

# Food and Agriculture Technology in India

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## Introduction

Food and Agriculture Technology Fund, as well as existing investor Deerfield Management Company. The firm intends to develop genetically enhanced fresh produce technology, Pair wise is working on developing fruits and vegetables that have improved taste, enhanced convenience, increased shelf life, improved yield, simplified harvesting and with lengthened season availability. Good Manufacturing Practices for Food Industries: Crises, it is important that current advancements in technology are made taking into consideration the impact on humanity and the environment. This new volume, Food Technology: Applied Research and Production Techniques, in the Innovations in Agricultural and developments and innovations in food technology and sustainable technologies. Advanced topics in the volume include food processing, preservation, nutritional analysis, quality control, and maintenance as well as good manufacturing practices in the food industries. The development of current food- and agriculture-based knowledge into promising technologies.

Agriculture needs technology infusion to accelerate the production so that food is accessible to the common man. According to 'The State of Food and Agriculture 2013' of the Food and Agriculture Organization (FAO) of the United Nations, 12.5 percent of the world's population (868 million people) are undernourished in terms of energy intake. Of these people, 852 million were reported to be citizens of developing countries. According to the estimates of the Food and Agricultural Organization (FAO), agricultural production would need to grow globally by 70 per cent by 2050 and more specifically by almost 100 per cent in developing countries, to feed the growing population alone. Pace of technology infusion should be fast.

The study found that malnutrition accounted for a loss of 5 per cent of the world Gross Domestic Product (GDP) by way of lost productivity and expenditure on treatment. On the other hand, money spent on reducing malnutrition boosts earnings with a benefit-to-cost ratio of almost

According to the CDC, only 10% of people in the recommended daily allowance of fruits and vegetables. To tackle challenges of inconsistent flavor, seeds, shelf life, year-round availability, and snack ability, Pair wise aims to bring new varieties of nutritious fruits and vegetables that consumers prefer to eat. The firm is currently developing new types of leafy greens, berries and cherries. Its first product is expected in 2022. Pair wise CEO Tom Adams said: "People see innovation all around them, except in the produce aisle. We will give consumers new options that make healthy eating easier and more exciting. "With this additional funding from industry-leading investors, Pair wise is taking a bold step toward achieving our mission of building a healthier world." developed a crop trait development platform, based on gene-editing technology that has been licensed from research organizations, including Massachusetts General Hospital (MGH) and the Broad Institute of MIT and Harvard (Broad Institute).

The Food Science and Technology (FST) is the official publication of the Association of Food Scientists and Technologists of India (AFSTI). This monthly publishes peer-reviewed research papers and reviews in all branches of science, technology, packaging and engineering of foods and food products.

Special emphasis is given to fundamental and applied research findings that have potential for enhancing product quality, extend shelf life of fresh and processed food products and improve process efficiency. Critical reviews on new perspectives in food handling and processing, innovative and emerging technologies and trends and future research in food products and food industry byproducts are also welcome. The journal also publishes book reviews relevant to all aspects of food science, technology and engineering. Due to the overwhelming number of manuscripts coming to the journal, there could be a delay of 30 days in the first decision.

## **Revive of literature:**

The firm was founded by CEO Dr Tom Adams and chief business officer Dr Haven Baker, along with co-founders Dr David Liu, of Harvard University, Dr Feng Zhang, of Massachusetts Institute of Technology, and Dr J Keith Joung, of Massachusetts General Hospital. In 2018, Pair wise raised \$25m through Series A round to develop its gene-editing platform and initial product portfolio. The company then also announced \$100m collaboration with Bayer Crop Science to further gene-editing tools in corn, soybeans, wheat, canola and cotton. Within three years, the firm has grown to 100 team members across two locations in Durham, North Carolina.

## **Scope**

The demand for processed, packed and convenient food with prolonged shelf life requires well-trained human resource in the food industry. There is an encouraging, challenging and rewarding future for professions and careers in Food Technology and Food Processing industry. As this field requires the application of science and technology to the processing, utilization, preservation, packaging and distribution of food and food products, it encompasses a diverse range of specializations. The work of food technologists is mainly in food industries, quality control departments, hotels, hospitals, labeling and packaging industries, breweries/distilleries, soft drink industries, dairy, confectionery, fish and meat processing, fruit and vegetable processing, processing of grains, cereals, millets, rice and flour mills, etc. Their expertise is useful in various departments such as purchase and storage, processing/manufacture, quality monitoring and management, safety assessment, as well as research and development. Besides this, entrepreneurship is a highly rewarding avenue. There are various avenues for employment

## **Background:**

The using technology's improvement Agriculture The food processing sector comprises of two segments- Primary processed food and Value added food. Primary segment comprises of packaged fruit and vegetables, milk, flour, rice, spices etc and constitutes around 62% in value terms of the processed foods. Value added segment includes processed fruits and vegetables, juices, jam & jelly etc and holds around 38 % share in the total processed food technology.

crises, it is important that current advancements in technology are made taking into consideration the impact on humanity and the environment. This new volume, Food Technology: Applied

Research and Production Techniques, in the Innovations in Agricultural and Biological Engineering book series, looks at recent developments and innovations in food technology and sustainable technologies. Advanced topics in the volume include food processing, preservation, nutritional analysis, quality control, and maintenance as well as good manufacturing practices in the food industries. The chapters are highly

focused reports to help direct the development of current food- and agriculture-based knowledge into promising technologies.

## Technological Needs and Future Agriculture

It is apparent that the tasks of meeting the consumption needs of the projected population are going to be more difficult given the higher productivity base than in 1960s. There is also a growing realization that previous strategies of generating and promoting technologies have contributed to serious and widespread problems of environmental and natural resource degradation. This implies that in future the technologies that are developed and promoted must result not only in increased productivity level but also ensure that the quality of natural resource base is preserved and enhanced. In short, they lead to sustainable improvements in agricultural production.

Productivity gains during the 'Green Revolution' era were largely confined to relatively well endowed areas. Given the wide range of agro-ecological setting and producers, Indian agriculture is faced with a great diversity of needs, opportunities and prospects. Future growth needs to be more rapid, more widely distributed and better targeted.

### Features:

- provides information relevant to technology
- makes suggestions for equipment and devices
- looks at standardization in food technology
- explores new and innovative packaging technology
- studies antimicrobial activities in food
- considers active constituents of foods and provides information about isolation, validation and characterization of major bioactive constituents
- discusses the effect of laws and regulatory guidelines on infrastructure to transform technology into highly value-added products

Food Technology and Production Techniques will be a very useful reference book for food technologists, practicing food engineers, researchers, professors, students of these fields and professionals working in food



New technologies are needed to push the yield frontiers further, utilize inputs more efficiently and diversify to more sustainable and higher value cropping patterns. These are all knowledge intensive technologies that require both a strong research and extension system and skilled farmers but also a

reinvigorated interface where the emphasis is on mutual exchange of information bringing advantages to all. At the same time potential of less favoured areas must be better exploited to meet the targets of growth and poverty alleviation. One thing is, however, clear – the new generation of technologies will have to be much more site specific, based on high quality science and a heightened opportunity for end user participation in the identification of targets. These must be not only aimed at increasing farmers' technical knowledge and understanding of science based agriculture but also taking advantage of opportunities for full integration with indigenous knowledge. It will also need to take on the challenges of incorporating the socio-economic context and role of markets. Swath control and variable rate technology. This is where guidance really begins to show a return on investment. Swath control is just what it sounds like. The farmer is controlling the size of the swath a given piece of equipment takes through the field. This video is a great visual representation of how swath control works.

## Benefits of Food Processing

Benefits of food processing include toxin removal, preservation, easing marketing and distribution tasks, and increasing food consistency. In addition, it increases seasonal availability of many foods, enables transportation of delicate perishable foods across long distances and makes many kinds of foods safe to eat by de-activating spoilage and pathogenic micro-organisms. Modern supermarkets would not exist without modern food processing techniques, long voyages would not be possible and military campaigns would be significantly more difficult and costly to execute. Processed foods are usually less susceptible to early spoilage than fresh foods and are better suited for long distance transportation from the source to the consumer. When they were first introduced, some processed foods helped to alleviate food shortages and improved the overall nutrition of populations as it made many new foods available to the masses. Modern food processing also improves the quality of life for people with allergies, diabetics, and other people who cannot consume some common food elements. Food processing can also add extra nutrients such as vitamins.

The significant benefits for different stakeholders involved in food processing are:

- ✓ Farmer – higher yield, better farm realization, lower risk
- ✓ Consumer – greater variety, lower prices, new products
- ✓ Companies – new business opportunities, demand growth
- ✓ Economy/Government – Employment generation, reduced rural migration

## Agricultural Development

Agriculture is essential not only to achieve self-reliance at national level but also for household food security and to bring about equity in distribution of income and wealth resulting in rapid reduction in poverty levels. Indian agriculture has, since Independence, made rapid strides. In taking the annual food grain production from 51 million tonnes in early fifties to 206 million tonnes at the turn of the century, it has contributed significantly in achieving self-sufficiency in food and in avoiding food shortages. Over 200 million Indian farmers and farm workers have been the backbone of India's agriculture. Despite having achieved national food



## Food and Nutritional Security

Special efforts will be made to raise the productivity and production of crops to meet the increasing demand for food generated by unabated demographic pressures and raw materials for expanding agro-based industries. A regionally differentiated strategy will be pursued, taking into account the agronomic, climatic and environmental conditions to realize the full growth potential of every region. Special attention will be given to development of new crop varieties, particularly of food crops, with higher nutritional value through adoption of bio-technology particularly genetic modification, while addressing bio-safety concerns.

## High yielding technologies:

The green evolution of the sixties would not have occurred without the High Yielding Varieties of Wheat and Paddy. These high yielding varieties along with increased area under irrigation fertilizers saw India becoming a bread basket from once being leveled as a begging bowl. Unfortunately, presently also our yields are less comparative to the yields of crops in other countries. This has severely reduced our total production. If Indian agriculture is to remain in competition with the global agriculture it has to increase the per unit yield of its crops. This requires the development and production of seeds which have more yields, are resistant to diseases, are not susceptible to insect pest attack, and can withstand the environmental extremities

## Food laws:

Food laws were among the earliest of enactments known to man. Governments over many centuries have endeavored to provide for the safety and wholesomeness of man's food by legal provisions and appropriate punitive action. Over the years also, rude forms of fraud, such as adding worthless substances to food or extracting valuable constituents from it, have been followed by sophisticated methods of adulteration more difficult to detect. The birth of modern chemistry in the early nineteenth century made possible the production of materials possessing properties similar to normal foods which, when fraudulently used, did not readily attract the attention of the unsuspecting purchaser. Later, better analytical methods were used in food control work to detect adulterants. When scientists demonstrated that some adulterants were dangerous to health, the aroused public demanded laws that would both protect their health and prevent fraud. Food Laws in one form or another, such as religious tenets or prohibitions, were inherent in all ancient civilizations and have come down to us from early times. It was not until the late nineteenth and early twentieth century — with the urbanization of societies and the depopulation of rural areas—that food laws, as understood today, were prepared. This process was hastened by pressure that developed as the public rebelled against the generally unhygienic conditions of the period.

Food industry and this development continue today; at the same time, our knowledge of the risks, actual and potential, has considerably increased. Reorientation and further consolidation of food laws have therefore become necessary to protect the health of the consumer from the many new risks to which he has become exposed and over which he has little personal control.

## HISTORY OF FOOD PROCESSING

Food processing dates back to the prehistoric ages when crude processing incorporated slaughtering, fermenting, sun drying, preserving with salt, and various types of cooking (such as roasting, smoking, steaming, and oven baking). Salt preservation was especially common for foods that constituted warrior and sailors' diets, until the introduction of canning methods. Evidence for the existence of these methods can be found in the writings of the ancient Greek, Chaldean, Egyptian and Roman civilizations as well as archaeological evidence from Europe,

Modern food processing technology in the 19th and 20th century was largely developed to serve military needs. In 1809 Nicolas Apart invented a vacuum bottling technique that would supply food for French troops, and this contributed to the development of tinning and then canning by Peter Durand in 1810. Although initially expensive and somewhat hazardous due to the lead used in cans, canned goods would later become a staple around the world. Pasteurization, discovered by Louis Pasteur in 1862, was a significant advance in ensuring the micro-biological safety of food. In the 20th century, World War II, the space race and the rising consumer society in developed countries (including the United States) contributed to the growth of food processing with such advances as spray drying, juice concentrates, freeze drying and the introduction of artificial sweeteners, colouring agents, and preservatives such as sodium benzoate. In the late 20th century products such as dried instant soups, reconstituted fruits and juices, and self cooking meals such as MRE food ration were developed.

### Food Safety and Standards Act, 2006

- I. Food Safety and Standards Rules, 2011
- II. Food safety and Standards (Licensing and Registration of Food businesses) regulation, 2011
- III. Food Safety and standards (Packaging and Labelling) regulation, 2011
- IV. Food safety and standards (Food product standards and Food Additives) regulation, 2011

- V. Food safety and standards (Prohibition and Restriction on sales) regulation, 2011
- VI. Food safety and standards (contaminants, toxins and residues) regulation, 2011
- VII. Food Safety and Standards (Laboratory and sampling analysis) regulation, 2011

## FOOD PROCESSING INDUSTRY IN INDIA

The Indian food processing industry stands at \$135 billion and is estimated to grow with a CAGR of 10 per cent to reach \$200 billion by 2015. The food processing industry contributed 7% to India's GDP. The industry employs around 13 million workers directly and about 35 million indirectly. The industry is segmented into sectors namely, milk and allied products (dairy), meat and poultry, seafood, bakery and confectionery, fruit and vegetables, grain, pulses and oilseeds (staple) products, alcoholic and non-alcoholic products (beverages), and packaged foods. The classification is not distinct as many processed products overlap different segments.

India ranks No. 1 in the world in production of Milk (Fresh, whole, buffalo), Pulses, Ginger, Chick Peas, Bananas Guavas, Papayas and Mangoes. Further, India ranks No. 2 in the world in production of Rice, Wheat, Potatoes, Garlic, Cashew Nuts, Groundnuts, Dry Onion, Green Peas, Pumpkins, Gourds, and cauliflowers. With the huge production base India can easily become the leading food supplier to the world and at the same time serving its vast growing domestic market with over a billion people. Investments in the registered food processing units have been growing in the recent years. In 2007-08 the fixed capital of registered food processing units have increased by 18.93% over the previous year.

Food processing industry in India is increasingly seen as a potential source for driving rural economy as it brings synergy between industry and agriculture. A developed food processing industry is expected to lead increase in farm gate prices translating into increased rural incomes, reduce wastages, ensure value addition, promote crop diversification, generate employment opportunities as well as export earnings. With such a large and diversified production base coupled with low manpower cost and modern technology, the Indian food processing sector is poised for growth, if the advantages are leveraged optimally. The growth is driven by the fact that the central government has given a priority status to all agro-processing businesses. Government incentives in the field of mega food parks, cold chain and exports benefits are also playing an important role in promoting food processing.

The major challenges are investments at different points of the supply and value chain, proper research, farm and lab connectivity, up gradation of technology, increase in farm holding, skill and manpower training, backend and front-end integration and cold chain integration. The opportunities in the food processing industry are vast. However, there is a need to improve technology and productivity to be competitive globally. As the economy grows, the food processing industry will offer bigger opportunities to the new as well as the existing players.

India has the second largest arable land of 161 million hectares and has the highest acreage under irrigation. Next to China, India ranks second largest food producer in the world and has the potential to immerse the biggest with its food and agricultural sector. India accounts for less than 1.5% of international food trade despite being one of the world's major food producers, which indicates huge potential for both investors and exporters.

## Challenges faced by the industry

High level of wastage of agricultural produces is primarily on account of the inherent disadvantages faced by the sector. This sector is characterized by preponderance of small farmers, small scale & tiny processors, outdated technology, poor infrastructure and a maze of middle men. Therefore, this sector needs support in terms of creation and strengthening of infrastructure which individual farmers and processors will not be in a position to create and sustain. Further, there is also a need for strengthening R&D activities in food processing sector for innovation of technology which suits local needs, popularization of appropriate technology, skill development and creation of an institutional framework supportive of the industry.



## Advantage India

- India is one of the largest food producers in the world.
- India has diverse agro-climatic conditions and has a large and diverse raw material base suitable for food processing companies.
- India is looking for investment in infrastructure, packaging and marketing.
- India has huge scientific and research talent pool.
- Well developed infrastructure and distribution network.
- Rapid urbanization, increased literacy, changing life style, increased number of women in workforce, rising per capita income leading to rapid growth and new opportunities in food and beverages sector.
- 50 per cent of household expenditure by Indians is on food items.
- Strategic geographic location (proximity of India to markets in Europe and Far East, South East and West Asia).

## Key growth drivers of Food Processing Sector in India

- Increasing spending on health and nutritional foods.
- Increasing number of nuclear families and working women
- Changing lifestyle
- Functional foods, fresh or processed foods
- Organized retail and private label penetration
- Changing demographics and rising disposable incomes



## Key opportunities in Food Processing Sector

- Processable varieties of crop
- Contract farming
- Investments in infrastructure through Public Private partnership (PPP)
- Mega Food parks
- Logistics and cold chain infrastructure
- Food safety Management Systems
- Machinery and packaging

## New technologies in vegetable production

In present scenario, survival of farmers, especially small and marginal farmers is challenged by continuously reduced land holdings, decreased subsidies for inputs, increased labour costs, input costs and slow increase in price per unit volume of output of grain-based crops. On the other hand, increasing urbanization, rising purchasing power and increased awareness about health benefits of vegetable consumption among economically middle and high strata of society leads to more demand for vegetables. Welfare schemes of Government of India like MNREGA, Mid-day meal scheme, Food Security Bill provides more scope for economically weaker sections of society to include nutritious and high value commodities (like vegetables) in their diet, by supporting them to invest less on food grains. Under these conditions, diversification of cropping systems with high value crops like, vegetables can be regarded as a viable option for Indian farmers to improve their incomes and the economic viability of Indian agriculture. In this context, some of the new technologies can be pivotal for promotion of vegetable production in the country. Some modern technologies related to vegetable production have been discussed here.

## Development of new varieties

Since man started domesticating plants, development of new crops and their varieties for better yield, quality, resistant to diseases, pests and abiotic stresses has become a dynamic process. With the advancement in science and its applications in agriculture, the tailoring of crops became more precise and rapid. Technologies like molecular markers, tagging, sequencing, cloning etc., made it possible to isolate and study specific genes or genomic regions conferring resistance to one or more biotic and abiotic stresses. Such useful genes or genomic regions from wild relatives of crop



plants are being transferred to cultivated forms with the help of marker assisted selection (MAS). a tomato variety resistant to tomato leaf curl virus has been developed by combining MAS and traditional pedigree breeding method at Indian Institute of Vegetable Research, Varanasi. Many vegetable crops have been genetically modified to include resistance to pests, pathogens and herbicides, and for other improved features like, slow ripening, higher nutritional status, seedless fruit, and increased sweetness. At the end, such products will be successful only if clear advantages along with safety of the products are guaranteed to both growers and consumers.

## Major Areas

The sector comprises of the following major areas

### ➤ Fruits & Vegetables

Beverages, Juices, Concentrates, Pulps, Slices, Frozen & Dehydrated products,  
Wine Potato Wafers/Chips etc.

### ➤ Fisheries

Frozen & Canned products mainly in fresh form

### ➤ Meat & Poultry

Frozen and packed mainly in fresh form, Egg Powder

### ➤ Milk & Dairy

Whole Milk Powder, Skimmed milk powder, Condensed milk, Ice cream, Butter and Ghee

### ➤ Grain and Cereals

Flour, Bakeries, Biscuits, Starch Glucose, Cornflakes, Malted Foods, Vermicelli,  
Pasta Foods, Beer and Malt extracts, Grain based Alcohol.

### ➤ Consumer Industry

Chocolates, Confectionery, Soft/Aerated Beverages/Drinks

### ➤ Plantation

Tea, coffee, cashew, cocoa, coconut etc

## Agricultural and Food Products Export Development Authority (APEDA)

The Agricultural and Processed Food Products Export Development Authority (APEDA) was established by the Government of India under the Agricultural and Processed Food Products Export Development Authority Act passed by the Parliament in December, 1985. The Act came into effect from 13th February, 1986 by a notification issued in the Gazette of India: Extraordinary: Part-II [Sec. 3(ii): 13.2.1986). The Authority replaced the Processed Food Export Promotion Council (PFEPCC).

APEDA is mandated with the responsibility of export promotion and development of the following scheduled products:

- ✓ Fruits, Vegetables and their Products.
- ✓ Meat and Meat Products.
- ✓ Poultry and Poultry Products.
- ✓ Dairy Products.
- ✓ Confectionery, Biscuits and Bakery Products.
- ✓ Honey, Jaggery and Sugar Products.
- ✓ Cocoa and its products, chocolates of all kinds.
- ✓ Alcoholic and Non-Alcoholic Beverages.
- ✓ Cereal and Cereal Products.
- ✓ Groundnuts, Peanuts and Walnuts.
- ✓ Pickles, Papads and Chutneys.
- ✓ Guar Gum.
- ✓ Floriculture and Floriculture Products
- ✓ Herbal and Medicinal Plants

In addition to this, APEDA has been entrusted with the responsibility to monitor import of sugar.

APEDA has marked its presence in almost all agro potential states of India and has been providing services to Agri-export community through its head office, five Regional offices and 13 Virtual offices.

### **Indian Crop Processing Technology (IICPT)**

Indian Crop Processing Technology (IICPT) is an autonomous organization under the Ministry of Food Processing Industries, Government of India. It is located in Thanjavur, Tamil Nadu. The main activities of IICPT are teaching, research and extension in areas of food processing to cater to the needs of stakeholders in the country. It runs a four year B.Tech Programme and a two year M.Tech Programme. The first M.Tech batch graduated in 2011; the first B.Tech batch will graduate in 2013. A Ph.D Programme is also in operation. IICPT has two regional centers; one in New Delhi and the other in Guwahati to cater to the needs of the stakeholders in those regions. The Guwahati Centre caters to the needs of the north-eastern region of the country. A state of the art food processing business incubation center and a food quality testing laboratory are being created in the Guwahati center. The New Delhi centre is catering to the Northern States such as Jammu and Kashmir, Himachal Pradesh, Punjab, Haryana, Delhi, Uttar Pradesh, Uttarakhand and Rajasthan. IICPT has NABL accredited food quality testing laboratory, food product development laboratory, food microbiology laboratory, a state of the art hi-tech food processing incubation center and food engineering laboratories. With its modern and world class laboratories equipped with hi-tech instruments, IICPT is engaged in identifying technologies for processing, preserving, value addition, by-product utilization through bio-processing, and process and product development. The subjects of research IICPT takes up are chosen with careful selection and approach. IICPT focuses their research in areas like: non-destructive quality evaluation and grading of fruits and vegetables, acoustic determination of fruits and vegetables maturity for harvesting, application of soft X-rays for identifying internal blemishes in fruits and vegetables, development of on-farm pre-coolers and vegetable washers, development of indigenous technology knowledge based food, composite grains foods, energy saving in parboiling, improving milling techniques of cereal grains, pulses, oil seeds and millets, food processing effluent treatment, creating ready to use dry mix fermented batter for idly and other Indian foods, new food product development based on grains, fruits and vegetables, fortification of processed foods for making health foods at affordable prices, development of new equipments for puffing, multipurpose yard drying, parboiling, for producing hand pound

rice, reducing storage losses, economic utilization of biomass, food industries by-product and waste utilization. Besides R & D, the institute started offering bachelor, master and doctoral degrees in food processing technologies apart from conducting non-formal short term certificate programs in food processing related areas.

### **The implementation of Food Safety and Standards Act, 2006 –**

- President assent received on 23.08.2006.
- Notified in the Gazette of India on 24.08.2006.
- The work allocation by Cabinet Secretariat notified vide S.O 1568(E) dated 17.09.2007 to allocate work relating to Food Safety and Standards (FSS) Act, 2006, to the Ministry of Health and Family Welfare.
- The Ministry of Health and Family Welfare issued notification on 15.10.2007 invoking section 4 to 10, 87-88, 91 and 101 relating to establishment of Food Authority, selection of Chairpersons and member of the Authority, function of Chief Executive Officer, power of Central government to make rules and powers to remove difficulties.
- Section 90 relating to transfer of existing employees of central government agencies governing various food related Act, /Orders to Food Authority, invoked vide gazette notification dated 28.08.2008.
- Food Safety and Standards Authority of India (FSSAI) established under Section 4 of the Act vide notification dated 5th September, 2008.
- Chief Executive Officer of Food Authority was appointed on 30.09.2008.
- Various sections (16-18,81-86,92 and 93) were invoked on 18.11.2008 and other sections (11-15) relating to Central Advisory Committee, Scientific Committee, Scientific Panel etc. were invoked vide notification dated 09.03.2008.
- 29.06.2009 - Section 99 notified.
- 31.07.2009 - Section 36-47 notified.
- 29.07.2010 - all remaining sections have been notified except section 22.
- 05.05.2011 - Rules notified
- 05.08.2011 - Regulations notified

### **BASMATI RICE FOR HIGHER INCOME AND PROSPERITY OF THE FARMERS**

Aromatic rice with extra long and soft textured grain, double expansion in length after cooking with excellent taste are unique characteristics of basmati, which is being cultivated in the foothills of Himalayas. There is appreciable demand for such rice in the international and domestic market; it is grown mainly in districts) the farmers is to be created for better transfer of research technology. supply are the pre-requisites for an excellent basmati crop. The fragrance, cooking and eating qualities of basmati are improved, if the crop matures in relatively cooler temperature and doesn't suffer from any biotic and abiotic stress. There is wide gap between the technologies developed at the research institutions and their applicability at the farmer's field. Therefore, awareness among the farmers is to be created for better transfer of research technology in the interest of rice industry.

## Resource-conserving technologies

Resource-conserving technologies are defined here as any practice that improves the efficiency of use of natural resources, including



water, air, fossil fuels, soils, inputs, and people. This can only be possible if the planting techniques of rice or wheat crops are improved resulting to saving of time, cultivation cost and irrigation water. Resource conserving technologies can be helpful in the achievements of major goals.

### Benefits of Direct Seeded Rice

- Avoids repeated paddling, preventing soil degradation and plow-pan formation
- Facilitates timely establishment of rice and succeeding crops as crop matures 10-15 days earlier
- Saves water by 35-40%, reduces production cost by Rs 3000/ha, and increases yields by 10%
- Saves energy: labour, fuel, and seed
- Solves labour scarcity problem and reduces drudgery of labours.
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### Choice of Variety

The varieties must be recommended after having the qualities based on market oriented Demand, consumerliking/cooking qualities,



appreciated by exporter/miller and minimum problem of plant protection, but always it is not happening with the varieties released by centre and state. Presently in the basmati growing areas, varieties ‘Sugandha 4’ (‘Pusa 1121’) and ‘CSR 30’ occupies about 70% share during kharif 2017- 18. Other varieties like Taraori Basmati’, ‘Basmati 386’ and ‘Pusa Basmati 1’ are also having sizable contribution in export of aromatic rice. Moreover,

## Conclusion

Food processing in India has always been practiced as household or cottage scale activity. Despite lack of basic training in new technology food processing operations, sweets, papads, murrabas, pickles, fried snacks, roasted and puffed cereals were prepared and marketed for local consumption. Now with the growth in agriculture, horticulture and pisciculture, the production of raw material has improved. One thing is, however, clear – the new generation of technologies will have to be much more site specific, based on high quality science and a heightened opportunity for end user participation in the identification of targets. These must be not only aimed at increasing farmers' technical knowledge and understanding of science based agriculture but also taking advantage of opportunities for full integration with indigenous knowledge. Department of Agriculture & Cooperation, Government of India for dissemination of relevant information, giving topical and seasonal advisories and providing services through SMSs in language of the state. It is an integrated Farmers' Portal and has been hosted as a Beta site and Farmers' like new technology in India and All Talukas level experiments in land cultivation by purchasing adapting Portal is the most important part of it.

## Reference

1. <http://apeda.gov.in> – Agricultural & Processed Food Products Export Development Authority
2. Authority
3. [www.dgft.gov.in](http://www.dgft.gov.in) – Directorate General of Foreign Trade
4. [www.indianspices.com](http://www.indianspices.com) – Spices Board
5. [www.cbec.gov.in](http://www.cbec.gov.in) – Central Board of Excise and Customs
6. [www.mpeda.com](http://www.mpeda.com) – Marine Produce Export Development Authority
7. <http://www.dgciskol.nic.in/> - Directorate General of Commercial Intelligence and Statistics, Ministry of Commerce, Government of India
8. Statistics, Ministry of Commerce, Government of India
9. <http://www.cftri.com/> - Central Food Technological Research Institute
10. <http://icmr.nic.in/> - Indian Council of Medical Research
11. <http://www.ndri.res.in> – National Dairy Research Institute
12. <http://www.ndri.res.in> – National Dairy Research Institute
13. <http://www.icar.org.in/> - Indian Council of Agricultural Research

14. [http://www.fao.org/index\\_en.htm](http://www.fao.org/index_en.htm) - Food and Agriculture Organization of the United Nations
15. Gustafson, J.; Cedarburg, C.; Sonesson, U.; Otterdijk, V.; Me beck, A. Global Food Loss and Waste: Extent, Causes and Prevention. FAO: Study Conducted for the International Congress. 2011. Available online: <http://www.fao.org/3/a-i2697e.pdf> (accessed on 13 July 2020).
16. FAO. The State of Food and Agriculture 2019. In Moving Forward on Food Loss and Waste Reduction; Food and Agricultural Organisation of the United Nations: Rome, Italy, 2019. Available online: <http://www.fao.org/3/ca6030en/ca6030en.pdf> (accessed on 13 July 2020).

