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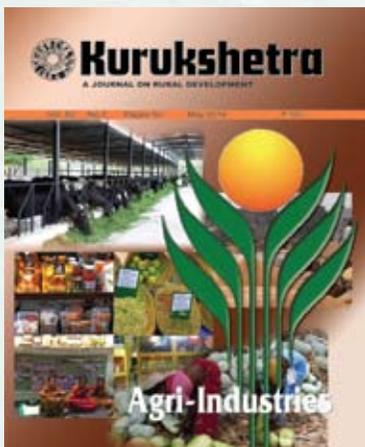
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## CONTENTS

☞ Employment Opportunities in Food Processing Industry for Rural Areas	Dr. Harender Raj Gautam	3
☞ Agro Based Industries for Rural Development-Problems And Prospects	Ratneswar Poddar	6
☞ Agro Based Industries And Rural Development	Dr. Arpita Sharma	10
☞ Agro-Processing Industry: Key to Enhance Farmer's Profitability	Dr Amrit Patel	13
☞ Vegetable Based Family Farming In India	Shubhadeep Roy Tanmay Kr Koley Neeraj Singh	19
☞ Hydroponics-Hi-Tech Vegetable Cultivation In Soil-Less Culture	Dr. R.S. Sengar Dr. Shalani Gupta Kalpana Sengar Dr. M. Pandey	23
☞ Indian Dairy Industry - Paradigm Shift	Dr M Alexpandi	27
☞ Prosperity Through Peri-Urban Vegetable Production	Dr. Krishan Pal Singh Dr. Prem Chand Dr. Beena Nair	29
☞ Role of Coir Industry on Kerala's Rural Development	K. Baby	34
☞ Agroforestry: A Potential Tool for Rural Development And Food Security In India	Dr. Avinash Tripathi	38
☞ Palmyra – The Invaluable Palm of India	Dr. Bibhas Chandra Mazumdar	43

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# INSIDE

**A**griculture based industries provide maximum employment in rural India and help the farmer get better price for his produce, thus increasing substantially, his quality of life. Agro-industries, which are largely village based industries have the best potential for employment generation and also require less capital.

Agro-industries are now considered as the sunrise sector of the Indian economy in view of its large potential for growth employment and income generation.

An extended arm of agriculture, agro-industries can make agriculture more lucrative and create employment opportunities, both at the production and marketing stages. The broad based development of the agro products industry will improve both the social and the physical infrastructure of India.

On account of poor post harvest management, the losses in farm produce in India are estimated to over one lakh crore rupees each year. These losses occur during storage, handling, milling and processing.

Various studies have concluded that these losses can be halved with the help of processing industries.

The agro industry helps in processing agricultural products such as field crops, tree crops, livestock and fisheries and convert them to edible and other usable forms. The private sector is yet to actualize the full potential of the agro industry. The global market is huge for sugar, coffee, tea and processed foods such as sauce, jelly, honey, and other products.

Agro-industries are involved with post-harvest activity involving processing of fruits and vegetables. This activity is only 2 per cent compared to 80 per cent in United States and 40 per cent in China. The Food Processing Sector is an important segment of the economy, constituting a share of around 9.0 to 10.0 percent of the Gross Domestic Product.

Studies suggest that the setting up of an agro-industry in a rural area sets in motion forces which positively impact the socio-economic structure of the areas.

India tops in milk, sugarcane and tea production and is the second largest producer of wheat, fruit and vegetable production accounting for nearly 10 per cent of the total fruit production of the world. However, the processing of fruit and vegetable has yet to take off in a manner which can act as a multiplier effect in rural economy.

Commercializing the agriculture sector, through agro-industries have helped the farmer get a better price for his crop and has involved him in the entire farming business. □

# EMPLOYMENT OPPORTUNITIES IN FOOD PROCESSING INDUSTRY FOR RURAL AREAS

Dr. Harender Raj Gautam

**A**griculture is gradually losing the attraction of a potential occupation with the rural youth due to lower profitability. If farming can be augmented with additional income generated from agri-based industries, it will help to retain the interest of the youth in farming. Such agri-based industries should be centred in the rural hubs so that rural youth is retained in the rural areas. We have to keep in mind that 68.9 per cent of the population in our country lives in 6.40 lakh villages. Though share of agriculture to overall GDP in India has come down to 14 per cent, still 66.2 per cent of rural males and 81.6 per cent of rural females are engaged in agriculture as cultivators or labourers. Thus, agriculture based industries are very important for creating value addition in our agricultural produce and also for creating enormous job opportunities for the rural youth. This is one of the largest sectors in the global economy (USD 7 Trillion) and it is going through a transition phase in India. We produce greater than 600 million tons of food in all.

Processing of fruits and vegetables is only 2

per cent in India in comparison to 80 per cent in USA and Malaysia, 78 per cent in Philippines, 70 per cent in France and Brazil, 40 per cent in China and 30 per cent in Thailand. Food Processing Sector is an important segment of the economy, constituting a share of around 9.0 to 10.0 percent of GDP in agriculture. During the last 5 years ending 2010-11, this sector has been growing at an Average Annual Growth Rate (AAGR) of around 6 per cent as compared to around 4 per cent in agriculture and 9 percent in manufacturing. Food and food products are the biggest consumption category in India, with spending on food accounting for nearly 21 per cent of India's GDP and with a market size of Rs. 9,050 billion.

The food and agro processing industry employed over 16 per cent of total workforce in the organized manufacturing sector whereas it is 32 per cent of the total workforce in the unorganized sector. In total numbers, the industry employs 13 million people directly and 35 million people indirectly. This highlights the huge potential of this



industry in job creation. For the projected growth in the Food Processing Industry, it is expected that the requirement of human resource would be about 17.8 million in 2022.

### Scope for the Growth of the Industry

There are many factors which highlight the growth potential of food processing industry. An average Indian spends around 53 per cent of his/her income on food. We have about 300 million upper middle class consumers for value added foods. Due to changing prospective economic scenario 200 million Indians are in a transition zone from lower economic status to upper middle class levels. The domestic market for processed foods is not only huge but is growing fast in tandem with the economy. It is estimated to be worth \$90 billion. India's domestic food processing market was US \$ 157 in the financial year 2012-13 and is estimated to reach US \$ 258 billion by 2015. Various studies have estimated post production losses in food commodities to the tune of Rs. 75,000-1,00,000 crore per annum. According to a new report by Emerson Climate Technologies India- a subsidiary of US-based manufacturing and technology company Emerson, wastage of fruits, vegetables and grains in India is pegged at INR 440 billion annually. Fruits and vegetables account for the largest portion of that wastage. Eighteen per cent of India's fruit and vegetable production – valued at INR 133 billion – is wasted annually, according to data from the Central Institute of Post-Harvest Engineering and Technology (CIPHET). Other important factor is the availability of enormous quantity of variety of raw material required for the food processing industry. Our country is the largest producer of milk, fruits, pulses, cashew nuts, coconuts and tea in world and accounts for 10 per cent of the world fruit production.

### Future Strategies

The Government has adopted a Vision Document 2015 which has suggested strategy to ensure faster growth in this sector. The vision document outline the priority to enhance the level of processing of perishables to 20 per cent, enhancing value addition to 35 per cent and India's share in food processing to 3 per cent by the year

2015. The Ministry of Food Processing estimates that our country would need USD 24.7 billion worth of investment to restructure the industry and to lift share of global processed food trade to just 3 per cent. To promote private sector activity and invite foreign investments in the sector the Government allows 100 per cent FDI in the food processing & cold chain infrastructure. As per the Annual Survey of Industries (2010-11), the Fixed Capital in Food Processing industry stood at Rs. 1,20,705 Crore growing at an AAGR of 21.66 per cent during 2006-07 to 2010-11. The sector grew at a compounded growth rate of 9 per cent between 2008 and 2012, much above the 3 per cent growth rate for agriculture. An essential part of the programme is the flagship Mega Food Parks Scheme and 10 such projects are already in the pipeline across the country. Each of these parks is expected to generate 30,000 direct jobs and several times of it in indirect opportunities. Based on the success parameters of the first 10 parks, the number will be scaled up to 30 in the next five years. The Ministry has taken a number of steps for encouraging investment into the FPI sector. These include issuing expression of interest (EOI) for setting up 15 cold chain projects, information dissemination on resources and facilities available in different states, creating an investor portal, and modification of guidelines for setting up cold chains

The National Mission on Food Processing (NMFP) was approved in 2013 with formulation of guidelines to states. Ministry of Food Processing Industries is implementing a scheme for Human Resource Development in the Food Processing Sector. The HRD Scheme focuses on developing technologists, managers, entrepreneurs and manpower for quality management in food processing. The scheme provides assistance for creation of infrastructure facilities in academic institutions and for setting up of Food Processing and Training Centres (FPTC). There are also two academic-cum-research institutions under this Ministry viz. National Institute of Food Technology Entrepreneurship & Management (NIFTEM) at Kundli, Sonapat, Haryana and the Indian

There are many factors which highlight the growth potential of food processing industry. An average Indian spends around 53 per cent of his/her income on food.

Institute of Crop Processing Technology (IICPT) at Thanjavur, Tamil Nadu, which offer academic programmes at Bachelors, Masters and Ph.D Levels in food processing. The institutes are also conducting short term skill development training courses. Increasing organised retail penetration and the government's proposed mega food parks will encourage business expansions in the food processing sector, which will ensure higher realisation for farmers and a reduction in wastages, the report said. Farmers get only 25-60 per cent of what the consumer pays for the produce, the report said, adding that improving supply chain can benefit the consumers and producers by 20-25 per cent. Continuous financial and regulatory support from government, increasing participation of private and public corporate and increasing exposure of foreign players is likely to spur investments in developing the infrastructure across the value chain right from farm inputs to the consumers.

### Grey areas which need attention

Dairy product is another area where there is enormous potential. No doubt the country has made tremendous strides in the last 20 years in production and processing of milk and milk products. But the fact remains that only 15 per cent of all the milk produced is processed. Today, a large number of people suffer from diabetic or cardiac ailments and availability of fat free milk, fat free curd and sugar free food is poor. A simple product like soya milk is not produced in adequate quantity. Fish and shrimp have good export potential but there is an immense lack of cold storage and modern processing facilities. For instance fish production is around six million tonnes a year and the frozen storage capacity spread over 500 units is only one lakh tonnes. Another area is herbal medicine. It is being increasingly realized world over that herbal drugs do not have any side effects. India has a good number of tried and tested herbal products in use and what is required is rigorous quality control, proper packaging and a brand name.

### Constraints in the Growth of Food Processing Industries

**1. Long and fragmented supply chain:** Food processing industry needs uninterrupted supply

of raw material to sustain the production schedule. But, diversity in crop profiles and farm size are the limiting factors to ensure the continuous supply of quality and uniform raw material. In addition, high level of wastages as the product reaches the manufacturing base and unwanted cost additions with minimal value additions are also worrying factors.

- 2. Inadequate cold storage and warehousing facilities:** India's existing food cold storage facilities can accommodate 21.7 million tons of produce compared to a requirement for more than 31m tons which indicates a shortfall of 10m tons of cold storage facilities for agriculture produce. Also, cold storage facilities now available are mostly for single commodity like potato, orange, apple, grapes, pomegranate and flowers etc. which result in poor capacity utilization. Without a strong and dependable cold chain vital sector like food processing industry which is based mostly on perishable products cannot survive and grow. Warehousing which is a key requirement in the overall supply chain, is mostly dominated by unorganized players.
- 3. Challenges related to logistics:** Road infrastructure in India still faces challenges related to quality and connectivity. Indian national highways account for only 2 per cent of the total road network but carry 40 per cent of all cargo. This puts a lot of pressure on the highways due to high traffic volumes and accordingly, results in delays in transit.
- 4. Skill gaps in the Industry:** As per a study conducted by the National Skill Development Corporation on Human Resource and Skill Requirement in the food processing sector, there is a required demand for about 1 lakh trained persons annually against a supply of over 10,000 persons. This requirement will increase to over 5.3 lakh if the unorganized sector is also taken into account. Central government has taken many steps in this direction which will help in plugging the gaps.

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# AGRO BASED INDUSTRIES FOR RURAL DEVELOPMENT- PROBLEMS AND PROSPECTS

Ratneswar Poddar

Agriculture is the backbone of India where the agro industry is considered as an extended arm of agriculture about 65% of India's population is directly or indirectly related with agriculture. With the development of the agro based industries, it can produce a stabilized and profitable enterprise through which more employment opportunities, both at the production and marketing stages can be created. The broad-based development of the agro-products industry will improve both the social and physical infrastructure of India. Since it would cause diversification and commercialization of agriculture, it will thus enhance the income of farmers and create food surplus. The agro-industry mainly comprises of the post-harvest activities of processing and preserving agricultural products for intermediate or final consumption. Agro processing could be defined as set of techno economic activities carried out for conservation and handling of agricultural produce and to make it usable as food, fibre, fuel or industrial raw material. It is a well-recognized fact across the world, particularly in the context of industrial development that the importance of agro-industries is related to agricultural increase as economies develop.

Inadequate attention to the agro-processing sector in the past put both the producer and the consumer at a disadvantage and it also hurts the economy of the country. Agro-industries are now regarded as the sunrise sector of the Indian economy in view of its large potential for growth and likely socio economic impact on employment and income generation. Some estimates suggest that in developed countries, up to 14 per cent of the total work force is engaged in agro-processing sector directly or indirectly. However, in India, only about 3 per cent of the work force finds employment in this sector revealing its underdeveloped state and vast untapped potential for employment. Properly developed, agro-processing sector can make India a major player at the global level for marketing and supply of processed food and a wide range of other plant and animal products.

## The Agro based Industry is Broadly Categorized in the Following Types:

**Village level Industries:** This type of industries are owned and run by rural households with very little capital investment and a high level



of manual labour. Example- pickles, papad, etc.

**Small scale industry:** This type involves medium investment and semi-automation. Example- edible oil, rice mills, etc.

**Large scale industry:** This type involves large investment and a high level of automation. Example- sugar, jute, cotton mills, etc.

### Problems

The different problems generally faced during developing of an agro based industry are-

#### Infrastructure Problem

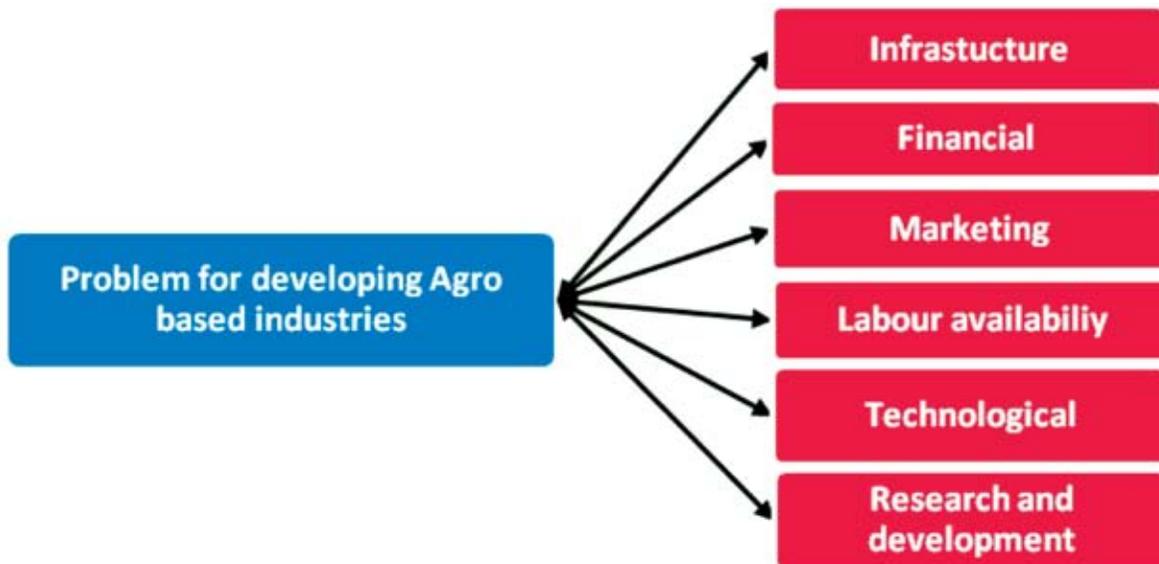
For development of any industrial culture,

infrastructural facilities are required without which no industrial enterprise can survive and sustain for long. Generally many industries have been set up by the entrepreneurs as a result of their own efforts. The cost of transportation has also gone high due to lack of proper infrastructure like road facility as the rural based industries are basically in remote locations.

#### Financial Problem

It has been observed that agro based industries are facing numerous financial problems as there is a lack of finance by the financial institutions.

Classification of Agro Based/Agro Processing Industry		
Sl. No.	Category on the basis of raw material	Finished products
1.	Cereal based industries	<ul style="list-style-type: none"> <li>i. Fully automatic modern rice mills</li> <li>ii. Partially cooked/quick cooking rice</li> <li>iii. Breakfast cereals and value-added products</li> <li>iv. Attractive packaging and branding</li> <li>v. Wheat flour</li> <li>vi. Confectionary and bakery item</li> <li>vii. Rice bran and rice bran oil</li> <li>viii. Corn flakes and value-added products including ready-to-eat snacks (salted &amp; sweetened)</li> <li>ix. Cattle feed</li> <li>x. Baby corn</li> </ul>
2.	Pulses and oilseed based industries	<ul style="list-style-type: none"> <li>i. Gram flour (Basen)</li> <li>ii. Namkeen (ready to eat snacks)</li> <li>iii. Papad</li> <li>iv. Whole or split dal</li> <li>v. Edible oil</li> <li>vi. Animal feed</li> </ul>
4.	Fruits and vegetable based industries	<ul style="list-style-type: none"> <li>i. Chips and Wafers (Ready to eat snaks)</li> <li>ii. Juices</li> <li>iii. Jam &amp; Jelly</li> <li>iv. Pickles</li> <li>v. Dehydrated vegetable</li> </ul>
5.	Floriculture and Spices based industries	<ul style="list-style-type: none"> <li>i. Fresh and dried flowers</li> <li>ii. Paste and powder</li> <li>iii. Aromatic extraction</li> </ul>
6.	Poultry, fishery and livestock based industries	<ul style="list-style-type: none"> <li>i. Processed meat</li> <li>ii. Processed fish</li> <li>iii. Fish meal</li> <li>iv. Milk, Ghee, Curd etc.</li> </ul>
7.	Others	<ul style="list-style-type: none"> <li>i. Fibre processing</li> <li>ii. Honey</li> <li>iii. Mushroom</li> <li>iv. Gur, Jaggery</li> <li>v. Tea powder etc.</li> </ul>



### Marketing Problem

Generally the newly set up agro based industries face the problem of proper marketing to sell their products in the nearby areas and have to remain dependent upon supply to government/ others agencies like food Supply Corporation of India or any private organizations. Besides this, high cost of manufacturing also comes due to transportation cost incurred as the product needs to be carried to an appropriate market.

### Technological Problem

It is an important aspect to build a high profitable industry sector. New technology and modern thinking need to be incorporated with the existing one help the agro based industries in getting more liquid money. Due to shortage of capital there is a huge gap between the improved technologies integration and the accessible ones

### Labour Availability

The main asset of any enterprise is its manpower or human resource. If any of the industries including agro based industries get right number of and skilled labour the profitability and productivity will enhance to a manifold level. Generally agro based industries of any rural area depend on local labour to produce the food material; the wage becomes high due to scarcity of labour. Sometimes the labour needs to undergo training which enhances the cost of the unit as well.

### Research & Development Problem

Research and Development occupies an important place for developing of any industrial culture. To test the final product or for developing new one, well equipped lab facility is very essential. Generally rural based agro industries have to move for testing their products in different parts of the country as a result the cost of production increases to a great extent.

### Prospect of Small Scale Agro Based Industries in Rural Areas

India is rich in her natural resources. But these resources have not been fully and adequately utilized till today. There are great opportunities for the development of small scale rural industrial units for the development of rural area in this country.

India is the 2<sup>nd</sup> largest arable land (184 million hectares) occupied country in the world. The country is the largest producer of wheat (92 million tones), pulses (18 million tones), milk, spices, tea and live stock where as it is the 2<sup>nd</sup> producer in rice (104 million tones), wheat, fruits, and vegetables in the world.

By utilizing this agro based material, rural industrial set up is not so unbelievable. The main thinks that should be emphasized are:

- i. Encouraging the rural youth with possible financial support from the government sector to establish agro industries.



- ii. Development of systematic marketing network for selling of industrial product.
- iii. Opening of global markets may lead to export of new technologies and facilitate generation of additional income and employment opportunities.
- iv. The institute may initiate establishing agro based industry development cell for providing modular training to the students and farmers.
- v. Research and extension on different models of agro based industries.
- vi. Strategic advertising by using print, electronic and web media for marketing and export of this agro based industrial products.
- vii. Strengthening of effective linkage between State Government and State Agriculture University, ICAR along with NGOs, National Horticultural Board, NABARD and other funding agencies.
- viii. Integration of developments in contemporary

technologies such as electronics, material science, computer, bio-technology etc. offer vast scope for rapid improvement and progress.

### Conclusion

Industrial development in rural country will act as an engine for job creation, innovation and diversity. It is generally observed that, women participation in any industrial sector is very less. Cottage industry can overcome this problem besides making the family fully employed. Agro based industries in rural areas not only provide employment generation opportunities but it can also save the agro product from wastage. So, to build up a New Bharat, agro industries will play a lead role in near future.

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# AGRO BASED INDUSTRIES AND RURAL DEVELOPMENT

Dr. Arpita Sharma

**A**gro-based industries play a vital role in the development of India's rural economy, which has been receiving increased attention from the central as well as state governments, in view of its importance to the national reconstruction. The economic prosperity of a developing country like India depends largely on the development of agro-based industries which in turn leads to the creation of forward and backward linkages of the development process on large scale by making mutual complementary of agriculture and industries.

**Concept of Agro industry:** The agro industry is regarded as an extended arm of agriculture. The development of the agro industry can help stabilize and make agriculture more lucrative and create employment opportunities both at the production and marketing stages. The broad based development of the agro products industry will improve social as well as physical infrastructure of India. India is one of the largest producers of food, and is the second largest producer of rice, wheat, fruits, and vegetables in the world.

Nearly 70 per cent of the population depends on agriculture and agro-based industries. It should be emphasized that food is not just produce. Food also encompasses a wide variety of processed products. It is in this sense that the agro-industry is an important and vital part of the manufacturing sector in developing countries and the means for building industrial capacities.

## **Development of Agro-based industries:**

The development of agro-based industries commenced during pre-independence days. Cotton mills, sugar mills, jute mills were fostered in the corporate sector. During the post-Independence days, with a view to rendering more employment and using local resources, small scale and village industries were favored. The agro industry helps in processing agricultural products such as field crops, tree crops, livestock and fisheries and converting them to edible and other usable forms. The private sector is yet to actualize the full potential of the agro industry. The global market is mammoth for sugar, coffee, tea and processed foods such as sauce, jelly,



honey, etc. The market for processed meat, spices and fruits is equally gigantic. Only with mass production coupled with modern technology and intensive marketing can the domestic market as well as the export market be exploited to the fullest extent. It is therefore imperative that food manufacturers understand changing consumer preferences, technology, with modernization, innovation and incorporation of latest trends and technology in the entire food chain as well as agro-production, the total production capacity of agro products in India and the world is likely to double by the next decade. Whether it is canned food, processed food, food grains, dairy products, frozen food, fish, meat, poultry, the Indian agro industry has a huge potential, the significance and growth of which will never cease. Sea fishing, aqua culture, milk and milk products, meat and poultry are some of the agro sectors that have shown marked growth over the years.

**Agro based industries and rural development:** The agro-based industries assume great significance in the Indian economy, where agriculture accounts for over 35 percent of the national income and about two thirds of the working population. We also need to bear in mind that over three-fourths of Indian population live in rural areas. Agro-based industries have great priority in the rural areas since they could be instrumental in fostering strong linkages between the agricultural and industrial sectors and enhancing the employment potential. The establishment of naturally beneficial linkages between industry and agriculture is one of the central themes of the development process. Agro-based industries play an important role in strengthening industrial and agricultural linkages. Agro-based industries are those industries which have either direct or indirect links with agriculture. Such industries must use the raw materials provided by agriculture and their output must have a market among the rural population. Surplus rural manpower must be absorbed by these industries. Agro-based industries are those processing industries which use large quantities of agricultural raw materials such as rice milling, wheat flour processing, textiles, sugar, tea, jute, coffee, paper, rubber production etc. These agro-based industries provide an excellent nexus in promoting integrated development of agricultural

industry and in transforming a stagnant rural economy into a dynamic economy.

### Various Agro-based industries in Agriculture:

**[1] Sugar Industry:** The sugar industry is the most important industry among the various agro-based industries. The life of approximately 2.5 crore of people in the rural areas is dependent on this industry. Almost Rs. 2200 crore worth revenue is collected from the sugar industry alone. In the process of sugar production, almost 5000 people are involved, right from the cultivation of sugarcane to the delivery of sugar in the market. One sugar factory means employment for 5000 personnel. These figures substantiate the importance of sugar industry. There are total 202 registered sugar factories (including some that are either closed or in financial difficulties), with a turnover of approximately 12,000 crore of rupees. There is an increase in the production of sugar every year and in 2012, it reached an all-time high of almost 1050 lakh tonnes. The sugar factories in India have a 60-year old tradition. Dr. Vitthalrao Vikhe-Patil established the first co-operative sugar factory in Ahmednagar district of Maharashtra. The cooperative sugar factories in the State have not just remained an industry, but they have become a movement. The establishment of sugar factories in India has led to speedy development of basic amenities in its neighbourhood. It has also led to the tradition of starting major educational complexes just next to the sugar factories. Many irrigation schemes-lift irrigation as well as many schools, colleges, hospitals and other social-welfare schemes were implemented by these sugar factories. This has resulted in social as well as educational development along with industrial progress.

**Allied Products:** The sugar industry also creates many by-products. Approximately 28-30 tons of crushed sugarcane, 4 tons of scum, 3 tons of distilled mess and almost 0.3 tons of ashes are the by-products after crushing 100 tons of sugarcane. These secondary by-products become the raw material for other industries. The sugar factories in India are also concentrating on diverse fields like alcohol, chemicals and paper industries. 960 sugar factories in India have used crushed sugarcane, while two hundred other sugar

factories have used bio-gas to produce electricity through cogeneration. The sugar factories have also contributed to an all round development in the rural areas by encouraging and engaging in various activities like building machines to produce bio-gas, digging wells, building public lavatories, producing animal-feed, poultry and horticulture.

**[2] Textile Industry:** The textile industry using modern methods started in India 150 years ago. The first cotton mill was started in Mumbai in 1854. This cotton mill is considered the first mill in the country. Mumbai is the biggest centre of the textile industry in India. As the city is close to the sea, its humid climate is suitable for the production of textiles. This is why the textile industry has centred in Mumbai on a large scale. Specific types of textiles are also produced in Nashik, Kolhapur, Sangli, Solapur and Nagpur. For example, Paithani Saris and Peetambaras from Yeole (Nashik), blankets from Solapur as well as cotton textiles from Nagpur. Ichalkaranji (Kolhapur) and Malegaon (Nashik) are also famous for handloom and machine loom.

**[3] Animal Husbandry:** Animal husbandry plays an important role in the rural economy of India. Animals like cows, buffaloes, bullocks, goats, sheep and hens have an important place in rural economics. In the year 2011-12, this sector had 24 per cent share in the agricultural income of the gross state product. The density of animal resources is 120 per sq km. Other agro-based industries include the dairy industry. The dairy industry has become a regular source of income throughout the year, which is why it has been accepted as a supplementary industry to farming. 65 per cent of farmers in India are involved in the dairy industry. Mahanand, Gokul and Warana are some of the major as well as popular names in this sector. This sector creates opportunities for employment in the aspects of production, processing, transport and cattle rearing. In the year 2011-12, this sector had 21 per cent share in the agricultural income of the gross country product.

**[4] Silk Industry:** The climate in India is suitable for the silk industry and there is a great scope for further development in this sector leading to greater employment generation. Maharashtra ranks first in the country in the production of silk using non-traditional methods and 5th in the total production of silk. Mulberry silk development programme is being run in 23 districts while the Tussar silk development programme is being run in 63 districts.

**[5] Fisheries:** Dahanu, Mahim, Vasai, Versova, Alibaug, Murud-Janjira, Shrivardhan, Dabhol, Ratnagiri, Shirol, Harne and Vengurle are important fisheries centres. The *Surmai*, Pomfret, Prawns, *Bangda*, *Ravas* and *Halva* type of fish are found off the coastline areas. Besides this, fresh water fishing is carried out in rivers, lakes and the backwaters of dams. Fish is an important food item of the diet of people. Fish is also used for production of oil, cosmetics and fertilizers. Salt water fishing is carried out over an area of 70 lakh sq km, fresh water fishing over an area of 17 lakh hectares while semi salt water fishing is over an area of 14 lakh hectares in India.

**Conclusion:** The agro-based industries have played important role in the rural economy. The role of co-operative sugar factories is also important in rural economy. The sugar factories helped in the development of rural area and providing the employment opportunities. Sugar co-operatives have realized the importance of education and tried to provide educational facilities through opening schools and colleges in the rural area. Many co-operative sugar factories in India have set up engineering colleges, health centers, co-operative credit societies, consumer stores, technical training centers, super bazaars etc. which are helpful in development.

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**The agro-based industries assume great significance in the Indian economy, where agriculture accounts for over 35 percent of the national income and about two thirds of the working population. Agro-based industries have great priority in the rural areas since they could be instrumental in fostering strong linkages between the agricultural and industrial sectors and enhancing the employment potential.**

# AGRO-PROCESSING INDUSTRY - KEY TO ENHANCE FARMER'S PROFITABILITY

Dr Amrit Patel

*Critical components of the supply chain require substantial financial investments to create grading and packing centres, controlled atmosphere storage facilities, refrigerated vans, testing laboratories, among others.*

India produces about 450 million tons of raw food materials of plant and animal origin which are refined, stored and transformed into various usable products using conventional and modern post-harvest and food processing technology. It involves operations like cleaning, grading, drying, storage, milling, packaging, transport, marketing and utilization. At the end of each operation, it adds value to the product. The Agro Processing Industry API serves as a vital organic link between agriculture and manufacturing sectors. In this relationship, the raw material being produced by farmers provides assured backward linkages for the API and an assured source to supply healthy foods to the consumers in easy to carry packets throughout the country.

The API in India offers tremendous scope for development of industries utilizing produce

of agriculture, livestock and fisheries sectors, viz. processing of rice, wheat, coarse cereals, maize, pulses, oilseeds, fruits and vegetables, sugarcane, tea, coffee, spices, condiments, cotton, jute, silk under agriculture; milk, meat under livestock; fish under fisheries etc.

The importance of the Food Processing Industry [FPI], a significant component of API, in India's agriculture can best be understood from the studies by McKinsey which reveal that food in India has an economic multiplier effect of 2.0 to 2.5 which means for every rupee of revenue generated from food the economy at large benefits by Rs.2.0 to Rs.2.50. According to NABARD (2005-06) the share of agro-industry in village level rural industries was 83per cent, 78 er cent and 72per cent in terms of number of enterprises, total employment generated and gross value addition respectively.



## Current Status

- The food processing industry being a significant component of the agro-processing sector is the second most important industry in terms of revenue generation. However, the productivity is low due to the use of traditional technology in production
- With adequate investment in food processing, technical innovation and infrastructure India could become the food basket of the World. The existing level of processing and the extent of value addition are very low as compared to other developing countries. Value addition has now been considered as the thrust area. In India the food processing industry is ranked fifth in terms of production, consumption, export and expected growth.
- **Fruits and vegetable:** Fruits and vegetables processing is highly unorganized enjoying a share of 70% in the total market size. Ready to eat foods, frozen vegetables, processed mushrooms, among others, have witnessed rapid growth in the recent past. However, processing of fruits and vegetables accounts for a meagre 2.2 per cent of which 48 per cent is in the organised sector. The major challenge with this sector is the lack of infrastructure facility to transport and store produce.
- **Dairy:** In 2011, the value of milk output from livestock was around Rs.2400 billion and the value of dairy products market around Rs.4000 billion. Dairy industry has been growing at five per cent rate per year. The dairy sector accounts for the highest share of the processed food. While 35 per cent of its total produce is processed, organised sector is processing as low as 15 per cent. The dairy sector being highly unorganized its products do not conform international standards of quality.
- **Meat and Poultry:** India's meat production accounts for around two per cent of the global meat production. Industry has been witnessing the accelerated growth with the entry of corporates in meat processing and packaging

The Agro Processing Industry API serves as a vital organic link between agriculture and manufacturing sectors.

segment of the industry. Processed meat and poultry products account for around 21 per cent.

- **Fish and marine products:** Indian seafood processing industry aims at value addition and exporting through establishing new units, expanding capacity of existing units and diversifying their current activities etc. The export of marine products has steadily grown over the years from a meagre Rs.3.92 crore in 1961-62 to Rs.8607.94 crore in 2008-09. Marine products account for around 1.1 per cent of the total exports from India. The fast changing dietary habits of the people within and outside India has increased the demand to produce and supply value added products in tinned packs by adopting the modern technologies and tapping the unexploited and under exploited fishery resources.
- **Snacks:** The Indian snacks market is reported to be worth Rs.150 billion with the organized segment accounting for about 50 per cent of the market share. While the market is growing at the rate of 15 to 20 per cent annually, the unorganized segment is growing at a rate of 7 to 8 per cent. Share of the potato chips and potato based products is almost 85 per cent of the Indian snack market.
- Despite specific policy initiatives to give a thrust to the food processing sector, it still continues to be in its nascent stage with remarkably low penetration. It is highly fragmented and dominated by the unorganized sector employing around 82 per cent of the workforce in unorganized sector. The unorganized segment varies across categories of food products and regions but nonetheless around 75 per cent of the market is still in this segment.
- Domestic expenditure on food and food products accounts for about 21 per cent of the GDP in India and constitutes the largest portion of the Indian consumer spending. It has a market size of Rs.9,050 billion. The share of food processing industry in GDP increased to Rs.44,937.43 billion in 2009-10 from Rs

32,542.16 billion in 2005-06, with Compound Annual Growth Rate (CAGR) of 8.40 per cent.

- Food processing accounts for about 14 per cent [Rs.2,800 billion] of manufacturing GDP and employs about 13 million people directly and 35 million people indirectly.
- India's food export market, at US\$ 13.7 billion, accounts for a meagre share of only 1.4 per cent of the world food trade.
- India's access to enormous natural resources and growing technical knowledge base presents favourable comparative advantages over other developing economies in this industry.
- According to FICCI report 2009, India has a food and food products market of US\$ 181 billion. The Indian domestic food market is expected to grow by nearly 40 per cent of the current market size to Rs12,900 billion by 2015 and Rs17,200 billion by 2025.
- For prospective investors the FPI in India is an attractive sector. Confederation of Indian Industry has estimated that the food processing sector alone has potential of attracting US\$ 33 billion of investment in next ten years.
- The Indian food processing industry can seize an opportunity of significant growth in the light of changes over the past few years, because of changing trends in markets, consumer segments and regulations. In particular, continuing trends, such as changing demographics, growing population and rapid urbanization can influence the demand for value added food products. Factors attributed to create the demand of the Food Processing are [i] increasing urbanization, disposable income, spending on food products, nuclear families, working women and demand for nutritive foods; changing demographics, lifestyle and aspirations; and growth of organized retail and private label penetration.

**Domestic expenditure on food and food products accounts for about 21 per cent of the GDP in India and constitutes the largest portion of the Indian consumer spending. It has a market size of Rs.9,050 billion.**

### Government's initiative

Government has initiated specific policy reforms to facilitate and exploit the growth

potential of the sector, viz. [i] rationalization of food laws [ii] FDI to the extent of 100 per cent in the food processing and cold chain infrastructure in order to attract private sector and invite foreign investments in the sector.

Several schemes are formulated viz. Scheme for [i] technology up-gradation, establishment and modernization of FPI [ii] quality assurance, codes standard and R&D [iii] up-gradation of quality of street foods [v] addressing the low scale of processing activity by setting up the mega food parks integrating facilities/services for procurement, processing, storage and transport.

FPI envisages a network of food testing laboratories to help [i] establish a surveillance system for monitoring the quality and composition of food [ii] analyse samples received from processing industries and other stakeholders [iii] minimize time of analysis of samples by reducing transportation time of samples [iv] ensure compliance of international standards on food for exports and imports. This should guarantee safety and quality of food products as mandated by regulatory authorities and would benefit small and medium entrepreneurs of domestic industry and promote exports.

Efforts are being made to [i] provide state of the art infrastructure for FP in selected clusters being identified in a demand driven manner. [ii] ensure value addition of agricultural commodities and poultry, meat, dairy, fisheries products [iii] establish a sustainable raw material supply chain for each cluster [iv] address the issues of small farm size and small and medium nature of processing industries through a cluster approach with stakeholders managing the supply chain [v] put in place an institutional mechanism for products, processes and retails to work together to build the supply chain.

### Cold chains

Objectives of cold chain, value addition and preservation in the FPI are [i] to provide integrated infrastructure comprising complete

cold chain, value addition and preservation facilities without any break from the farm gate to the consumers and [ii] to link producers to the processors and market through well-equipped supply chain. In the absence of on-farm cooling and grading arrangements, the farmers are compelled to sell their produce to the arhitia at a lower price. Facilities to farmers to grade and store their produce nearer to farms add value to their produce and enable them to bargain and secure better/remunerative price from the processors. The consumer can benefit when there is uninterrupted and increase in the supply of food products with a longer shelf life. This necessitates creating sustainable supply chains which link the farmers with the processing and marketing centres. However, one of the main reasons for inadequate development of cold chains is the lack of understanding and appreciation of the critical components of the supply chain mechanism in the FPI that integrates all components beginning with farm inputs and ending in food retail and food service, viz. [i] makes available seeds, fertilizers, pesticides, water, bank credit and insurance for crop production followed by procurement of crop-produce [ii] facilitates storage and transportation of crop-produce from one place to another for domestic trading and export. Field experiences suggest that the absence of proper cold storage facilities leads to wastage of produce amounting to as high as 35 per cent. According to the survey by the FICCI, the problem of wastage of crop-produce has been identified as number one challenge in FPI [iii] processing which involves grading, sorting and waxing in case of fruits and vegetables; milling and grading in case of food grains. At this stage, value addition takes place such as, value addition of wheat into noodles and bakery items, processed fruit and vegetables, extruded snacks etc. [iv] branding, wholesale trading and export. The entry of well-known brands and multi-national corporations in country's market has created a stiff competition

**The Indian food processing industry can seize an opportunity of significant growth in the light of changes over the past few years, because of changing trends in markets, consumer segments and regulations.**

for local /small players and difficult to grow, as they lack in resources for developing appropriate brand and extensive publicity [v] food retail and food services imply retailing of value-added foods through hotels, restaurants, eat-outs and retail stores (for packed items, grains, Ready to Eat foods etc.).

According to the vision 2015 document, the FPI envisages to increase processing of perishables from six per cent to 20 per cent, value addition from 20 per cent to 35 per cent and increase in share of global food trade from 1.5 per cent to 3.0 per cent. In order to capitalise the available opportunities it is necessary to create an enabling environment for healthy growth of the FPI and formulate a strategic action plan to accomplish the Vision 2015 by end of the Twelfth Plan.

- All village level agro-industries need support of technology and institutional credit and to be brought under single registration authority.
- In order to have a desired impact on perishable food products [viz. fruits, vegetables, milk, meat and poultry products] an efficient supply chain that, *inter alia*, include cold storages, refrigerated vans, better road facilities, and uninterrupted power supply is a pre-requisite to facilitate perishable farm produce to reach consumption and processing centres promptly. Prepare a road-map to strengthen infrastructure facilities specifically for uninterrupted supply of electricity, road connectivity, and storage facilities.
- To boost domestic consumption and export trade of processed foods improvement is called for in respect of production and quality of processed foods, consumer safety and public health. There is need for up-gradation of processing, handling, packaging, production of intermediary and finished products including design and building of prototype equipment and pilot plants.

- Total Quality Management [quality control system and quality assurance] is must for a competitive food processing sector in the world market.
  - Value addition centres demand infrastructure facilities that include [i] processing/multi-line processing/collection centres etc. for produce of horticulture, marine, dairy and poultry etc. [ii] irradiation services with facilities of warehousing, cold storage for storage of raw material and finished products.
  - The last few years have witnessed encouraging growth in ready to serve beverages, fruit juices and pulp, dehydrated and frozen fruits and vegetable products, tomato products, pickles, pastes, processed mushrooms and curried vegetables. However, the issues concerning the low level of domestic consumption of value added fruit and vegetable products need to be addressed viz. higher incidence of tax and duties including that of packaging material, lower capacity utilization, non-adoption of cost-effective technology, high cost of finance, infrastructure constraints, weak linkage between farmers and processors leading to dependence upon intermediaries and inability of smaller units to promote market.
  - To incentivize and encourage Public Private Partnership (PPP) to overcome constraints particularly creating facilities for cold chain, packaging and grading centres, quality control and testing, efficient supply chain, evolving processable varieties of farm produce, seasonality of raw material, reduction in high inventory carrying cost and high packaging cost.
  - API in order to be sustainably viable should develop and implement a system approach integrating assured supply of quality raw material exclusive for processing, timely availability of quality production inputs, technology, credit, insurance, storage, warehousing, processing, packaging, transport, marketing facilities. System approach can focus enhancing cost advantages and competitiveness in the international export market.
  - Private sectors and Agricultural universities/ research institutes established in varying agro-ecological regions in a mission mode can evolve promising farming models and successfully demonstrate them.
  - Bring unorganized food processing sector into organized sector since not only the unorganized sector is very large but is also growing fast. Effective inter-institutional coordination is required in areas of training, technology up-gradation and improvement in infrastructural facility.
  - Put in place business-friendly administration and customer-oriented promotional measures.
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# VEGETABLE BASED FAMILY FARMING IN INDIA

Shubhadeep Roy, Tanmay Kr Koley and Neeraj Singh

In the present scenario of increasing input cost, market prices fluctuation and climatic damage, small holder agriculture becomes non-remunerative. As a result rapid demographic changes have been observed in labour migration towards cities causing population misbalance in rural and urban India. In this context, the concept of family farming can be an alternative option to retain rural agriculture as remunerative enterprise. World rural forum defined Family Farming (also Family Agriculture) as a means of organizing agriculture, forestry, fisheries, pastoral and aquaculture production which is managed and operated by a family and predominantly reliant on non-wage family labour, including both women and men. The family and the farm are linked, co-evolve and combine economic, environmental, reproductive, social and cultural functions. The holdings are run by family groups, a large proportion of which are headed by women and women play important roles in family farming or small holder agriculture. Family farming is prevalent in developing countries like India. Data

compiled by the high level panel of experts on food security and nutrition (FAO) for 81 countries shows that 38 percent of the agricultural area and 73 percent of the total number of holdings dispose of less than 1 hectare of land and 85 percent dispose of less than 2 hectares. The majority of holdings below 2 hectares are found in Asia. In Africa, 80 percent of the holdings are below 2 hectares. In developing countries, the total number of small holdings tends to reach 500 million units (HLPE, 2013).

In India about 70% of the population is directly or indirectly related to agriculture. Among 615 million total farming families 498 million are family farmers whose average land holding is 1.33 hectares. So it is apparent that small holder agriculture or family farmers are the pillars of food security in India. These small holders contribute to the country's food security and nutrition while performing other related roles in their territories. Small holder agriculture, adequately supported by policy and public investments, has the capacity to

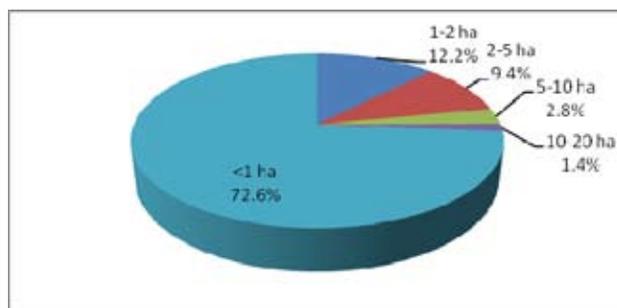


contribute effectively to food security, nutritional security, and sustainability. It can significantly contribute to economic growth, generation of employment, poverty reduction and emancipation of neglected and marginalized groups by reducing spatial and socio-economic inequalities. It helps in sustainable management of biodiversity and other natural resources while preserving cultural heritage and Indigenous Technical Knowledge.

### Family Farming and Food and Nutritional Security:

In the present context of increasing cost of necessary item and nutrition linked deficiency in common population, major challenge to scientists is to provide nutritional security to the nation. Presently 47.9% children in India are underweight, almost 75% are anaemic and 22% children are born with low birth weight. Malnutrition in all its forms – under nutrition, micronutrient deficiencies, and underweight imposes high economic and social costs on countries at all income levels. While the nature and causes of malnutrition are complex, the common denominator among all types of malnutrition is a nutritionally inappropriate diet. Major malnutrition problems are associated with inappropriate diet deficient with basic vital nutrients like minerals (Iron, Zinc, and Iodine), Vitamins (Vitamin A, Folic acid) and proteins. Inclusion of vegetables in family farming can solve this deficiency related malnutrition problem as vegetables form a very rich source of vitamins, minerals and proteins. Besides it is reservoir of many bioactive compounds which keep our health well and sometimes prevent from or cure of various lifestyle diseases like cancer, heart diseases, diabetes etc.

**Figure 1: Percentage of land holding by class area in 81 developing and under developed countries**



Source: HLPE, 2013

Lacking of balance diet is another burning problem of our society. In rural India people are unable to take balanced diet mainly due to unavailability and nutritional unconsciousness. Family farming promotes cultivation of crop plant coupled with dairy and animal husbandry. Thus foods derived from farming system are balanced sources of nutrition coming from plants as well as animals. Besides it also promotes underutilised crop plants which are better and higher sources of nutrition. Animals reared in family farming system have balanced omega-3 and omega-6 fatty acids than animals reared in commercial husbandry system. Economic condition is always associated with nutritional security as it is positively linked with purchasing power of a person. Family farming improves the economic condition of family farmers through sustainable income. Improved economic condition enables them to purchase the nutrition rich food which they are unable to produce in farming system.

### Family Farming leads to Organic Agriculture and Safe Environment

Organic agriculture is important because it has the potential to maintain and increase yields

**Table 1: Malnutrition scenario in Asian Countries**

	Prevalence of stunting among children (%)	Prevalence of Micronutrient deficiency and anaemia among children (%)		
		Anaemia	Vit. A def	Iodine def
World	25.7	47.9	30.7	30.3
China	9.4	20.0	9.3	15.7
India	47.9	74.3	62.0	31.3
Bangladesh	43.2	47.0	21.7	42.5
Pakistan	43.0	50.9	12.5	63.6
Sri Lanka	19.2	29.9	35.3	30.3

Source: HLPE, 2013

while improving soil fertility, biodiversity and other ecosystem structures. It is particularly suited to small holder farmers, who are less dependent on external resources, since it makes use of their traditional knowledge. In fact, the majority do not use chemical inputs. Several reports have confirmed that small farmers who have shifted to organic production and marketing enjoy higher and more stable yields and incomes, thus enhancing their food security. International markets for organic products continue to grow at a rapid rate of 10–30 percent per annum in most countries and over US\$5 billion per year globally, with fresh fruit and vegetables as the leading sector. For instance, organic vegetables comprise over 5 percent of all vegetable sales in northern European countries and exceed 10 percent in some Scandinavian and Alpine countries. The organic fruit market is reporting even higher growth, as more tropical and exotic varieties have come into the market. In recent years, the central and state governments have taken a number of steps to promote organic farming among farmers and consumers. These include National Project on Organic Farming (NPOF) and National Centre of Organic Farming (NCOF). Some states like Uttarakhand, Himachal Pradesh and North Eastern states have also initiated programmes to encourage farmers to convert to organic farming and to facilitate the organic certification process, which is necessary to obtain a premium price in the market. As a result, the area under organic cultivation had increased to around 1.2 million hectares in 2008 (ICCOA, 2009). A large proportion of certified organic production goes to export markets, mainly Europe, the United States of America, Australia, New Zealand, Israel and the Middle East. If favourable policy is formulated, Family farmers have tremendous potential in organic farming as demand for organic products in developing countries continues to grow and price premiums for these products will continue to exist.

### **Family Farming Nurturing the Traditional Values and Indigenusness**

Globally, there are some 370 million Indigenous people representing at least 5,000 different linguistic groups in more than 70

countries. Indigenous people comprise about 5.5 percent of the world's population, yet they are disproportionately represented among the poor and food insecure, in both developed and developing countries. In India Indigenous people are called tribals, whose population is around 8.43 crore living in various geo-climatic and ecological conditions ranging from plains and forests to hills and inaccessible areas. Nearly cent percent of the tribals are family farmers whose livelihoods are dependent on small pieces of lands, forest resources and small scale animal husbandry. Tribal Peoples' relationship with their traditional lands and territories forms a core part of their identity and spirituality and is deeply rooted in their culture, language and history. Since land and its resources form the basis of tribal peoples' subsistence activities, it gives a flavour of self-sufficiency and conservation of valuable genetic resources and biodiversity. Furthermore, tribal peoples' overall health, well-being and cultural continuity are directly related to their ability to eat traditional food which is free from inorganic toxicity of the modern world. These traditional practices and indigenusness are deeply intertwined with their culture which give strong value systems to their offspring and conserve the socio-cultural ethos. Many agro-products especially vegetables are associated with religious ceremony of tribal and rural culture. Various traditional vegetables are used in socio-religious festivities like Makarsankranti (Radish flower), Ganesh couth (Black carrot), Chatt Puja (Suthni) etc.

### **Role in Women Empowerment**

Women comprise a significant share of the labour force engaged in agriculture as farm labourers, producers, distributors, marketers, and agricultural entrepreneurs. In Latin America, 20 percent, in Asia 30 to 60 percent and in Sub-Saharan Africa, 50 to 75 percent of the agricultural labour force is supplied by women. However, they do not enjoy the same rights and privileges as their male counterparts. It is estimated that women are responsible for 70 percent of actual farm work and constitute up to 60 percent of the farming population. In vegetable cultivation

women contribute from seed sowing to marketing and post-harvest operation like their male counterparts. In many cases women force are better options than men like nursery raising, hand pollination of pointed gourd etc. Table 2 shows the result of a study conducted in rural Rajasthan to quantify the contribution of women in several farm activities in India.

**Table 2: Percentage contribution of farm women in several agricultural activities**

Farm Activities	Percent
Ploughing of field	2.0
Cleaning of field	85.0
Levelling of field	5.0
Raising nursery for seedling (Okra, chilli, tomato, pea)	55.0
Sowing	25.5
Transplanting	20.5
Manure application	32.5
Fertilizer application	1.0
Weeding	75.5
Thinning	60.5
Gap filling	80.5
Irrigation	26.0
Plant protection measure (Insecticide, pesticide use)	0.0
Cutting	100.0
Picking	100.0
Shifting production to threshing floor	89.5
Threshing	50.0
Winnowing	95.0
Drying of grain	100.0
Cleaning of grain	100.0
Grading	90.0
Storage	100.0
Processing	100.0

Source: Chayal et al, 2010

Not only agricultural activities, women have to reconcile their work in the fields with domestic and child-care responsibilities. Women's position is complicated further because their work in agriculture is often done on informal basis – through part-time or informal labour arrangements and therefore goes largely unrecognized. Providing them with educational and technical support, can be an effective approach to increase the productivity of women and fight hunger and poverty. Empowerment of women through better access to economical assets and decision making process will not only give proper nourishment of the children and family members but will also secure a sustainable growth to the small farming families.

### Conclusion

Vegetable cultivation in small scale of holding is more profitable. Because vegetables are short duration crops and price of vegetables is relatively higher than cereals. In India where average land holding is 1.33 hectares, vegetables have the potential to give higher cropping intensity which can be a continuous source of income to the small farmers. In the family farming system vegetables will provide nutritional security to the marginalised farmers. United Nations has declared 2014 as the “International year of Family Farming”. On this occasion, we require a positive outlook and different framework for the family farmers of India. We need to foster the strengths of family farming philosophy to defeat the weakness of small and marginalised Indian farming community for their sustainable livelihood.

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**The family and the farm are linked, co-evolve and combine economic, environmental, reproductive, social and cultural functions. The holdings are run by family groups, a large proportion of which are headed by women and women play important roles in family farming or small holder agriculture.**

# HYDROPONICS-HI-TECH VEGETABLE CULTIVATION IN SOIL-LESS CULTURE

Dr. R.S. Sengar, Dr. Shalani Gupta, Kalpana Sengar and Dr. M. Pandey

**H**ydroponics is defined as the 'Cultivation of plants in water'. It is the system of growing plants in nutrient solution or water culture.

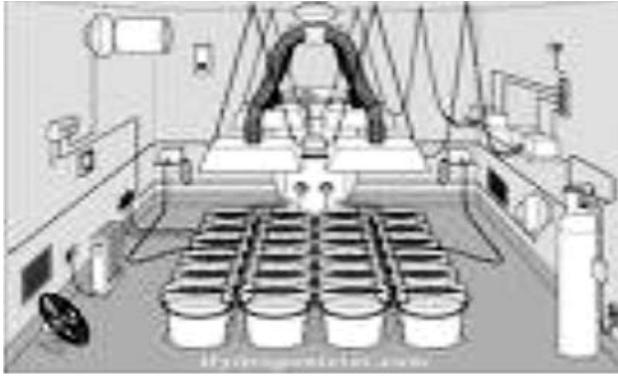
The term hydroponics was used by Gerick (1940) to refer soil-less growth of plants in water and sand culture. The word hydroponics is derived from Greek language and literally means 'water working'. Hydroponics is an art and science of growing plants without soil by feeding them with chemical solution and hence also called chemical gardening. The solution used in culture contains all essential elements in proper properties needed for normal growth of plants.

Hydroponics culture of green house vegetables involves the production of crop in sand, gravel or artificial soil-less mixes in bags, tubes, tanks or troughs designed to allow the circulation of nutrient media needed for crop growth. Unlike conventional soil culture, hydroponics culture of greenhouse vegetables is less for giving and

requires intensive management. Although present automation system can minimize fertilization and irrigation labour inputs, continuous monitoring of system is important. Growers must be highly knowledgeable about plant growth, nutrient balances, culture media characteristics and plant physiology.

**The concept of hydroponics:** Hydroponics is based on the theory that all the factors of plant growth naturally supplied by the soil can be coordinated artificially by the use of water and chemicals into a crop production method capable of competing with agriculture. Basically, there is no change in the fundamental principles of crops growing in hydroponics. In general course, the nutrients are supplied to the roots through soil media; where as, in hydroponics the method of supplying the nutrients is changed. All the nutrients needed by the plant are supplied as per requirement at suitable material while growing in suitable container. In India, it was first introduced





Hydroponics - Indoor System

at Kalimpong in Darjeeling district of West Bengal. Soil-less planting is a method of growing plants using clean water or clean organic matter with or without additional plant nutrients. When clean water and nutrients are used, it is called hydroponics. When clean organic matters like peat, compost, organic extract are used, it is called organics.



hydroponics

**Relevance of hydroponics in present scenario:** Each year three million acres of farmland are lost to urbanization. The population increases each day by 5000 people. This means we will have to produce more food on less land. Three million acres of farmland are lost jointly by erosion and poor land management annually. Hydroponics is the answer. There is no need for soil, it can be used in any climate, it only uses 1/25<sup>th</sup> the amount of water as conventional farming and can be grown virtually anywhere. Even rooftops of buildings and factories are being used for vegetables production. Hydroponics system may be divided in to different forms. Yield of vegetable crop grown hydroponically in desert green houses (CEA) and in open fields (OFA). The data indicates that the yield is usually higher

in hydroponics CEA (Controlled Environment Agriculture) than in OFA (Open Field Agriculture) because of the optimal growing conditions, balanced plant nutrients etc, provided in control environments.

**Requirements of hydroponics:** Following are the requirements of the well hydroponics or water culture.

- a. **Nutrient solution:-** Many formulae for hydroponics nutrient solution have been given but they are all quite similar, different mostly in the ratio of nitrogen to potassium. Plants need less nitrogen during short or dark days and more nitrogen in longer days, brighter sunlight, and higher temperatures. Smaller operation often buy ready-mixed nutrient formulations, only water needs be added to prepare the nutrient solutions to standard or slightly modified formula.
- b. **Growing medium:** - i) Growing medium is used to lend support to the roots and plants. ii) A variety of growing meda are utilized for their individual qualities in various types of hydroponics systems.
- c. **pH:-** i) The acidity or alkalinity of nutrient solution, ii) pH reading run from 0-14, iii)



Grape Links In hydroponics' system



Gardening hydroponics

0-6 acidic, 6-neutral, 8-14 alkaline, iv) The recommended pH is between 6-6.5. Few popular examples of growing medium are: Sand, Brick, Shards, Vermiculite/Perlite, Gravel, Rockwool, Sawdust, Polyethylene Sheeting.

### Type of Hydroponics

**Solution Culture:** The plants are raised in pure nutrient medium containing only the desired elements. The pyre or any other clear hard glass vessels are used as containers and for plant support special engineered structures are required. To protect the roots from direct light and to check algal growth in the nutrient solution, the containers are covered on their outer surface with black paper. The aeration for the root is provided with the help of vacuum lines which continuously keep on providing fresh filtered air to the nutrient solution. In case of any change due to absorption of nutrients by plants occasional pH adjustment are done and nutrient solutions are frequently changed. There are several culture media available but knops and Hoagland's media is commonly used.



Hydroponics

**Rock wool culture:** Rock wool is an inert, porous, sterile growing medium made from rocks that are heated at high temperature and made into a fiber. The resulting fibers can be turned into slabs or bags as a loose rockwool for bag culture. The small cubes of rockwool used for starting transplants slabs are packaged in white or white-on-black polyethylene sleeve slabs are laid in two rows and irrigated by micro-irrigation with one emitter per plant. Fertilization of rockwool is accomplished by fertilization through drip

irrigation system each time. In most systems, water is mixed with fertilizers to make stock solution in 1:100 ratio before it is applied to the slabs. The rockwool slabs can be re-used for upto three seasons. Rockwool culture has many advantages viz. ease of handling, installation and media removal, high water holding capacity, more precise control of nutrients and good air circulation. The major disadvantages of rockwool are the need for a leachate collection system and the need to replace the media every two to three seasons.



Fig-7 drip hydroponics growing system

**Nutrient film technique (NFT):** It is a type of 'water culture' system in which the bare roots are continuously bathed in a flowing nutrient solution. True NFT consists of growing plants in a shallow plastic-lined trough in which nutrient flows continuously. Roots are spread out over the width of 12 inch channel and are continuously bathed in a thin film of flowing oxygenated nutrient solution. Channels are on a slope to allow the nutrient solution to flow from one end of the channel to the other end collected for return to the sump tank. Nutrient solution is pumped continuously from the sump tank back to the channels. Nutrients are added to the solution as needed and the solution may be replaced periodically to reduce the build up of salts and disease organism. In NFT system, channel and plants are arranged in the green house similar to rock wool culture. It is expensive to install and require high degree of management and experts to operate the system to ensure correct irrigation and fertilization. The vegetable

crops are adaptable to NFT system are tomato and cucumber.

The major problem of this system is high probability of quick recirculation of disease organism like *Rythium* within the green house. Management of nutrient concentration and pH of the solution is highly labour intensive and there is no water holding capacity in the event of a power failure.

### Advantages of hydroponics culture over soil culture:

1. Hydroponics culture provides a controlled chemical composition of nutrient solution.
2. There are no soil colloids present to immobilize any of the nutrients through adsorption.
3. The frequent replacement of culture solution prevents the accumulation of toxic organic decomposition products.
4. The growth of bacteria and fungi is minimized which may otherwise cause disease.
5. It should be made free from soil borne disease and weeds.
6. Natural calamities such as floods, droughts, erosion etc can be avoided.
7. This system can assume high yield with good quality produce.
8. It allows the culture of greenhouse vegetables in area where soil is not suitable for vegetable production

### Disadvantages of hydroponics

1. This high-tech system call for a higher investment compared to other commercial methods of cultivation.
2. It requires huge investment and some basic knowledge of chemistry; plant physiology and crop botany have deferred many adopting this technology.
3. Slight mistake in calculating exact requirement of fertilizers may end up with deficiencies or toxicities in the crop.
4. Pests and diseases remain a big risk.

5. Not all plant varieties are suitable for hydroponics.
6. Plants have quick reaction to both good and bad.

### Effect on farmer

1. If hydroponics become a major part of the agriculture world then farming as we know it today would no longer be same.
2. All the tractors and farm equipment will be gone and land will be used for construction of houses.
3. All of our food as in veggies will be grown in water and a greenhouse.

### Future thrust area

1. Development of new temperature –tolerant, disease resistant hydroponics cultivars.
2. Disease control of water-borne pathogens in closed hydroponics system. Further development of the application of solar heating in hydroponics greenhouse will reduce cost and economics impact of hydroponics.
3. Currently plans are being drawn for using the techniques of soil-less culture on space-station and perhaps one day on surface of other celestial bodies (planets, moon) that don't have soil.
4. In the future developing countries, along with all other nations, will be able to feed many people using less land than current farming techniques.
5. In the future, application of hydroponics in providing food in areas having vast regions of non-arable land such as deserts and mountains terrain will be more heavily used.

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**Hydroponics is an art and science of growing plants without soil by feeding them with chemical solution and hence also called chemical gardening.**

# INDIAN DAIRY INDUSTRY - PARADIGM SHIFT

Dr M Alexpandi

*“Eight hours for dairy, eight hours for family and eight hours for sleep”*

*- Dr. Verghese Kurien.*

Even as agriculture holds the pivotal point in rural economy, allied sectors like animal husbandry, dairy and fishery activities play vital role in pan-Indian economy through the socio-economic development of the particular, for these activities have contributed to the food basket, nutrition security and household income of the farmers. This has been playing a significant role in generating gainful employment in the rural areas, particularly among women, the landless and the small and marginal farmers besides providing cheap and nutritious food.

India is the world's largest milk producer, accounting for more than 13 per cent of world's total milk production. It is the world's largest consumer of dairy products where almost 100 per cent of its own milk production is consumed. The per capita availability of milk has reached a level of 290 grams per day during the year 2011-12, which is more than the world's average of 284 grams per day and about 14.78 million farmers have been

brought under the ambit of 1,48,965 village level dairy cooperative societies up to March 2012 would again prove the acute necessity of dairy industry.

**Table 1 Volume of Milk Production in India**

Period	Production (In Million Tonnes)
1950-1951	17.0
1960-1961	20.0
1970-1971	22.0
1980-1981	31.6
1990-1991	53.9
2000-2001	80.6
2010-2011	116.2

Source: *Department of Animal Husbandry & Dairying, Ministry of Agriculture, Government of India*

It is clear that milk production in India has been continuously increasing over time. The



volume of milk production in India increased from 17 million tonnes in 1950-1951 to 116 million tonnes in 2010-11. Despite the increase in population and demand for more milk in India, the co-operatives, corporate bodies and local vendors are able to achieve tremendous output, with no fluctuations in milk production.

Figure 1 Volume of Milk Production in India

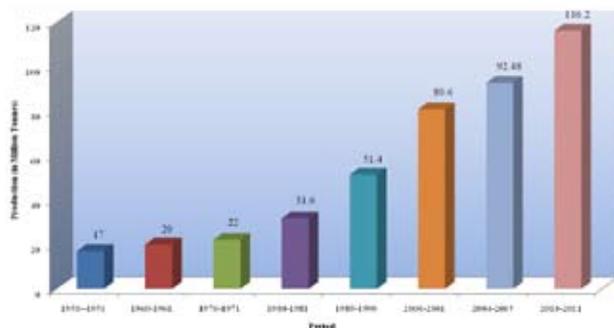


Table 2 Annual Growth Rate of Milk Production in India during 1950-51 to 2010-11

Period	CGR (%)
1950-51 to 1960-61	1.64
1960-61 to 1973-74	1.15
1973-74 to 1980-81	4.51
1980-81 to 1990-91	5.48
1990-91 to 2000-01	4.11
2000-01 to 2010-11	4.22

Source: Department of Animal Husbandry and Dairying, Ministry of Agriculture, Government of India.

The annual growth rate of milk production in India has begun to rise from 1970-71 onwards. During the period 1970-71 to 1980-81 the growth rate was 4.51 per cent and from 1980-81 to 1990-91 the compound growth rate was 5.21 per cent. Thereafter, there is a small decline in this trend from the year 1990-91 to 2010-11 where the growth rate decreased to 4.22 per cent compared to 1980-81 to 1990-91.

### State-wise Relative Share of Milk Production in India

To study regional imbalance, major twelve states of India have been selected since state level aggregation is considered as a meaningful level of regional aggregation. The states Andhra Pradesh,

Bihar, Gujarat, Haryana, Karnataka, Madhya Pradesh, Maharashtra, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh and West Bengal have been selected. These states together have contributed 89.43 per cent of total milk production of India during 2010-11. Furthermore, comparative growth performance has been investigated across states and across time span. The study period has been divided into three sub-periods namely 1990-91, 2000-01 and 2010-11.

Uttar Pradesh recorded the highest contribution of India's total milk production accounting for the one fifth of total output of milk in India during 1990-91 and also subsequent periods. Rajasthan has been recorded 10.86 per cent, followed by Andhra Pradesh (9.19 per cent) and Punjab (7.33 per cent) in the relative contribution of total milk production in India during 2010-11.

It could be further understood that an increasing trend has been observed in the states of Andhra Pradesh, Bihar, Gujarat, Madhya Pradesh, and Rajasthan during 2010-11 compared to the year 2000-01 and a decreasing trend in the states of Haryana, Karnataka, Maharashtra, Punjab, Tamil Nadu and West Bengal.

### Conclusion

The analysis proves that the total milk production in India has increased nearly seven times in the last six decades. Uttar Pradesh records the highest contribution of India's total milk production during the same period.

Dairying has become an important secondary source of income and is considered as one of the activities aimed at alleviating poverty and unemployment for marginal and women farmers especially, in the rural areas and in the rain-fed and drought-prone regions of India. The progress in this sector will result in a more balanced development of rural economy.

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The per capita availability of milk has reached a level of 290 grams per day during the year 2011-12, which is more than the world's average of 284 grams per day

# PROSPERITY THROUGH PERI-URBAN VEGETABLE PRODUCTION

Dr. Krishan Pal Singh, Dr. Prem Chand and Dr. Beena Nair

India with 1,270,272,105 people (1.27 billion) is the second most populous country in the world. The figures show that India represents almost 17.31% of the world's population, which means one out of six people on this planet live in India. Although, the crown of the world's most populous country is on China's head for decades, India is all set to take the numero uno position by 2030. With the population growth rate at 1.58%, India is predicted to have more than 1.53 billion people by the end of 2030. India's total gross area of 3, 287, 260 square km and total cropped area is about 192.2 million hectares and the net sown area is 140 million hectares.

Due to limited natural resources, limited land area, water and a vast majority of poor, uneducated and underutilized human resources, our cities are becoming increasingly un-sustainable. Peri-urban cultivation of vegetables is one of the solutions to convert urban poor to being employed while at the same time improving the built environment. There are hundreds of cities both in rich and

poor countries that have set targets to make their cities green and sustainable cities. The cost of greening and cleaning can be borne by urban food production and urban agriculture. Different countries in the world like China, Australia, USA, South America, Europe and many Asian as well as African countries are doing it and constantly improving on this. In India, though the concept of peri-urban agriculture is beginning to become popular.

**Table 01: Top three states on the basis of urban population**

States	Population	Share (%)
Maharashtra	50.8 million	13.5
Uttar Pradesh	44.4 million	11.8
Tamil Nadu	34.9 million	9.3

Cultivation of vegetables in peri-urban or urban areas is recognized for its potential role in increasing food security, employment and income generation, poverty alleviation, community



resource development, waste management and environmental sustainability. A large part of the world population is living in peri-urban areas. The rich social and economic variability of peri-urban areas offers opportunities for innovative science, living condition improvements and agricultural and ecosystem management requiring novel policies and action to promote harmony both between society and nature and groups of people.

Peri-urban agriculture as defined in the introduction can be subdivided in intra-urban and peri-urban agriculture. Intra-urban agriculture takes place within the inner city. Most cities and towns have vacant and under-utilized land areas that are or can be used for peri-urban agriculture, including areas not suited for building (along streams, close to airports, etc.), public or private lands not being used (lands waiting for construction) that can have an interim use, community lands and household areas and peri-urban agriculture takes place in the urban periphery.

Availability of rail, road and air transport, cold storage, processing units, export houses and well established market network, will be helpful for taking up vegetable cultivation in peri-urban areas of metro cities in an organized way. Also, a huge quantity of solid waste generated during handling and marketing of fresh vegetable produce in metro cities, which is creating health and environmental hazards, can be used or recycled to produce vermicompost, etc., for use in organic vegetable production. Peri-urban vegetable cultivation can provide farmers the possibility to cultivate a small piece of land and obtain an income to meet their essential and basic needs. In recent years, around big cities, green belts are being developed which can provide a very intensive and profitable network of small farms specialized in production of perishable vegetables for consumption by the urban consumers. This is likely to result in a social symbiosis between farmers and city dwellers with mutual benefits and advantages. This will require involvement of a large number of institutions to address many issues related to the peri-urban vegetable cultivation in a viable participatory approach to make an impact and deliver anticipated results to the peri-urban population.

Due to high levels of unemployment in cities, many families depend on growing their own produce, especially vegetables on small plots for home consumption and for sale. Poorer families spend a larger proportion of their income on food. Thus the ability to grow their own vegetables contributes significantly to household food and income security. Nutrition security is enhanced as well; vegetables diversify diets and more importantly, are a source of micronutrients, vitamins and minerals vital for good health.

Many research institutes and agriculture universities of India develop and promote a range of vegetables, from tomato to traditional leafy crops, which can be grown in urban and peri-urban environments. Simple, low-cost methods to handle these valuable crops after the harvest can help urban and peri-urban vegetable growers reduce post-harvest losses and provide more and better quality vegetables at home and to local markets.

Vegetable quality needs to be maintained from the moment of harvest. Even when the distance from the farm gate to the consumer is relatively short, as in urban and often in peri-urban horticulture, growers must take care while harvesting, storing, packing and transporting fresh produce to prevent damage and maintain quality.

Water quality is another concern for vegetable production in urban settings. The source of water used to produce and clean the crop may get polluted by industrial and domestic waste. If pesticides are used on crops, pesticide residue may contaminate the produce and the local water supply, if producers are not adequately trained and willing to follow proper use of the chemicals. Growers should avoid using polluted water to wash vegetables after harvest to prevent contamination from microorganisms, pesticide residues and heavy metals harmful to human health. Urban producers need a good understanding of the risks of using contaminated water.

The first step to deliver a good quality crop to the market is to harvest at the optimum stage of maturity. Leafy vegetables should be harvested when they reach full size and before they start losing color and becoming fibrous. Tomato is ready to harvest when its fruit is physiologically mature

– that is, when the pink or red color first becomes noticeable on the fruit. Vegetables destined for the market should be graded to remove damaged or diseased material (which will also reduce spoilage) and packed into uniform lots so that they are attractive to consumers and fetch a higher price.

A simple way to reduce post-harvest losses is to harvest before temperatures are high, such as in the early morning or late afternoon and to keep the produce in the shade once it has been harvested. Leafy vegetables kept in the shade will maintain their quality longer than those exposed to full sun. Ice can reduce the temperature of harvested vegetables. Covering the produce with a moist material, such as damp sacking or straw (taking care to keep the vegetables dry) is also effective in reducing the temperature by taking advantage of evaporative cooling principles.

Another simple technique is to use good-quality packaging that will protect the crop after harvest. Many growers put their newly harvested leafy greens in large polyethylene bags; during transport the leaves may be bruised or crushed. Bamboo baskets are not suitable for packing soft fruit vegetables such as tomato because the rough surface may damage the produce. Rigid containers with smooth surfaces reduce crushing, bruising and damage.

Training urban growers in proper handling methods and disseminating information to show the economic benefits of good post-harvest handling can help ensure that more vegetables of better quality reach the market. Recommended techniques and technologies should not be time-consuming to apply or expensive, as the lack of capital is often a major barrier to adoption. Improved post-harvest handling results in a higher quality product which is more nutritious

and should fetch a higher price – an important incentive for growers to adopt these techniques.

Vegetables are particularly well-suited to peri-urban farming because only a small land area is needed to produce an ample crop. For example, a home garden model developed by agriculture universities for a 6m x 6m plot can produce approximately 250 to 500 kilograms of fresh vegetables per year. Vegetables produced from home garden model can supply a family of four to six with 200 g of vegetables per person per day.

Various types of peri-urban agriculture can be observed: community gardens (formal and informal), home gardens, institutional gardens (managed by schools, hospitals, prisons, factories), nurseries, roof top gardening, cultivation in cellars and barns (e.g. mushrooms, earthworms). Research data seem to indicate that intra-urban agriculture tends to be more small-scale and more subsistence-oriented than peri-urban agriculture, although exceptions can regularly be found (e.g. vegetable production and production of mushroom or ornamental plants).

Many vegetable crops can be harvested within a short time from planting. Spinach, tomato, cucurbits, chillies and amaranths are ready to harvest in 30-50 days and can be harvested up to ten times per crop cycle, providing a steady supply of fresh greens during the growing season. Vegetables such as spinach, amaranth and sweet potato leaves are rich in nutrients, often surpassing more familiar crops such as cabbage in nutritional quality.

Vegetable production in urban and peri-urban settings means that the distance from the field to the consumer is much shorter. Home gardeners have fresh vegetables at their doorsteps

**Table 2: Nutritional value of some vegetable crops (100 g)**

Content	Tomato	Cabbage	Spinach	Amaranth	Sweet potato	Chilli	Cucumber
Carbohydrate (g)	3.9 g	6.0	5626 µg	65.25	20.1	8.8	3.63
Protein (g)	0.9	1.3	194 µg	13.56	1.6	1.9	0.65
Vitamin C (mg)	14	36.6	28 mg	4.2	2.4	144	2.8
Vitamin E (mg)	0.54	0.05	2 mg	1.19	0.26	-	-
Iron (mg)	-	0.47	2.71 mg	7.61	0.61	1	0.28

and small-scale urban growers who sell their crops have the advantage of lower transportation costs. These growers may not have to deal with middlemen or brokers as rural farmers usually do and thus are able to respond quickly to price fluctuations.

The most important distinguishing character of peri-urban cultivation of vegetables is not so much its location, but the fact that it is an integral part of the urban economic, social and ecological system. It uses urban resources (land, labour, urban organic wastes and water); produces for urban citizens; is strongly influenced by the urban conditions (policies, competition for land, urban markets and prices); and impacts on the urban system (effects on urban food security and poverty, ecological and health impacts). Although some forms of peri-urban cultivation are based on temporal use of vacant lands thus forming an important component for sustainable city development.

Rapid urbanization is taking place in most developing countries. Increase in urban poverty, food insecurity and malnutrition, with a shift in their concentration from rural to urban areas is accompanying urbanization. Many cities cannot

cope with the massive growth of its population, which leads to a decrease in urban shelter and security of tenure, backlogs in delivery of basic services, increasing inequality and segregation, degradation of the urban environment and increase in poverty, malnutrition and food insecurity.

Longer-term peri-urban cultivation of vegetables seems to be sustainable; especially when it's potential for multi-functional land use is recognized and fully developed. This multi-functionality of peri-urban cultivation makes it a cheap producer of public goods. Sustainability of urban agriculture seems strongly related to its contributions to the development of a sustainable city – i.e. one that is inclusive, food-secure, productive, and environmentally healthy.

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ALWAYS LEARNING

PEARSON

# ROLE OF COIR INDUSTRY ON KERALA'S RURAL DEVELOPMENT

K. Baby

**A**gro-based industries play an important role in strengthening industrial and agricultural linkages. Agro-based industries are those, which are involved in supplying the farm with agricultural inputs besides handling the products of the farm. Agro-based industries are those industries which have either direct or indirect links with agriculture. Agro-based industries must foster the spirit of interdependence between agriculture and industry. Such industries must use the raw materials provided by agriculture and their output must have a market among the rural population. Surplus rural manpower must be absorbed by these industries. Agro-based industries are these processing industries which use large quantities of agricultural raw materials such as rice milling, wheat flour processing, textiles, sugar, tea, jute, coir, coffee, paper, rubber production etc. These agro-based industries provide an excellent nexus in promoting integrated development of agricultural and industry and in transforming a stagnant rural economy into a dynamic economy.

## Economics of Coir industry

The coir industry has been significantly export-oriented and a valuable foreign exchange earner. On an average about 20 per cent of the total coir products manufactured are exported from the country, mainly to West European countries, United States of America (USA) and Canada. The products include fibre, yarn, mats, matting, rugs and carpets, rope and rubberized coir. Unfortunately, the exports in the recent past show a declining trend. Increased competition from other countries, use of substitutes, traditional methods of production, delay in executing orders, etc. are some of the major reasons mentioned for reduced exports. Because of this, the manufacturers have started to pay more attention to the internal market that was not fully exploited earlier. Efforts have been stepped up to popularise coir products in India by various organisations both in public and private sectors and to penetrate into huge market that exists for





floor covering and other applications. In the mean time, coconut cultivation also got spread over in many regions other than the traditional areas like Kerala, in a significant way. Prominent among the states other than Kerala, which have promoted coir industry, are Tamil Nadu, Karnataka, Andhra Pradesh and Orissa.

### Role of coir industry

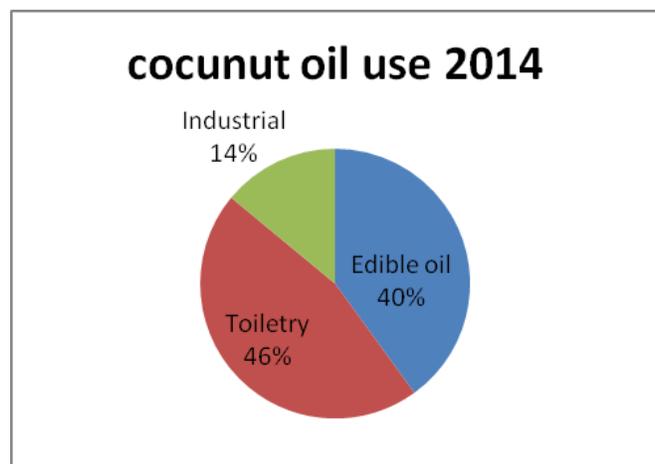
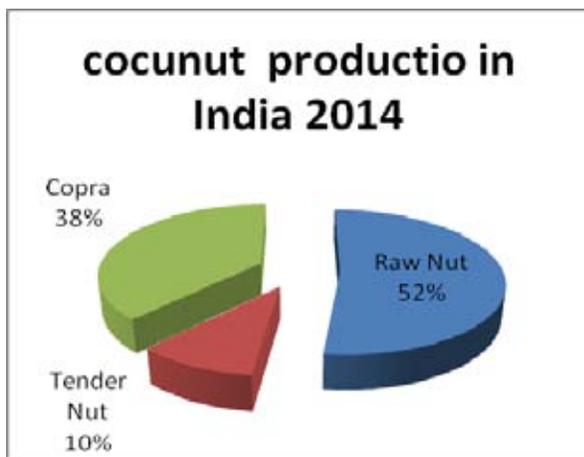
Taking into consideration the importance of agro-based industries coir is a unique natural fibre used in diverse applications. The industry is a traditional one in some ways, outmoded practices, and has had a chequered history. Most of the coir workers are coming from socially and economically backward classes. The industry provides direct employment to more than 3.5 lakh workers, majority of whom are women. It is mainly concentrated in coastal areas. The major constituents in the coir sector are co-operatives, private, public, government undertakings and unorganized manufacturing units. But, over a period of time, the coir sector has not grown appreciably and has remained almost stagnant.

### Employment generation

The coir industry in Kerala presently provides direct employment to about 3.60 lakh persons including those who are employed for part of the year. It is a fact that a good percentage of this includes women engaged in the spinning of coir. The indirect employment is also very significant. The potential of this industry for upgradation and expansion is high and if taken advantage of,



this will have a significant impact on the coastal economy of the State. Recognising this fact, the government introduced a number of regulations for sustaining the industry including those intended to improve the availability of husk for the industry at reasonable cost. Thanks to increased level of mechanisation, utilisation of husk for production of fibre out of the total husk available in the region is expected to improve from the current level of 30 per cent to 50 per cent. It is imperative that the Government of Kerala evolves strategies for research and development in this field and stimulates diversification and growth of the industry through co-ordinated activities among the



functional ministries concerned with agriculture, industry and infrastructure development.

### Coconut as an agro product

In Kerala, the coconut kernel is an essential food ingredient that contributes to taste in a number of preparations. Coconut is also valued for the extractable edible oil contained in the kernel. Thus the fibre associated with coconut is often considered secondary and due to lack of an organised collection mechanism, a large part of this is utilised as fuel and only the remaining is utilised for fibre extraction. This happens even in the coconut oil industry where they concentrate on the oil and the oilcake. Enough attention is not paid for utilisation of the fibrous part.

### Problems of coir industry

The industry is beset with certain inherent problems that need to be overcome to achieve accelerated growth. Neither the coconut farmers nor the end product manufacturers are involved in the primary and extensive activities of husk collection, retting husk, fibre extraction and spinning of yarn. The initiative for these peculiarly rests with the intermediary or informal sector operated by the local merchant community. The fact that the upward linkage is weak creates a disjointed situation with structural and productivity implications of sustaining a large mass of underemployed and un-organised workers.

### Challenges in the export market

The Exporters of coir in Kerala are facing new challenges. The emphasis of the buyers

is gradually shifting to the new wave of eco-friendliness, biocompatibility, concept of nature sustainable process, renewable resources, etc. from general considerations relating to the product. The industry always sees the trade in coir yarn and coir floor coverings as the thrust area of coir, but the share of foreign trade in this segment is small. It is mostly the high value products that fetch better returns in the export market. The domestic demand for such products is rather low. This is a factor, which stands in the



way of development of high value products taking advantage of economies of scale.

### Need for modernization

Another equally important factor for the need for modernisation of the industry is compulsions of the market. Unless the technology is modernised to produce improved and standardised products at reasonable cost and new products are developed, the future of the industry in Kerala does not look promising. Various governmental and non-governmental agencies have already realised the above

CHALLENGES IN COIR INDUSTRY	REMEDIAL MEASURES REQUIRED
Husk Procurement not achieved as desired, Shortage of Fibre in the State Frequent hike in price of Fibre in neighboring States	Strengthening of Husk collection and Fibre Production
Regulated Mechanization of Coir Industry	Modernisation of Coir Industry and enhancement of production
Marketing and publicity	Organising trade fairs at State National and International
Price Fluctuation Fund	Stabilization of price of coir fibre yarn and coir products
Coir Geo Textiles Development Programme	Implementing pilot projects inclusion of Geo textiles as a standard Engineering material
Cluster Development Programme	Formation of clusters as per direction from Government

factors and steps have been initiated for gradual modernisation and upgradation of the technology in coir industry in Kerala. In view of the social economic and development considerations, Coir Board the apex body functioning in the sector plans to bring in a quantum change with holistic approach to usher a new era in the coir sector. In order to ascertain the causes for the present unsatisfactory situation, Coir Board decided to conduct a Status Study of the industry, which will identify the problems of the various segments of the industry and arrive at likely solutions so that necessary policy measures can be initiated and further promotional and other schemes intended to mitigate the current problems in the industry can be launched. The State of Kerala accounts for 70 per cent of the production of coir products, and other states, who produce coir products are Tamil Nadu, Karnataka, Andhra Pradesh, Orissa West Bengal and North-eastern states. The promotional efforts are spearheaded by Coir Board supported by other state-level organizations Coir Board is a statutory body established by an act of Parliament, and it has now assumed the role of a promotional organisation as envisaged in the vision document named Millennium Development Mission Document (MDMD).

The main objective is to attain a quantum leap in the production and sale of coir products both in foreign and domestic markets. Co-operatives play a big role in the industry with a number of activities and a large share of workers under their fold. Kerala State Coir Cooperative Marketing Federation (COIRFED) is the apex body in this sector. To provide better welfare conditions, Kerala Coir Workers Welfare Fund Scheme was introduced in 1989. To achieve technical development, develop new processes and innovative products and achieve quality improvement, Central Coir Research Institute (CCRI), Alappuzha and Central Institute of Coir Technology (CICT), Bangalore were established under the aegis of the Coir Board. Value added products and product diversification

are the aim of these Institutes. Coir ply, Pith plus and Coir ret, Geo textiles are some of the notable contributions by these institutes.

## Conclusion

Coir industry though more than 150 years old, is still to achieve professional approach and strength to be competitive in the field. The employees are demotivated and younger generations are hesitant to take up jobs in the sector because of low income level and absence of a modern factory set up. The level of income is much below compared to other sectors. The shortage of fibre, environmental degradation, poor result in the mechanisation programme, etc. is other key factors for the backwardness of coir sector. A concerted effort for promoting coir products by introducing new products, product substitution, searching new areas of application integrating traditional sector with new management approach, new strategies for market development and export promotion, programmes for widening the husk collection areas etc. are to be made to ward off the challenges faced in the era of globalization. Programmes for introducing state-of-the art schemes and systems are to be given maximum priority. Development of need based financial assistance is another important aspect in the coir sector along with appropriate decisions like creation of Special Economic Zone. Hence, it is clear that an action to bring in a structural shift in the industry is highly warranted not only to overcome the existing problems but also to surge ahead to bring more prosperity to the sector and thus to the State. The motto should be to convert the low value high volume product to high value high volume product providing job security to the employees, benefiting the economy of the State taking the coir sector with a competitive spirit.

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**The industry provides direct employment to more than 3.5 lakh workers, majority of whom are women.**

# AGROFORESTRY: A POTENTIAL TOOL FOR RURAL DEVELOPMENT AND FOOD SECURITY IN INDIA

Dr. Avinash Tripathi

*Agroforestry is an integrated approach of using the interactive benefits from combining trees and shrubs with crops and/or livestock on the same piece of land. It combines agricultural and forestry technologies to create more diverse, productive, profitable, healthy, and sustainable land-use systems. This is the combining of agriculture and tree growing so as to produce both agricultural products and tree products on a commercial basis.*

The practice of agroforestry is not new to India. The origin of agroforestry practices is believed to have been during Vedic era (1000 BC), however, the agroforestry as a science was introduced only in the second half of the 20<sup>th</sup> century. According to agroforestry historian Chen Yung, agroforestry was practised 1,700 years ago in Shanyang County, China. Three hundred years ago, Chinese tree farmers grew agricultural food crops under fir tree plantations in southern China. John Benen, a Canadian forester, in 1970s coined the term agroforestry. The systematic research in agroforestry geared up after the establishment of the International Council for Research in Agroforestry (ICRAF) in 1977, which was renamed in 1991 as the International Centre for Research in Agroforestry. In India, organized research

in agroforestry was initiated in 1983 by the establishment of All India Coordinated Research Project on Agroforestry by ICAR at 20 centres and later establishment of the National Research Centre for Agroforestry at Jhansi in 1988.

## Types of Agroforestry Systems

**(1) Agrisilvicultural Systems:** In this system, agricultural crops are intercropped with trees in the interspace between the trees. Under this system agricultural crops can be grown upto two years under protective irrigated condition and under rainfed farming upto four years. The crops can be grown profitably upto the above said period beyond which it is uneconomical to grow grain crops. However fodder crops, shade loving crops and shallow rooted crops can be grown



economically. Periodic trimming and thinning of the trees is also recommended for better crop growth. Wider spacing between crop and tree rows is adopted for easy cultural operations and to provide more sunlight to the intercrop. Performance of the tree crops is better in this system compared to the monoculture.

**(2) Silvopastoral Systems:** The production of woody plants combined with pasture is referred to silvipasture system. The trees and shrubs may be used primarily to produce fodder for farm animals or they may be grown for timber, fuelwood, and fruit or to improve the physical properties and health of soil. The tree species suitable for silvipastoral system should have following properties-

- **High protein and nutrient content:** High protein content improves livestock nutrition.
- **Palatable:** Farm animals are selective about the fodder they eat.
- **Free of toxic substances:** Some fodder species contain toxic substances. These species should not be selected for this practice.
- **Rapid growth and sprouting:** Species selected for this practice should be able to grow rapidly after pruning.

**(3) Agrosilvopastoral Systems:** The production of woody perennials combined with annual crops and pastures is referred to as agrosilvopastoral system. This system is grouped into two categories- Home gardens and woody hedgerows.

**Home gardens-** Home gardens represent land use system involving deliberate management of multipurpose trees and shrubs in close association with annual and perennial agricultural crops and livestock within the compounds of individual houses. The whole tree-crop-animal units are being intensively managed by family labour.

**Woody Hedgerows-** In this system various woody hedges especially fast growing fodder shrubs and trees are planted for the purpose of browse, mulch, green manure and soil conservation.

**(4) Other Systems:** Other systems include apiculture with trees, aquaculture and horticulture with trees, etc.

**a) Apiculture with trees:** In this system various nectar producing trees frequently visited by

honeybees are planted on the boundary of the agricultural fields.

**b) Aquaforestry:** In this system trees and shrubs preferred by fish are planted on the boundary and around fish ponds. Tree leaves are used as feed for fish. The main role of this system is fish production and bund stabilization around fish ponds.

### Benefits of Agroforestry

Agroforestry systems can be advantageous over conventional agricultural and traditional forestry practices. They can offer increased productivity, economic benefits and ecological balance. Biodiversity in agroforestry systems is typically higher than in conventional agricultural systems. With two or more interacting plant species in a given land area, it creates a more complex habitat that can support a wider variety of soil microbes, birds, insects, and other animals. The overall benefits from agroforestry can be discussed under following heads-

#### Benefits to environment and soil health:

- Cleaner water through reduced nutrient and soil runoff.
- Reducing deforestation and pressure on woodlands by providing farm-grown fuel wood
- Reducing or eliminating the need for toxic chemicals and fertilizers.
- Odour, dust, and noise reduction.
- Green space and visual aesthetics.
- Maintenance of wildlife habitat.
- Reduction of pressure on natural forests. The daily needs of fodder, fuel, timber, etc. are met from the field as a result forest is used less, and so it is conserved.
- More efficient recycling of nutrients by deep rooted trees on the site.
- Better protection of ecological systems.
- Reduction in soil erosion through the agency of wind and heavy rains soil binding ability of tree roots.
- Improvement of soil structure and nutrient level through the constant addition of organic matter in the form of litter and humus.

- Trees protect the soil from the harmful effects of strong sun, wind and heavy rain, and conserve available soil moisture.
- Both trees and shrubs provide nesting and food for birds, thus contributing in enrichment of biodiversity.

#### **Benefit to crops and agriculture:**

- Increment in outputs of food, fuel wood, fodder, fertiliser and timber.
- Reduction in incidences of total crop failure due to epidemics, drought and flood which are common in single cropping or monoculture systems.
- Increase in levels of farm income due to improved and sustained productivity.
- Field productivity is not weather dependant in agroforestry systems.
- Tree leaves provide organic matter for soil organisms. This increases the fertility of the soil, and so crops get more nutrients to grow.

#### **Benefits to society, farmers and rural economy:**

- Reducing poverty through increased production of wood and other tree products for home consumption and for sale.
- Contributing to food security by restoring the soil fertility for cultivation of food crops.
- Countering global warming and the risk of hunger by increasing the number of drought-resistant trees and the subsequent production of fruits, nuts and edible oils.
- Through more diverse farm outputs, improved human nutrition is provided by agroforestry.
- Providing growing space for medicinal plants in areas where people have limited access to modern medicines.
- Improvement in rural living standards through employment generation and increased family income.
- Improvement in nutrition and health through increased quality and diversity of food crops, milk, meat, fish, etc.
- Stabilization and improvement of communities

through elimination of the need to shift sites of farm activities.

- Providing additional and diversified earnings.
- Improvement in living environments.
- Providing a buffer against the fluctuations in prices and drought, frost and flood events. Prices of wood products are relatively stable compared to most agricultural products.
- Creating opportunities for new jobs and industries.
- Timber, fruit, herbal medicines, firewood, fodder, etc. need not to be purchased from market. Livestock are also easier to raise for income, and overall the home economy is strengthened.

#### **Agroforestry and rural development**

##### **Agroforestry vis-a-vis rural environment:**

Agroforestry is a potential tool for sustainable management of natural resources. It increases the biodiversity. It gives shelter to plants, animal, birds and soil microbes. Biodiversity is very important for maintaining agricultural productivity. Introduction of agroforestry has helped reduce soil erosion and restored soil fertility. Due to tree cover the run off rainwater is reduced and the floods are checked. Agroforestry is an ideal example of application of art of growing trees on farm land. The dried leaves of trees are used as organic manure that promotes organic farming. Due to availability of fuel wood, there is a significant reduction of deforestation, which reduces ecological balance. Where farmers have incentives to plant trees and have easy access to information and planting material, they depend less on natural forests and are less likely to damage them.

##### **Forestry based small scale industries:**

Assessing local demand before planting trees is a critical step in adopting agroforestry. Several small scale industries based on major and minor forest products can be easily established in villages. Thus, the tree species should be selected according to the industrial and market needs. Tree derived products can be used in making furniture, toys, paper, oil, gums, natural dyes, charcoal, bidi, plates, mats, brooms etc. These small scale industries can very

effectively contribute to the overall development of farmers and the entire village.

**Security during crop failure:** Agroforestry enhances diversity both in terms of plant biodiversity and enterprise diversity. The enterprises diversity decreases risk and allow farmers to reduce seasonal labour breaks, earn income throughout the year and accrue benefits at different times – over the short, medium and long term. Farmers prefer trees over conventional crops because little effort is required to maintain them and they can be sold whenever cash is needed. Appropriate combinations of crops, animals and trees in agroforestry systems can not only increase farm yields, but promote ecological and social resilience to change because the various components of a system and the interactions between them will respond in differing ways to disturbances. A diversity of species and functions in an agroforestry system is therefore, a risk reduction strategy. The incidences of total crop failure are also considerably reduced in agroforestry. However, in case of any such happening the tree products can support the farm families thereby preventing famines.

**Employment generating potential of agroforestry:** Development of wastelands by the introduction of agroforestry will generate gainful employment for the rural poor. They can be engaged directly into the tree based village industries or they may sell the raw product to some medium or large scale manufacturers and earn their livelihood.

**Development of wasteland:** Introduction of agro forestry will be useful in the development of wastelands in Indian villages. These wastelands when developed would provide fuelwood, fodder, fruits, fiber and oils. Further, it greatly enhances the scenic beauty and aesthetic value of wastelands.

### **Agroforestry and Food Security**

Worldwide, 870 million people go hungry every day. With the world population projected to exceed nine billion by 2050, global agricultural output must expand by an estimated 60 percent to meet global food needs. The food prices have reached an all time high. A variety of factors

have led to rising food prices, including increase in the price of crude oil and other fuels, a lack of investment in the agricultural sector, an increase in demand for food grains in growing economies like India and China, the expansion of the biofuel sector, and land degradation and declining soil fertility.

Agroforestry has strong potential in addressing problems of food insecurity in developing countries, particularly in India. It allows producers to make the best use of their land, can boost field crop yields, diversify farm income and increase resilience to climate change. The incorporation of tree species into agricultural systems can increase farm productivity, increase the incomes of marginal and small farmers, and improve nutrition among the rural poor. The World Agroforestry Centre (ICRAF) on 10 July, 2013 announced the publication of a working paper, titled 'Agroforestry, food and nutritional security,' which highlights the contribution of agroforestry to food security and the policies required to maintain and enhance this contribution. The publication highlights four links between food security and agroforestry viz., the direct provision of tree foods, increased farm incomes, the supply of cooking fuel, and the provision of ecosystem services that maintain other food sources. The role of agroforestry in food and nutritional security can be justified in following heads:

**Improved soil fertility:** One of the major potential benefits of farm trees is their ability to replenish nutrient depleted soil. The leguminous trees and shrubs are very effective at drawing nitrogen from the air and fixing it in the soil, reducing the need for inorganic nitrogenous fertilisers. The leaves shed by the trees also replenish the soil, increasing its structural stability and capacity to store water. Further, in silvipastoral and agrosilvopasoral systems animal manure is easily available which can be used to fertilise the soil reliance on inorganic fertiliser can be further minimized. In many parts of our country productive agricultural land is degrading in quality, and the fertility of soil continues to decline due to extensive monocropping and unjustified uses of chemical fertilizers and pesticides. This situation must be reversed. Many farmers are unable

to afford commercial fertilizers, lack sufficient animal manure, and cannot leave their land fallow to rebuild soil health. This means that soil organic matter is declining and farmers are unable to replenish the nutrients that are removed from the soil with each harvest. As a result, the yield is falling year after year. Agroforestry can be a suitable solution to this alarming problem.

**Enhanced yield:** The practice of agroforestry enhances the crop production by increasing soil fertility and by adding organic matter to soil for better water retention. The enhanced yield per hectare contributes significantly in mitigating the global hunger.

**Availability of fodder for animals and access to milk and meat protein:** Agroforestry can contribute in increasing the production of milk and meat protein without sacrificing large tracts of agricultural land. The fodder trees and shrubs can be planted along boundaries for protection of crops. At maturity they are cut or trimmed and the leaves fed to the cattle, and the trees grow again for subsequent rounds of feeding. Improved milk yields from feeding cattle can improve household food security. Further, alongwith food security, a nutritional security can also be provided by silvipasture or agrosilvopasture through access to milk and meat protein to farmers.

**Availability of fruits and nutrition:** fruits are major sources of vitamins and these are very important from nutrition point of view. Expanding fruit tree cultivation can have a significant impact, particularly on the quality of child nutrition. By growing several species of indigenous and exotic vitamin-rich fruit trees on their farm, farmers can have access to fresh fruits throughout the year.

**Availability of fuel for cooking:** Firewood and charcoal from trees play significant role in food security of villagers enabling them to cook food to make it safe for consumption and palatable. The prices of modern energy sources are increasing continuously and this situation is unlikely to change in near future. When the farmers practise agroforestry, less fuel wood needs to be purchased, there is less reliance on collecting from natural stands, and less time is involved in collection. This leaves more time for on-farm and off-farm income-generating activities.

### **Increased purchasing power of farmers:**

Many farmers appreciate agroforestry because it generates cash income through the sale of tree products. It also provides products that the farmer would otherwise have to purchase. It provides opportunity to farmers to substitute nitrogen-fixing plants for mineral fertilizers, fodder shrubs for expensive dairy meal and farm grown timber and fuelwood for wood bought from the market. Through agroforestry farmers can also generate additional income through sale of livestock. It overall improves their purchasing power. Buying food using the income received from a single commodity crop can also lead to food insecurity for farm households when payments are delayed or unpredictable in value. Monocultures also reduce resilience to shocks such as drought, flood and the outbreak of pests and epidemics. The species diversification through agroforestry also supports the farmers in such difficult situations by diversifying their income avenues.

### **Conclusion**

Integration of agroforestry practices into the existing farming systems improve the livelihoods of farm families by increasing the range of products available and opportunities to earn cash income, lower risks associated with drought and at the same time improve biodiversity and nutrient and water cycling in the agro-ecosystem. Although the benefits to livelihoods and ecosystems may be clear, there is a one to three-year lag between the first use of agroforestry and the appearance of the benefits. It is a long term investment. The poor farmers may be hesitant in adoption of the agroforestry systems despite knowing the benefits, as their priority is to meet immediate household food and income requirements. A potential way of encouraging farmers to agroforestry is cash payment for their environmental services. Farmers introducing trees could be rewarded for the ecosystem services they provide during initial years to support their economy.

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# PALMYRA – THE INVALUABLE PALM OF INDIA

Dr. Bibhas Chandra Mazumdar

**D**espite the fact that regular cultivation of palmyra palm in organized orchards is not a practice in India except in some parts of Tamil Nadu, Andhra Pradesh, Orissa and West Bengal, the tree numbering around 77 million is estimated to have anchored in all the tropical parts in the country.

Ability to thrive and make vigorous growth in inferior type of soil, easy propagation by seeds, occupying less soil space, resistance against high wind, long span of life of up to 100 years or more and getting favour and protection from man for versatile attributes are the distinctive features of this palm which keeps up its survival and persistent production. In spite of the fact that this valuable tree going by regional names as taar, taal, tala, tale, nungu, pana nungu, tate nungu, thati munjal, munjal etc. rarely receives cultural care and inputs by the people, it continues to render plentiful benefits to them. In fact, every part of the tree has usefulness and a proverb goes in Cambodia that palmyra confers 800 benefits to man. Practical utility of the tree under Indian condition may be known from the following facts:

(i) **Fruit** – The rich yellow coloured mellowish juice is the liquid part of mesocarp which the common people call as pulp. It remains intermixed with the fibrous part of mesocarp of the fruit and is obtained on squeezing

the fibrous mesocarp after removing the peel of the fruit. This yellow juicy extract has a gustative appeal when consumed especially on blending with thickened milk, with or without pulpy fruits like banana, jackfruit, mango and ground coconut and sweetening with sugar or jaggery. A number of sweetmeats are made by the Bengalee families using the juicy pulp, such as luchi (puri), bora (fried cake), pudding, taal-patali (hardened block) and payas (blended with thickened milk, jaggery of wild date-palm and ground coconut). Making these products has even a religious link among the Bengalee hindus, who prepare these sweetmeats to offer them to Lord Krishna on his birthday, which is celebrated as the holy Janmastamee. Nutritive value of the pulp is high and consumption of 100 g provides 0.7, 0.2, 0.5, 20.7 and 0.7 gram respectively of protein, fat, crude fibre, carbohydrate and minerals, 87 Kcal energy and appreciable amount of carotene and vitamin C.

(ii) **Toddy**- The sweet sap tapped from spadices (spikes of flowers) of the palm, known as toddy is perhaps the most important produce having large use in India. This by-product of the tree is obtained by tapping both male and



female trees. While in male trees, flowering shoots are tapped in winter season, for female trees, fruiting bunches are tapped from late winter to spring and yield goes higher in the latter. Before tapping, many leaves of the tree are cut off to stimulate sap flow. Beating and crushing of the racemes (inflorescence) is also necessary to make wounds. The exuded sap is collected in earthen pots in the morning and evening. When freshly extracted, the sap is very sweet, refreshing and aromatic and is called neera, pathaneer, kallu, taal ras etc. However, it is fermented within few hours and gives rise to an alcoholic product, known as arrack, taari etc. This is raw wine and has much popularity. Some people believe it to be an energy-giving drink. Fermentation may however, be retarded by lacquering the earthen pots with lime before tapping but this makes the juice somewhat alkaline.

- (iii) **Jaggery** - A thick molasses made from toddy has a great demand in south India where it is popularly known as ole bella, karupatti vellam, thaati bella etc. Various products are made there using this, e.g., payasam, by mixing with thickened milk, neyyai appam, panakkam etc. To make jaggery, toddy is first warmed adding some lime to it and the alkalinity developed by liming is countered by adding tender tamarind on cooling it. Then it is strained and boiled to 1200 - 1300 C for an hour. White frothing that appears at early stage is skimmed out with ladle. Addition of some milk or cooking oil during boiling also prevents scum. On suitably adjusting the cooking duration, texture of the jaggery is made hard, medium hard or soft. After cooking, the product is allowed to settle for few days and circular or brick-shaped blocks are made before it is hardened. Occasional coating of the blocks is done to avert their fermentation. Although slightly acidic, palm-jaggery is very sweet containing 77% sucrose (cane sugar) and 1.7% glucose. It also contains 1 % protein, 3.2% minerals, 0.5 % phosphorus, 0.8% calcium, besides adequate carotene and vitamin C. For high calcium content, jaggery is fed to the cattle to avert illness in them that may develop after a calf is born.
- (iv) **Candy** - Candy or sugar-crystal is another product made from the toddy. To make this, the boiled sap is poured into pots, which are tightly covering with lids and are stored underground. After several months, the lids are removed, the crystals formed are taken

out and the part which has not crystallized is used again. Palm juice crystals have great medicinal value against cough and cold in children.

- (v) **Sugar**- Crude form of brown coloured sugar is also a product made from boiling the toddy.
- (vi) **Seed** - When tender, the endosperm of seeds is succulent, mildly sweet, pale white like litchi, which is refreshing and thirst quenching. These are sometimes preserved in syrup with addition of flavouring substance. Storing the seeds till winter is also done to allow the kernels present inside the hardened endosperms to become swelled. These mildly sweet soft kernels are highly relished and there is a ritual among the Bengalee hindus to offer these to the goddess Lakhshmee.
- (vii) **Sprouts** - Seedlings of palmyra are even consumed at infant stage of growth. For this, drupes are closely planted in loosened soil. After a few months when sprouts have emerged, these are uprooted and the long fleshy stems containing high starch are consumed by roasting, boiling or frying. The preparation is very popular in parts of south India, where it is known as panai kizhangu, thegalu, gengulu etc. Making flour from the stem is another use in south India.
- (viii) **Root** - A snack is prepared in some parts in south India on drying the roots, known as odiyil. Apart from the uses as food which have been stated above, parts of the palmyra tree are utilized for other purposes also and some of these have been cited in the following.
  - (i) **Leaf** – The tree produces 30–40 long leaves and these are used in thatching of roofs, making hand-fans, hats, umbrellas, mats, buckets, toys, fancy materials etc. In ancient India and Indonesia, palmyra leaves were used for writing purpose like paper. These are still scantily used in parts of India for some special purpose of writing. To prepare these, suitable sized leaves are used and these are processed by boiling with salt water and turmeric. On drying, these are polished with pumice stone, cut to size and used for writing with stylus. Hard midribs of the leaves are used to make coarse brooms.
  - (ii) **Trunk**- The robust and cylindrical trunk of the tree has good timber value. Being long and durable, this is used as post, pillar, foot-bridge on streams, furniture etc.

(iii) **Fibre**—Heavy fibrous material extracted from leaf-petioles, stem and fruit pericarp is processed to make hard brushes. These are painted with black colour to make bassinets.

The palmyra palm (syn. Cambodium palm, toddy palm, sugar palm, lontar palm), which is botanically recognized as *Borassus flabellifer* L. has its nativity to Africa, Asia and New Guinea but is considered India also. The tree exists in two forms, which are male and female and the flowers of these two types are borne by separate trees. Only the female trees that produce female flowers are capable to produce fruits and the male trees producing male flowers do not fruit. Nevertheless, existence of at least one male tree near the female trees is essential to pollinate the flowers of the female trees, for without that, the female trees cannot set fruits. However, the same tree producing both female and male flowers is sometimes met with though rarely and for such a tree, presence of any separate male tree for pollination purpose and thereby, fruit production is not essential. The blackish brown fruit of palmyra which may weigh 3 kg or more is oblate to spherical in shape when 3 seeds are present in it and is curved when contains two seeds and is more curved when contains one seed.

**Production:** Although palmyra trees grow as wild from the seeds that are thrown here and there on consuming the pulp, these are also raised by interested people in places of choice. In tropical parts of West Bengal, banks of large tanks are often utilized by planting palmyra and such a tank is popularly termed as taal-pukur. Planting along roads, farm land and homestead land in villages is also a common practice in the peninsular region, Orissa and West Bengal. The tree is grown exclusively from seeds, which germinate easily but sowing at more than 15 cm depth may cause the seeds to rot. More than one seedling coming out from a single seed is frequently observed. At early stages, the plants grow slowly but later they make quicker growth. Normally, no manuring is done to a tree but application of 50 – 60 kg farmyard manure in winter is observed to raise the yield considerably. Like any other palm, productiveness of palmyra is markedly increased by copious application of wood ash or potash fertilizer.

Palmyra has a problem in that, it gives fruits after many years which may be 12–15 or sometimes after 25 years of sowing seeds. An adage in West Bengal says that a palmyra tree will bear fruits at the 12th year but only when it has not touched the saliva of a cow. This indicates that feeding of the tree by cattle at its early period of growth is a

cause for its delayed maturity. However, this is not the real cause but it reminds that the palm should be protected from animals during its early growth period. Palmyra trees are sometimes threatened by a number of fungal diseases and insect pests. Among fungal diseases, splitting of leaves, stem-bleeding etc. are serious but most destructive is bud-rot, caused by the pathogen, *Phytophthora palmivora*. Application of copper fungicides makes effective control of all diseases. Among insect pests, rhinoceros beetle is most notorious. To control insect pests, suitable insecticides become necessary to be applied. The tree yields 100 – 200 fruits, 100 – 150 litres of sap and 20 – 30 kg of jaggery in a year. High yield is obtained in the coastal tropics and in the Laccadive Islands.

## Conclusion

For multifarious benefits derived from palmyra trees, it is a logical approach to pay much greater emphasis on this palm in India. The following suggestions are put forward in particular.

- (i) Yield potential of fruits and sap being lower in India, high-yielding varieties or types from south-east Asian countries should be imported and screened to sort out those having higher productiveness specifically for various tropical zones of the country.
- (ii) Clonal propagation of the palm needs encouragement as seed propagation does not retain all characters in the offspring.
- (iii) Attention should be paid to lessen maturity of the trees to bear fruits.
- (iv) Processing of fruit pulp as well as toddy needs improvement for greater acceptability and export.
- (v) Export potentiality of the country liquor made from the toddy on distillation deserves interest.
- (vi) Expansion of area under the palm by afforestation should be seriously viewed.
- (vii) Tallness of the palmyra trees appears to be a great problem in harvesting of the fruit clusters and also spraying the crowns to protect against pests and this necessitates climbing on the trees. Tall trees with leaves having spikes are much threatened by thunderbolts and for this reason, many people have aversion to grow palmyra trees. Hence, imparting dwarfness to the trees by suitable means and exploration of dwarf varieties, if any deserves attention.

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# BE READY TO COMBAT VECTOR BORNE DISEASES

Dhanya Sanal

**S**mall bite by a seemingly trifling organism can really turn your life upside down. Can you believe the fact that Vector borne diseases cause more than one million deaths each year? Yes, the number of deaths from vector born diseases is increasing alarmingly. Under tropical conditions of excessive heat and high humidity, man is subject to serious physical and mental handicaps. He perspires profusely and loses vigor and energy and exposes himself to such dangers as sun stroke and diseases. Tropical conditions are ideal for survival of germs and bacteria and also encourage the spread of insects and pests. On this World Health Day, WHO is drawing attention to a group of diseases that are spread by insects and other vectors, the heavy health and economic burden they impose and what needs to be done to reduce these burdens. Many people who survive infection are left permanently debilitated, disfigured, maimed or blind.

The tag line of this year's World Health Day 'Small Bite Big Threat', compel to turn the attention towards the alarming occurrence of vector borne diseases, and it substantiate and recommends the governments, local authorities, community groups

and individuals to work together to prevent vector borne diseases. "Mosquitoes, flies, tick and bugs may be a threat to your health-and that of your family-at home and when travelling", is the message of this year's World Health Day.

Epidemiology Vectors are organisms that transmit pathogens and parasites from one infected person (or animal) to another. Vector borne diseases are illnesses caused by these pathogens and parasites in human population and account for 17% of the estimated global burden of all infectious diseases. Although, the disease most commonly found in tropical areas where 40% of the population is at risk, globalization, climate change and urbanisation have affected transmission

of vector borne diseases and causing their appearance in countries where they were previously unknown.

## Prevention and control

Time has come to utilize the full potential for vector control for reducing vector-borne disease. Back in 1940's, the discovery of synthetic insecticides was a major breakthrough and the massive use of insecticides in 1940's and 1950's successfully brought many important vector-borne diseases under control. But, with in the past two decades, many important vector-

**World Health Organization**

### VECTOR-BORNE DISEASES

**VECTORS MAY BE A THREAT TO YOU, AT HOME AND WHEN TRAVELLING**

**VECTORS ARE SMALL ORGANISMS THAT CARRY SERIOUS DISEASES**

**WITH JUST 1 BITE** they can transmit diseases such as:

- Malaria
- Dengue
- Leishmaniasis
- Lyme disease
- Yellow fever
- Japanese encephalitis

**Diseases spread by vectors kill a million people every year and more than half of the world's population is at risk**

**TAKE SIMPLE MEASURES TO PROTECT YOURSELF AND YOUR FAMILY**

- Get vaccinated against yellow fever and Japanese encephalitis
- Install window screens
- Wear light-coloured, long-sleeved shirts and trousers
- Use insect repellent
- Sleep under an insecticide-treated bed net
- Get rid of stagnant water from places where mosquitoes breed, such as in old containers, flower pots and used tyres

For more information, contact your health-care professional  
[www.who.int/world-health-day](http://www.who.int/world-health-day)

borne diseases have re-emerged or spread to new parts of the world. Alongside this alarming spread of vectors there is a serious concern of increasing insecticide resistance. At the same time, the world is facing an extreme shortage of entomologists and vector control experts who promote 'integrated vector management' as the best approach to strengthen vector control. This approach uses a range of interventions, from indoor residual spraying to the use of natural insect predators, in combination and in a value added way. Integrated management makes sense as many vector borne diseases overlap geographically.

**Key elements in the prevention and control of vector borne diseases include the following:**

- Long-lasting insecticidal nets.
- Indoor residual spraying
- Outdoor spraying
- Addition of chemicals to water
- Insect repellents like coils, vaporizing mats.
- Reducing breeding habit of the vector.
- Biological control of vectors through the introduction of parasites, predators or other living organisms.
- Genetic control strategies.
- Waste management.
- Housing modification
- Personal protection against the vector
- Medication for travelers
- Prophylaxis and preventive therapies.
- Mass treatment for lymphatic filariasis, soil transmitted helminthiasis, onchocerciasis.
- Vaccines for Japanese encephalitis, Tick-borne encephalitis, and yellow fever.
- Blood and body fluid safety in the case of Chagas disease and Crimean-Congo haemorrhagic fever.

- Food safety in case of Chagas disease and Tick borne encephalitis.

**Key challenges in the control of vector-borne diseases include.**

- Emerging insecticide resistance.
- Lack of expertise in vector control.
- Surveillance of vectors and their diseases.
- Sanitation and access to safe drinking water.
- Pesticide safety and poisoning
- Climate and environmental change.

The poorest segment of the society and least developed countries are most affected by vector born diseases. illness and disability prevent people from working and supporting themselves and their family causing further hardship and impeding economic development.

World Health Day is celebrated on 7 April every year to mark the anniversary of the founding of WHO in 1948. Each year a theme is selected that highlights a priority area of public health. The Day provides an opportunity for individuals in every community to get involved in activities that can lead to better health. In recent years, renewed commitments from ministries of health, regional and global health initiatives, with the support of NGO's, the private sector and the scientific community, have helped to lower the incidence and death rates from some vector-borne diseases.

As vector borne diseases begin to spread beyond their traditional boundaries, action needs to be expanded beyond the countries where these diseases currently thrive. WHO resolved to provide communities with information and aims to raise awareness about the threat posed by vectors and vector-borne disease, and to stimulate families and communities to take action to protect themselves from the perennial bane.

*\*Dhanya Sanal is (Assistant Director, PIB)  
Thiruvananthapuram*

**The tag line of this year's World Health Day, 'Small Bite Big Threat', compels to turn the attention towards the alarming occurrence of vector borne diseases**

# TAX INCENTIVES FOR FOOD PROCESSING INDUSTRIES

## Income Tax

**Deduction of expenditure:** These incentives are allowed for the following businesses for the investment made in the previous year and prior to commencement of its operations:

- i) Businesses allowed 100% deduction:
  - (a) Setting up and operating a cold chain facility
  - (b) Setting up and operating warehousing facility for storage of agricultural produce.
- ii) Businesses allowed 150% deduction (provided the taxpayer has commenced its business on or after 01.04.2012):
  - (a) Bee-keeping and production of honey and beeswax.
  - (b) Setting up and operating a warehousing facility for storage of sugar.

**2. Deduction of Tax from profit:** This tax incentive is available at the rate of 100% tax exemption for the first 5 years of operations. After 5 years, it is at the rate of 25% of the profits. However, in case of a company, rate of tax is 30% of profits, after 5 years of operations. This benefit is available only for ten years provided that such business had commenced with effect from 01.04.2001. This incentive is provided for new units in the business of processing, preservation & packaging of fruits or vegetables, meat & meat Products, poultry, marine or dairy products. However, in case of business relating to meat, meat products, poultry, marine products or dairy products, the above incentive is available to only those units who have started their production after 01.04.2009.

## 3. Service Tax

**i) Negative list:** Service tax is not leviable on items contained in the negative list. These are services including processes carried out at an agricultural farm including tending, pruning, cutting, harvesting, drying, cleaning, trimming, sun drying, fumigating, curing, sorting, grading, cooling or bulk packaging and such operations which do not alter the essential characteristics of agricultural produce but make it only marketable for the primary market.

**ii) Exempted category:** Exemption from Service Tax is allowed for following services:

- a) Construction, Erection, Commissioning or installation of original works pertaining to post-harvest storage infrastructure for agricultural produce including Cold storages for such purposes.

- b) Mechanized Food grain handling system, machinery or equipment for units processing agricultural produce as food stuff excluding alcoholic beverages; and
- c) Services provided by a goods transport agency by way of transportation of fruits, vegetables, eggs, milk, food grains or pulses in a goods carriage.
- d) Services of Loading, unloading, packing, storage or warehousing of agricultural produce.

## 4. Customs Duty

All goods related to Food Processing, imported as part of the project, irrespective of their tariff classification, would be entitled to uniform assessment at concessional customs duty of 5% plus CVD as applicable.

- ii) Customs duty on Hazelnuts has been reduced from 30% to 10%.
- iii) Customs Duty on De-hulled Oat grains has been reduced from 30% to 15%.

## 5. Central Excise Duty

In order to promote food processing industry, the Government has given following concessions in Central Excise Duty from time to time:

### i) Food Products

- a) Nil excise duty in milk, milk products (Chapter 4), vegetables (Chapter 7), nuts & fruits, fresh & dried (Chapter 8).
- b) As against standard excise duty of 12%, Processed Fruits & Vegetables (Chapter 20) carries a merit rate of 2% without CENVAT or 6% with CENVAT.
- c) Soya Milk Drinks, Flavoured Milk of Animal origin also carry a duty of 2% without CENVAT or 6% with CENVAT.
- d) Exciseduty on "Tapioca Starch manufactured and captively consumed within the factory of their production, in the manufacture of Tapioca Sago (Sabudana)" and excise duty on Tapioca Sago (Sabudana) has been reduced to nil in the Budget 2013-14.

### ii) Food Processing Machineries

- a) All Refrigeration Machineries and parts used for installation of Cold storage, Cold room or Refrigerated Vehicle, for the preservation, storage, transport or processing of agricultural, apiary, horticultural, dairy, poultry, aquatic and marine produce and meat are exempted from Excise Duty.
- b) Pasteuring, drying, evaporating, etc. machinery used in Dairy sector is exempted from Excise Duty. □



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