricultural production by generating remunerative prices for the produce and reduces post harvest losses. It promotes various backward and forward linkage industries and services. Hence, it is time that the country made sufficient and concentrated efforts towards the development of agro-based industries, particularly in the major irrigation schemes like Lunugamvehera, Muthukandiya, and in the various management systems under the Mahaweli Development Programme.