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contents

- ★ Agro Industrial Biotechnology 1
- ★ Rising Food Prices: A Global Crisis 2-3
- ★ Fresh Fruits & Vegetables Market in EU 4-5
- ★ Agriculture-Industry Interface: Value Added Farm Products 6-7
- ★ Bamboo Scenario in India: A Snapshot 8-9
- ★ Organic Agriculture: Opportunities for Indian farmers 10-11
- ★ News Focus 12

AGRO-INDUSTRIAL BIOTECHNOLOGY

Over the past two decades, the advances made in agricultural biotechnology have opened up new frontiers in agricultural production. The new techniques for understanding and modifying the genome of living organisms have led to large investments in agri biotechnology research and development. Most of this development has taken place in North America, Western Europe and East Asia, with the United States being far ahead of the others. Today, six transnational agro-chemical corporations (Monsanto, Bayer, Syngenta, DuPont, Dow and BASF) dominate the global arena for GM-crops, starting from R&D to marketing.

Agro-industries play a pivotal role in converting raw agricultural materials into value added products while generating income and employment and contributing to overall economic development in both developed and developing countries.

Bioprocessing, which involves the use of enzymes and microorganisms for the conversion of raw food materials into a diverse products, offers tremendous opportunities for stimulating agro-industrial development in developing countries. The processes involved are scaleable, environmentally friendly, and can be economically applied and linked to existing practices in these countries. Many of the traditional food bioprocessing techniques used in developing countries, however, require considerable scientific and technological improvement.

Currently, the application of genetically improved microorganisms in food bioprocessing is quite limited. Genetically improved microorganisms are not likely to play a role in improving food fermentations in developing

countries in the near future. In the near term, however, the diagnostic use of the tools and techniques of biotechnology for the precise characterisation of strains for tailor-making starter cultures applicable in food fermentations, offers considerable potential for improving the quality and safety of fermented foods.

A number of products of bioprocessing, such as gums, amino acids and flavour compounds are used as food ingredients, while others such as enzymes and microorganisms are used as processing aids. Recombinant DNA (RDNA) technologies offer considerable potential for improving the efficiency of producing these commercially attractive ingredients and processing aids, thereby valorizing fermentation processes. The use of RDNA technologies in the production of microbial enzymes has improved the availability, specificity and purity of enzymes applicable in food processing, while reducing costs. However, none of these opportunities can be reasonably realized by most developing countries in the near term.

While considerable potential exists for exploring and exploiting traditional food fermentations as sources of these commercially attractive value added products, an enormous amount of diagnostic work would be required for an enhanced understanding of traditional fermentation systems, and for effective exploitation of their value added potential. Production of these value-added products could very well serve as a catalyst for upgrading the quality and safety of food fermentations, which contribute substantially to the food security of millions in the developing world.

➤ Source: FAO



RISING FOOD PRICES: A GLOBAL CRISIS

Current Scenario

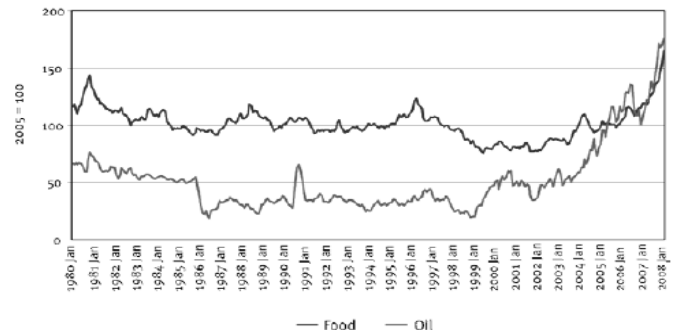
Soaring food prices pose problems for three major groups. First, the poor, whose ability to buy food is undermined. Second, governments of low-income countries facing higher import bills, soaring costs for safety net programmes and political unrest. Third, aid agencies juggling increased demands for food, cash and technical advice. High food prices threaten the gains made since the 1960s and highlight the long-term need for investment in, and better management of, the global food supply.

Before recent price hikes, the real price of food had been falling since the 1950s. The 'green revolution' in the world, that began in the mid-1960s, resulted in farmers from developing world planting improved varieties of cereals, prompting extraordinary increases in yields, falling food prices and reductions in poverty. But food prices have risen since the early 2000s, and particularly since 2006. The price of a tonne of wheat climbed from US\$ 105 in January 2000, to US\$ 167 in January 2006, to US\$ 481 in March 2008

Forecasts for the next ten years predict continuing high prices because of structural changes in supply and demand. On the supply side, rising oil prices means increasing costs for fertilizers, agricultural operations and transportation. On the demand side, growing income in countries such as China and India means rising demand for meat. OECD and FAO forecast that in non-OECD countries consumption of meat and dairy produce would rise by up to 2.4% a year between 2007 and 2016. Much of the additional meat, and some of the dairy, would be produced by feeding grains to livestock.

With oil now costing over US \$130 per barrel – and the US and EU trying to reach biofuel targets – grains, sugar and palm oil are increasingly used to produce ethanol and biodiesel. About 80 million tonnes of maize went to US ethanol refineries in 2007 against total US maize exports averaging 47 million tonnes a year (2000 to 2005), due to which maize prices rose in 2007, despite one of the largest maize harvests ever seen. Rising cereal costs are alarming, as they provide the bulk of the diet for many of the poor in developing countries. Rice and wheat prices soared in late 2007 and early 2008, up 60% and 89%, respectively over 2006 & 2007 levels.

Food and oil price indices, 1980 to early 2008



Commodity Food Price Index, 2005 = 100, includes Cereal, Vegetable Oils, Meat, Seafood, Sugar, Bananas, and Oranges Price Indices Crude Oil (petroleum), Price index, 2005 = 100, simple average of three spot prices; Dated Brent, West Texas Intermediate, and the Dubai Fateh.
Source: IMF Commodity Price data, downloaded 12 March 2008 from <http://www.imf.org/external/np/res/commod/index.asp>.

Future trends

OECD, FAO and USDA predict higher cereal prices over the next 10 years than in the early 2000s, but lower prices than in late 2007. The current high prices are unlikely to last as farmers are expected to increase planting and yields in 2008. However, prices are unlikely to drop to former levels in the medium term. Compared to 2005 levels, the price of maize is likely to be higher by 40% in 2016-17, with wheat prices up by 20%, and rice by 14%.

Impact on the poor

Rising food prices affect the poor directly, and producers and consumers, indirectly, through the impact on their economies. The greatest concern is the impact on their food consumption. The poor generally spend large fraction of their budget on food; so rising prices make them reduce their food consumption. This may not mean as large a fall in calorie intake, as households may spend more on cheaper, calorie-rich staples and less on foods rich in protein and vitamins, such as meat, fish, dairy, fruits and vegetables, reducing the quality of their diet. The short-term impacts are alarming: incomes fall by more than 25%, and food consumption by almost 20%. Medium-term prospects remain bleak, with incomes and food consumption down by 11% and 8%, respectively.

Impact on low-income countries

Low-income countries face inflationary pressure and rising import bills – both of which undermine economic growth and development. FAO estimates that food import bills for developing countries rose by 25% in 2007. Many receive food aid that is likely to be reduced just when it is most needed. As food aid is programmed by budget, not volume,

rising prices depress supply. With the World Food Programme (WFP) needing another US\$ 500 million to sustain current operations, the likely outcome for countries is that food availability may fall.

However, higher food prices are incentives to produce local food and could stimulate agriculture, cushioning the impact on the poor. In the coastal cities of West Africa, a shift to consumption of bread, rice and pasta based on imported grains at the expense of local yam, cocoyam, cassava, millet and sorghum could be reversed, giving a fillip to domestic farmers. Effects vary, with farming households benefiting, and others losing out. Overall, the economy suffers, as the reduction in consumer spending, on other goods and services, puts brake on economic growth.

Responding to the crisis

The main options available are compensating transfers and control of food prices. Transfers in the form of cash or vouchers would need to reach those facing under-nutrition. However, this means compensating the poor, while the nearly poor, who pays the same prices, are left out. Schemes to raise incomes through public works, with workers receiving wages rather than handouts, are more feasible. Examples of innovative schemes include Latin American conditional cash transfers and the introduction of universal old age pensions in India and South Africa. Price controls can mean setting prices, but can be hard to enforce and could remove incentives for farmers to produce more. Food price subsidies might be wasteful, as wealthier consumers would also benefit. Subsidizing 'inferior' foods is less popular, politically, than subsidizing favoured items.

Developing countries have tried to manage food price increase through subsidies, reducing tariffs on imported grains, and by limiting or taxing grain exports. Taxing exports could exacerbate the price spike and depress incentives to farmers to increase output.

Countries need compensatory financing to respond to the food price spike. There is a case for the IMF to provide more resources under the Compensatory Financing Facility to help low-income countries that import both oil and food. WFP has identified some countries at risk like Afghanistan; Angola; Benin; Burundi; Chad; Eritrea; Ethiopia; Gambia; Guinea; Guinea-Bissau; Haiti; Kenya; Madagascar; Malawi; Mauritania; Mozambique; Myanmar; Nepal; Niger; Senegal; Sierra Leone; Somalia; Tajikistan; Yemen; Zambia and Zimbabwe.

The medium-term response

Rising incomes from economic growth can compensate for

increased food costs in the medium term. Two to four years of growth may be enough to offset real income losses and there is scope to expand food supply and mitigate price rises. Public investments in infrastructure and agricultural research would pay dividends; as they would support for institutions giving small farmers, access to finance, inputs and information.

Uncertainty and controversy surround technical agricultural advances. Biotechnology promises much, but has delivered relatively little for staple food production. That may change with higher prices for grains. Higher prices may make countries more inclined to introduce genetically modified organisms. At the same time, there is limited land and water and increasing anxiety over conservation and pollution.

If demand were restricted, food might become cheaper. Controlling food-spending is administratively difficult and politically unattractive; but countries, including the UK, have had rationing in the past. In the medium to long term, rising food prices make population control policies more attractive: whether world population stabilizes at eight, nine or ten billion matters that much more.

Responding in low-income countries

Countries should be prepared to face a world where food and oil imports cost far more than they have in the past. Countries now have an incentive to develop their unused agricultural potential, and investing in food production, that would pay dividends. Some countries with abundant land could offset higher oil prices through biofuel production, but this approach needs careful monitoring, as displacing food crops would push food prices further upwards.

Global and donor responses

Aid agencies should provide more support to the efforts taken by developing countries to boost social protection in the short term, and food production in the medium term. If less food aid is available, its use must be prioritised and efforts should be taken to close gaps between emergency relief and long-term development.

Finally, rising food prices raise questions about global food systems. Little consideration has been given to contingency plans to deal with abnormal events, as the run-down food stocks in China, the EU and the US demonstrate. Conventional wisdom needs revisiting and the world's rich nations may need to re-invest in strategic stocks to offset sudden shocks.

➤ *Source : Overseas Development Institute*

FRESH FRUITS & VEGETABLES MARKET IN EUROPEAN UNION

Production

The EU, as a bloc, is one of the major producers of fruits and vegetables. Europe's wide range of climatic regime allows production of wide variety of crops. Northern Europe has a temperate climate and produces only temperate species. This is mainly done in the open air, but in addition, there is production of vegetables in greenhouses which allows for year round production of some vegetables, such as tomatoes and sweet peppers. In Southern Europe, the Mediterranean climate allows for higher production levels, a longer growing season and a wider variety of crops, including subtropical fruits such as peaches, oranges, tangerines, and olives. However, the limited availability of irrigation water is often a constraint.

Consumption

Fruits

The EU market for fresh fruits, in 2006, totaled 77 million tonnes in 2006. From 2002 to 2006, consumption increased by 2.7%. Italy is the largest consumer and producer of fresh fruits in the EU. Spain is the second largest consumer and producer. The imports of these countries are relatively small. France is also a major consumer and producer. Its imports are higher than the aforementioned countries while its exports are also substantial. Germany and the UK have high levels of consumption and limited domestic production and therefore rely heavily on imports. Belgium and the Netherlands have average market sizes, but are important fruit traders. In Ireland, consumption of fresh fruits has doubled in two years due to a sharp increase in imports of apples and oranges. The Netherlands, the UK and Greece showed increase in consumption of fresh fruits.

Vegetables

In 2006, the EU market for fresh vegetables totaled 62 million tonnes. Since 2002, consumption has remained stable. In contrast to the consumption of fresh fruits, the consumption of fresh vegetables is almost equal to production. This means that the EU relies less on imports of fresh vegetables. Italy and Spain are the largest consumers (and producers) of fresh vegetables. The UK is the only (major) consumer with an increasing vegetables market. In the new member states, the situation is more diversified. Especially in the eastern EU countries, consumption patterns are rapidly changing towards a Western European style. Poland has the largest market, which has been fluctuating over the last four years.

In general, the EU market for fresh fruits and vegetables is declining in volume. This is due to a shift in the eastern

EU member states from consumption of basic products towards more diverse food products, such as snacks and fast food. The markets in countries such as Germany, Spain, Italy and France are nearly saturated. Only certain market niches and product groups provide opportunities for growth.

Consumption of fresh fruits and vegetables by EU member countries In 2002, 2004 and 2006

volume in thousand tonnes

	Fruits			Vegetables			
	2002	2004	2006	2002	2004	2006	
Total EU	74574	80427	76576	Total EU	61790	67262	61789
Italy	16026	18466	17945	Italy	12683	14969	13780
Spain	12932	14290	13578	Spain	7703	8216	7831
France	11902	12776	11280	France	6798	6869	6179
Germany	8339	7236	6641	Germany	6268	5848	5465
Greece	3924	3813	3953	Poland	4882	5480	5028
UK	3218	3377	3659	UK	4035	4243	4581
Poland	3564	3901	3605	Romania	3391	4153	3662
Romania	2887	4100	3563	Greece	3126	3399	3087

Source: Eurostat (2007)

Imports & Exports

The EU imports large and increasing volumes of fresh fruits and vegetables. The volumes of fruits imports are much higher than those of vegetables. One reason for this is that popular fruits, such as bananas, cannot be produced in the EU (on a large scale) and therefore has to be imported. Most of the popular varieties of vegetables can be produced in the EU. Some fruits are less perishable and thus allows for sea transport.

Fruits

In 2006, fresh fruits imports amounted to 25 million tonnes with a value of Euro 19 billion. Of all imports, 58% stemmed from other EU countries (intra-EU trade), the remainder were imported from outside the EU (predominantly developing countries). Between 2002 and 2006, total value of imports increased by nearly 20%, and the volume increased by 16%. The volume of extra-EU imports decreased by 10% and the value remained stable. Developing countries account for 37% of the value and 40% of the volume of fruits imports in the EU. Between 2002 and 2006 both the value and the volume increased, by 23% and 25%, respectively. Developing countries have a strong position in bananas, pineapples, mangos, papayas, lychees, guavas, dates, passion fruit and avocados.

EU imports of fresh fruits, in 2002, 2004 and 2006

value in Euro million, volume in thousand tonnes

	2002		2004		2006		Average annual % change in value
	Value	Volume	Value	Volume	Value	Volume	
Total EU	16172	21457	17861	23768	19330	24977	4.60%
Intra - EU	9589	12859	10695	14308	11417	14470	4.50%
Extra - EU	788	760	788	761	788	679	0%
Developing countries	5794	7836	6397	8700	7125	9828	5.30%

Source: Eurostat (2007)

Vegetables

In 2006, a total of 11.5 million tonnes, with a value of Euro 10.7 billion, were imported within EU countries. Only 14% of the total import value and 13% of the total trade volume originated from outside the EU. From 2002 to 2006, intra-EU imports grew by 17% in value, and by 12% in volume, while total extra-EU trade grew by 49% in value and 11% in volume. The majority of extra-EU trade in vegetables stemmed from developing countries, which accounted for 82% of total extra-EU imports, in both value and volume.

EU Imports of fresh vegetables, in 2002, 2004 and 2006

value in Euro million, volume in thousand tonnes

	2002		2004		2006		Average annual % change in value
	Value	Volume	Value	Volume	Value	Volume	
Total EU	9089	10226	9352	11075	10732	11464	4.20%
Intra - EU	7996	9089	8164	9809	9230	9994	3.70%
Extra - EU	187	240	214	227	276	264	10%
Developing countries	906	889	975	1040	1226	1205	7.90%

Source: Eurostat (2007)

The increase in imports of fresh fruits and vegetables and the strong position of developing countries in this trade can be explained by a number of factors. Firstly, EU countries produce exotic fruits by themselves, so they have to be imported. Consumption of these fruits is increasing due to a number of trends: health concerns, growing markets in new member states and increasing familiarity with these products amongst consumers. Not only the demand is growing among ethnic communities, the natives who frequently visit foreign countries get to know exotic fruits and want to purchase them at home. In addition, consumers increasingly demand year-round availability of fruits and as EU countries are not able to produce year-round they have started importing during the off-season.

The same goes for vegetables, albeit to a lesser extent. The EU produces large volumes of vegetables, but year-round production is not possible for many species. In addition, it is also cheaper to import some products, such as beans, chilli, peppers or asparagus, from developing countries than

to produce them domestically, as they are very labour-intensive and carry substantial production risks. Outsourcing is a trend, for both fresh fruits and vegetables, with European companies starting to produce in developing countries, and exporting the produce to the EU. In new member states, consumers are becoming more demanding. In Poland, for instance, apple production is decreasing, as consumers no longer accept poor quality domestic apples. Companies prefer to go for imported apples instead of investing in quality improvement.

EU imports by product groups

Fruits

Germany is the EU's largest importer of fresh fruits. In 2006, it accounted for 18% of total EU import value and 19% of total volume. The UK was the second largest importer, followed by the Netherlands, Belgium, France and Italy. Belgium and the Netherlands play an important role in intra-EU trade of fresh fruits. Their domestic markets are relatively small and most of their imports are re-exported to other countries, within and beyond the EU. Poland is the leading fresh fruits importer among the ten new EU member countries, followed at a distance by the Czech Republic and Romania. Compared to the huge quantities imported by the original 15-EU (mainly developed countries) countries the imports by developing EU nations are small, but show higher growth rates, particularly in Poland and Romania.

The main imported products are bananas (20% of total fruits imports by value), apples (11%), grapes (10%), oranges (7%), tangerines (7%) and peaches and nectarines (5%). Pineapple imports have grown by 20% in value and 42% in volume between 2004 and 2006, making it as one of the fastest-growing tropical fruit products. Imports of peaches and nectarines, melons and avocados also grew strongly, between 2004 and 2006.

EU imports and leading suppliers of fresh fruits, in 2002, 2004 and 2006

	2002	2004	2006	Leading Suppliers in 2006 (share in %)	Share (%)
	Euro million	Euro million	Euro million		
Total Fresh Fruits	16172	17861	19330		100
				Spain (19%), The Netherlands (9%), Italy (9%), Belgium (7%), France (5%),	59%
				Extra EU, excl. DC*: New Zealand (1.9%), Israel (1.2%), USA (0.8%), Australia (0.1%), Canada (0.1%)	4%
				DC*: South Africa (4.7%), Costa Rica (4.4%), Chile (3.6%), Ecuador (3.6%), Colombia (3.2%)	37%
Bananas	3482	3688	3961		20%

*DC = Developing Countries

Source: Eurostat (2007)

➤ Source: CBI, The Netherlands

AGRICULTURE-INDUSTRY INTERFACE: VALUE ADDED FARM PRODUCTS

Introduction

India, since ancient times, has been known as an agrarian economy, though the share of agriculture in the country's GDP has decreased in recent years. The problem of improvement in agriculture needs to be tackled from two different angles; first, to increase productivity of agriculture and delivery system, and second, to increase the farmer's earnings through efficient and effective value addition. Value addition to raw food material in India is estimated to be only 7 % while it is 23%, 45% and 188% in China, Philippines and UK, respectively.

World markets are undergoing a major transformation. Today, major markets are product-driven and less commodity-driven. To boost economic returns from farming, it is important to find ways for farmers to earn a greater share of the product sale revenue after adding value to the produce. Though the contribution of the agri-input industry has been progressing gradually, time has come when agriculture has to be run as agribusiness rather than subsistence agriculture. Agri-input companies in India are currently emphasizing on delivery of package of products and services to customers and help improving the farming community through technology transfer and value-added services. Profits have to be achieved through judicious selection and application of inputs, higher productivity and improved quality.

Large scale processing, through producer alliances, such as agricultural co-operatives or limited liability companies, is receiving greater interest among producers as well. These alliances can offer solutions to pool resources and manage risks. In some cases, producers lose marketing or processing facilities when corporate agribusinesses close local facilities. Some strategies that may be adopted in different segments of agriculture production are summarized below:

Wheat and Rice

The varieties of wheat and rice presently being grown now have been developed primarily for increased yield. The varieties grown at present, however, are more suited for making some traditional food items. R&D programmes may be undertaken that would focus on developing varieties for specific end-use and processing qualities. The marketing potential of new varieties may be explored and efforts made to make them into commercially viable propositions. Processing units should be linked to areas/zones that should grow specific varieties for specific products.

Current practices in post-harvest handling of grains results in high losses and leads to deterioration of quality. Storage and handling technologies and infrastructure should be designed in a manner that losses are minimized and the produce retains its original quality. Comprehensive processing units for developing products as well as bi-products should be set up. For example, wheat flourmills can earn added benefits by undertaking wheat germ and oil production in consonance. Rice processing units should simultaneously handle de-husking and processing of bran for food, feed, oil and biochemical, as is being done in many other countries.

Independent development boards for wheat and rice be established which should focus on all the activities from R&D to the production centers for quality grain, and from postharvest handling to processing and marketing, including image building in the national and international markets. Strategy formulation at the state and national level, development of infrastructure and facility for micro-level operators and intervention, wherein needed, should also be the role of these boards.

Fruits and Vegetables (Mango, Citrus and Potato)

R&D programmes should focus on end-use of the produce, both for international market and the processing needs. For example, mangos of attractive skin colour and size are needed for export and potato varieties with large uniform tubers, and those with delayed sprouting will be preferred for processing and reduced storage losses.

Processing units to make useful co-products like oil from mango kernels and beta carotenoids from peel should be set up alongside the pulp making units. Protocols for making traditional mango products e.g. *chutney*, *achar*, *aamṭapaṭar*, *murabba* need to be standardized for manufacturing under SPS conditions and promoted to produce quality products. These must also be packed appropriately and attractively.

In cases where debittering of citrus juice is not feasible, it should be blended with other juices after appropriate R&D to meet the taste of consumers and prolong the shelf life.

Potato varieties, *Chipsona-I* and *Chipsona-II* match, or international varieties for making chips and fries should be promoted among farmers and farmer-linked processing units. Technology for converting potato powder to high fructose syrup should be exploited at a commercially viable scale.

Peel, pulp and seed from different fruits are invariably discarded as 'waste'. These can be converted into valuable co-products. Technologies for production of oil and natural colour from citrus peel; fibre from banana leaves; oil and a rare protein from mango kernel have been developed. These have to be made as economically viable propositions.

Milk and Dairy Products

Some of the traditional products like milk and dairy products, backed by R&D support for processing and packaging, could be elevated to commercially viable ventures for national and international markets (just as is being done for *Shrikhand* and *Rasogulla*).

Attention must be paid to develop nutritive foods. One possibility is to supplement it with nutraceuticals, followed by gelling and suitably packaging it to enhance its shelf life.

Milk quality suffers from high levels of pesticide residues and heavy metals (which come through feed and fodder) and antibiotics mixed in feed or given for treating mastitis. This should be checked and monitored at the time of procurement to develop internationally competitive and pesticide-free products.

There is an urgent need to develop low cost technologies for mechanization to hermetically pack milk products as per needs of end users and involving the manufacturers of packaging material and equipment in an integrated manner. There are natural anti-bacterial agents in milk of camel/goat/sheep, which has a shelf life of 8-10 days. R&D efforts should be initiated for blending cow/buffalo milk with these milks, wherever possible. This will enhance shelf life and reduce handling costs.

Fish and Marine Products

Traditional preparations like fish/prawn pickle, fish *papad* and fish curry, battered and breaded products, fish (*Surimi*) mince based products like sausages, cutlets, patties, balls, pastes etc., need to be promoted in ready-to-eat packs. The packaging should be such that it ensures quality and hygiene as per international standards, with proper certification.

Since India has a higher fish processing capacity than the total catch capacity, the idle workforce could be effectively engaged in making products, based on *Surimi*, from low value/by-catch fish, which otherwise fetch poor returns to the farmers. Seaweed farming should be commercialized and seaweeds used for preparation of nutritive foods and feed items. Post-harvest handling of fish and prawn catches must be done as per international standards of sanitation. This is essential if we are to compete in the global trade. It would require extensive cold-chain and appropriate storage infrastructure till the catch is processed or consumed. Fisheries waste generated by the processing industry should be used for developing usable co-products like chitin and chitosan from prawn shells, sutures from fish guts, the technology for which is available.

Management Models

Processing units, adding value to agricultural produce, should lay emphasis on developing effective backward linkages with farmers, to procure quality raw material. Contract farming should be promoted in a manner that processing firms are not able to exploit an unequal relationship with growers. Most contracts in the past have been tilted against farmers and also some farmers have diverted the produce to open markets. The New Generation Cooperatives (NGC) model is ideal since it binds both farmers and processors to honour commitments and agreements. This should be applied in our cooperative enterprises. Contract farming involving small farmers should be promoted rather than involving a few big farmers. Small cooperative processing units should be promoted in rural areas. These could undertake primary processing, grading and cleaning of produce for adding value. The pattern of Town and Village Enterprises (TVEs) of China could be used, with necessary modifications. Rural processing and value-addition groups should be promoted. This will allow small and marginal farmers to be part-time farmers and work in rural enterprises for enhanced income and returns on their produce.

➤ Source: National Academy of Agricultural Sciences (NAAS)

BAMBOO SCENARIO IN INDIA: A SNAPSHOT

Bamboo is a grass belonging to the family *Poaceae*. It is an enduring, versatile and highly renewable resource found naturally everywhere. The growing stock of bamboo is estimated at over 100 million tonnes spread over forest areas, homesteads and private plantations. It is estimated that about 2.5 billion people use bamboo in one form or the other at the global level. The annual turnover is estimated at around US \$ 10 billion (Rs.45,000 crores) and this is estimated to shoot up to USD 20 billion by 2015. Of the 20 million tonnes harvested every year, almost three-fifth comes from India and China. China has emerged as a pioneer in bamboo products, with significant contribution of these products to the Chinese economy.

Trade and its Potential

The commercial consumption of bamboo globally, worth around US\$ 10 billion, is expected to reach US\$ 20 billion by 2015. China's share in the world bamboo market is currently the highest at US\$ 5 billion. India's share in the global bamboo market is estimated to be US\$ 1 billion and is expected to increase to US\$ 5.7 billion by 2015. In India 136 species of bamboos in 36 genera are found to exist. According to the Forest Survey of India, about 12.8% of total forest area is under bamboo cultivation, with the North East Region accounting for 66% of the country's bamboo resources, in terms of value, and 28% in terms of area. The Western Ghats area has the second largest diversity of bamboos. Though India has the largest area under bamboo, which is, estimated at around 9.6 million hectares, the yield per ha is estimated at around 3 tonnes, which is very low in comparison, to other countries like China, Malaysia and Costa Rica.

It is estimated that 8 million bamboo artisans are depending on this craft for their livelihood. By and large, this is a totally unorganized sector and bamboo has always been considered from the craft point of view and if otherwise for pulp making only.

Bamboo is capable of providing ecological, economic, and livelihood security to millions of people. Till recently, this crop was confined to the forests (12.8% of forest cover) with 28% of area and 66% of the growing stock being present in the North-Eastern region of India. Importance of the crop as a source of raw material for industrial and domestic use with its growing demand all over the country necessitated its cultivation in farmlands as well.

Usage

Though India has a deep-rooted legacy of traditional skills in bamboo cultivation and usages, their potential and attributes have never been fully exploited. In India, the commercial use of bamboo until today has been basically in the pulp and paper industry. But now bamboo is being rediscovered and new high-end products are being developed through research and application of technology. So varied is bamboo's application that one finds its utilization on a massive scale today in environment protection, as a nutrient food, high-value construction material and also in about thousands of other applications. Experts working in the field of bamboo are of the opinion that the full potential of this raw material still remains to be understood or tapped.

Some of the important usages are: -

Bamboo In Agriculture: Bamboo pipes are used to irrigate vast tracts of agricultural land in different agro-ecological settings. More than a million bamboo pumps are in current use. Bamboo is also used in making dams, dikes, sluice gates, farm implements, props, stakes, floats fish trap, silk cocoon trays, chicken coops, windbreak barriers and several other articles.

Bamboo In Construction: Bamboo houses are traditional in many countries. It is used for pillars, post, stilts, rafters, roofing, flooring, walling, scaffolding and a host of other purposes. Bamboo's mechanical properties also make it an ideal material for earthquake resistant and emergency housing.

Bamboo In Micro enterprises: Micro enterprises make extensive use of bamboo in furniture, handmade paper, handlooms, curtains and blinds, toothpicks, chopsticks, incense sticks and various other products. The incense stick industry in India has over 3800 production units that generate nearly US \$ 400 million from domestic and export markets.

Bamboo In Industry: Bamboo is an ideal raw material for many industries. The bamboo-shoots industry in China earns, estimatedly, US \$ 130 million per year from exports. About half of India's bamboo consumption is for making paper pulp. Other major uses of bamboo are in the production of rayon, activated charcoal and flooring and panelling products.

Bamboo in Handicrafts: Bamboo's natural elegance and easy workability make it a choice material for handicrafts. China manufactures more than 8000 bamboo and rattan items. From buttons to baskets, from lamps to lacquer ware, from mats to musical instruments from toys to walking sticks, bamboo is used as raw material.

Bamboo In Transportation: Bamboo culms float in water, as they are lightweight. This property has been put to use for thousands of years in making rafts, junks and boats, and their masts sail and outriggers. Bamboo is also used in making wagon floor, carts and their hoods, and suspension bridges.

The VII World Bamboo Congress- Recommendations

Recently, India had hosted the VII World Bamboo Congress. Some of the extensive deliberations and the recommendations of the Congress are given below.

- Millennium Development Goals stress environment, conditions of slum dwellers, health and education. Bamboo-based development can improve the environment by substituting for deforestation and by providing good inexpensive houses, schools and clinics.
- Employment opportunities for rural and semi-urban poor will remain a priority. Bamboo-based development can provide a wide range of employment opportunities at all levels of skill and capital involvement and is particularly suitable for community-based micro-credit financed activities.
- The use of bamboo should be encouraged in watershed management, soil and water conservation, rehabilitation of degraded land and rural development.
- Bamboo can offer innumerable opportunities for environmental improvement by sequestration of carbon, lowering light intensity and offering protection against ultraviolet rays, yielding more oxygen than equivalent stand of trees and working as a natural environmental cleansing system.
- Bamboo shoots are rich in fiber, protein and minerals. The products developed from bamboo shoots can provide food and nutritional security to 2 billion people living in Africa, Asia and Latin America.
- Bamboo biomass is a potential alternative source for bio-energy and opportunity to pioneer another industrial

usage through gasification to produce electricity.

- Bamboo a versatile material, has found uses in manufacturing pulp and paper, panel products, construction material, high strength fiber composites and an array of modern new generation bamboo products.
- The potential of bamboo as an economic resource capable for generating employment for rural poor, skilled and semi-skilled in plantation, and in semi industrial and industrial ventures should be fully exploited.
- The world would probably face a shortage of wood-base fibre in the future. Bamboo can substitute for wood in nearly all its uses and can help avoid future shortages and hardships.

Future Outlook

The demand for bamboo has increased, in recent years, within the country and abroad as a raw material for furniture making, as panel boards substituting wood, as agricultural implements, house/construction related uses and as a vegetable. China's focused intervention to harness bamboo's potential has led to increase in its productivity by more than 10 times since 1970.

The sector suffers from technology constraints both at plantation level as well as usage side. Plantation side lacks skilled labour, availability of improved planting materials, market driven R&D and scientific agronomic practices. Similarly, the usage of bamboo in different forms lacks proper technology and innovation.

The National Bamboo Mission is envisaged to promote the growth of the bamboo sector in the country through area based regionally differentiated strategies. Planting appropriate varieties of bamboo to enhance its production and productivity will increase the area under bamboo. The mission would also promote marketing of bamboo and bamboo-based handicrafts and to generate employment opportunities for skilled and unskilled persons, especially unemployed youths. Considering the role of bamboo in diverse fields such as food, fiber and shelter, it is important to enable bamboo-based industries to create economic prosperity and employment opportunities in the country.

➤ Source : Industry Sources
 Government of India Sources

ORGANIC AGRICULTURE: OPPORTUNITIES FOR INDIAN FARMERS

Introduction

Organic farming is gaining gradual momentum across the world. Growing awareness of health and environmental issues in agriculture has demanded production of organic food, which is emerging as an attractive source of rural income generation. While trends in rising consumer demand for organic products are becoming discernible, sustainability in production of crops has become the prime concern in agriculture development.

Organic farming is a form of agriculture that excludes the use of synthetic fertilizers and pesticides, plant growth regulators, livestock feed additives, and genetically modified organisms. As far as possible, organic farmers rely on crop rotation, green manure, compost, biological pest control and mechanical cultivation to maintain soil productivity and control pests. Organic farming is contrasted with conventional chemical farming. Infact, organic agriculture can be considered a subset of sustainable agriculture, the difference being that organic implies certification in accordance with legal standards. Organic methods are studied in the discipline of agroecology.

The world organic market (2006) is estimated at over US \$ 28 billion, cultivated on a total area of around 31 million hectares worldwide. Organic products are almost entirely (over 95%) consumed in developed countries. Major producers and importers of organic products are EU, USA and Japan. Categories of major organic products include fresh fruits and vegetables (non tropical and tropical), cereals (wheat, rice, corn, maize), coffee, tea, cocoa, spices, herbs, oilseeds, pulses, milk products, honey, meat, edible nut, semi-processed fruits etc.

Organic agricultural methods are internationally regulated and legally enforced by many nations, based in large part on the standards set by the International Federation of Organic Agriculture Movements (IFOAM), an international umbrella organization for organic cultivation, established in 1972.

Organic Agriculture in India

Organic cultivation is particularly suitable for a country like India with a huge population of small farmers who still use traditional methods of farming with few agricultural inputs. It is estimated that a significant proportion of the country's cropped area is organic by default, as the small farmers have no choice but to farm without chemical

fertilizers and pesticides. This default status coupled with India's inherent advantages such as its varied agro-climatic regions, local self-sustaining agri-systems, sizeable number of progressive farmers and ready availability of inexpensive manpower translate into the potential to cultivate a vast basket of products, organically.

India is endowed with various types of naturally available organic form of nutrients in different parts of the country, which can enhance organic cultivation in the country. There is diversity in climates – 100-10,000 mm rainfall, hill, desert, strong traditional farming system- crop-tree, animal, innovative farmers, vast dry lands (60% agriculture land), and least use of chemicals. Infact, there is hardly any chemical usages in the hilly, rain fed northeastern regions of the country. These areas are organic by default. Besides, there is enough scope for using biodynamic preparation, vermicompost, *Amrit Pani* etc. on on-farm production basis.

It is estimated that there are around 76,000 ha of Organic Farm land (certified) in India and 2.4 million hectare certified forest area for collection of wild herbs. But the actual area under organic cultivation may be more. The State of Uttarakhand and Sikkim have declared their states as organic states. In Maharashtra, since 2003, about 5,00,000 hectares is under organic farming (of the 1.8 crore ha of cultivable land in the state).

Export Market

Export opportunities are one of the major drivers of organic agriculture in India. It is estimated that India exported organic products worth Rs. 301.24 crores in 2006-07. Total quantity exported is around 20,000 metric tonnes. It is estimated that more than 85% of total organic production, excluding wild herbs from Uttar Pradesh and Madhya Pradesh is exported. India is best known as an exporter of organic tea and also has great export potential for many other products. Other organic products for which India has a niche market are spices and fruits. There is also a good response for organic rice, vegetable, coffee, cashew, oil seed, wheat and pulses. Among the fruit crops, bananas, mangos and oranges are the most preferred organic products. It is a paradox that though India is the third largest agriculture producer in the world, the share in world trade of agricultural commodities is 1% and share in organic foods is very miniscule, with exception of tea and basmati rice.

Key Developments and Opportunities

Organic farming has been identified as a major spearhead in the Tenth Five Year Plan (2002-2007) and is expected to be one of the focus areas to boost agricultural growth in the Eleventh Five-Year Plan (2007-12). Indian organic certifying bodies will now be receiving European Commission (EC) 'equivalence' status exempting Indian organic products from further certification by European agencies, which is likely to bring down the cost of organic exports, and will also result in savings of approximately 500-1,000 per hectare for certification.

Indian government has designated six organizations to accredit certifying agencies, undertaking inspection and certification of organic products. These are Agriculture and Processed Food Products Export Development Authority, the Tea Board, the Spices Board, the Coffee Board, the Coconut Development Board, and the Directorate of Cashew and Cocoa. National organic standards have been established under National Programme for Organic Production (NPOP). Currently, 11 accredited certifying agencies are functioning in India. IMO (Switzerland), ECOCERT (Germany), SKAL (The Netherlands), SGS (Switzerland), and Lacon (Germany) are some of the International certifying agencies.

The burgeoning European and US organic markets provide enormous scope for Indian exporters. US retail sale for organic products has grown 20-24% per year for the past 12 years and the same growth trends are expected to continue in future. Europe is the second largest market for organic products in the world and consumes around half of the world organic produce. European market for organic food is estimated to be around US\$ 9 billion and expected annual growth rate is of around 20%, depending on the markets. Japan is the largest organic food market in Asia. Retail sales of organic food and beverage is around US\$ 2.5-3.0 billion (2003). Of this, imports are estimated to be to the tune of around US\$ 360 million. Though the organic food market is not more than 0.5% of total food market of Japan, import of organic products is likely to grow by 40%, according to the Japanese Integrated Market Institute. Other global markets for organic products are Saudi Arabia, UAE and South Africa.

Currently, India's share in the US\$ 150 million global organic coffee market is 1% and its share in the US\$ 3.2 million organic spices market is 3%, which has considerable potential to grow due to India's production advantage. Fruits and vegetables are the major organic imports into the US and the EU (40%). India has huge potential in this segment, if the challenges of post-harvest infrastructure and cold

chain are adequately tackled. Dairy is another segment where India has production advantages and can harness its potential in organic dairy as majority of the cattle-feed used in India are chemical free.

The table below reveals that India has demonstrated capabilities of exporting some key agricultural commodities to most of the major global markets, where there is a considerable demand for organically produced commodities, attracting price premiums ranging from 10-100%. The table thus, showcases window of opportunities in these markets for Indian exporters and producers of organic agricultural commodities, which is yet to be exploited to its maximum potential.

Conventional agricultural products & prospective export markets for Indian organic products

Products	Select conventional markets	Potential organic markets
Rice	USA, UK, CIS region, UAE, South Africa	USA, UK, Japan, France, Germany, Italy, Netherlands, Switzerland, Poland
Wheat		USA, UK, Japan, France, Germany, Italy, Netherlands, Switzerland, Belgium
Tea	USA, UK, Japan, Germany, CIS region, Netherlands, Egypt, UAE, Saudi Arabia, Poland, Belgium	USA, UK, Japan, France, Germany, Netherlands, Italy, Switzerland, Egypt, Poland, Belgium
Coffee	USA, Japan, Germany, Italy, CIS region, Netherlands, Switzerland	USA, UK, Japan, France, Germany, Italy, Netherlands, Switzerland, Poland
Spices	UK, Japan, France, Germany, CIS Region, UAE	USA, UK, Japan, France, Germany, Italy, Netherlands, Switzerland, Egypt
Cashew	UK, Japan, France, Germany, CIS region, Netherlands, UAE	USA, UK, Japan, France, Germany, Netherlands, Egypt, Belgium
Cotton	-	USA, UK, Japan, France and Germany
Fruits and Vegetables	USA, UK, Germany, UAE, Saudi Arabia	USA, UK, Japan, France, Germany, Italy, Netherlands, Switzerland, Egypt

Conclusion

With the growing worldwide market, and scope for organic farming in the country, India holds significant potential in export of organic foods. India needs to enhance the attention towards generating market intelligence with regard to the products that are in demand and the regions from which the demand emerges, distribution channels in such markets, competition, market access, etc. India with its tradition of organic farming and growing consumer awareness has an edge to capitalize on the growing organic market.

➤ Source : APEDA, Industry Sources

NEWS FOCUS
Slaughter lamb producers in Australia ready to expand production

Slaughter lamb producers in Australia are well placed to expand production in response to strong export demand and high prices, according to a study by ABARE, "Australian Lamb: Financial performance of slaughter lamb farms, 2005-06 to 2007-08".

In 2006-07, production of slaughter lambs was adversely affected by drought and reduced irrigation water availability. With farm output constrained and costs rising, slaughter lamb producers of all scales recorded their largest farm business losses, in real terms. Improved seasonal conditions in 2007-08 are projected to result in many producers realizing a significant improvement in farm cash income, as receipts rebound and costs fall. In recent years, the slaughter lamb industry has undergone a period of significant new investments in capital, particularly land, plant and machinery.

ABARE, June 3, 2008

US non-farm productivity gathers pace

Revised figures published by US Government agencies show that US non-farm productivity has accelerated in the first quarter of 2008; a trend that could help companies offset the inflationary burden of rising energy costs. Non-farm productivity, a measure of business efficiency, increased at a 2.6% annualized rate in the first three months of 2008. From the first quarter of 2007 to the first quarter of 2008, productivity rose 3.3%, the highest increase since mid-2004.

Financial Times, June 5, 2008

Half of world fish trade sourced from developing countries

According to a report by FAO, driven by rising consumption worldwide, the international trade in fish products is expanding at a rapid pace. China has now become the world's largest exporter of fish (valued at US\$9.7 billion), but its imports are also growing, reaching US\$4.2 billion in 2007. The value of world exports of fish and fish products grew by 9.5 % in 2006 (US\$86 billion) and nearly by 7 % in 2007 (US\$92 billion). The proportion of world fish production (145 million tonnes) that is traded internationally now represents 38% of the total production or 55 million tonnes.

FAO News, June 2, 2008

Mitigating the effects of rising global food prices

The European Commission adopted a communication setting out potential policy responses to mitigate the effects of rising global food prices. The communication analyses structural and cyclical factors and proposes a three-pronged policy response, including short-term measures in the context of the Health Check of the Common Agricultural Policy (CAP) and in the monitoring of the retail sector; initiatives to enhance agricultural supply and ensure food security, including the promotion of sustainable future generations of biofuels; and initiatives to contribute to the global effort to tackle the effects of price rises on poor populations.

European Commission, May 20, 2008

The news items and information published herein have been collected from various sources, which are considered to be reliable. While every care has been taken for authenticity of the material published, Exim Bank accepts no responsibility for authenticity or accuracy of such items.

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