

# FINANCING AGRICULTURE

Vol. 43 Issue 12 December 2011

Rs. 50/-

ISSN 0015-2110



## Developing Horticulture Sector in India

**BIOFERTILIZERS: AN ECO-FRIENDLY  
WAY TO REPLACE CHEMICAL FERTILIZERS**

**ROLE OF ICT IN AGRICULTURAL  
MARKETING AND EXTENSION MANAGEMENT**



# The Most Comprehensive Event

For complete post harvest supply chain of Rice and Sugar i.e.

» Procurement » Warehousing/ Storage » Material Handling » Processing  
» Quality Control » Packaging » Logistics » Sale » Consumption

## INDIA

2-4 February 2012  
IARI Ground, Pusa,  
New Delhi, INDIA

Organizer Event Partner



## THAILAND

29-31 August 2012  
IMPACT Arena Exhibition  
and Convention Center,  
Bangkok

Organizers



Event Partner



For further queries, contact

**Geetika Malhotra**

Sr. Project Manager

M: 09991705003

isrmax@pcsl.co.in

**Sunil Dev**

Sr. Project Head

M: 09971842099

pro@pcsl.co.in

## Honorary Advisory Board

### **Shri Y.C. Nanda**

Chairman  
AFC Ltd.

### **Shri A.K. Garg**

Managing Director  
AFC Ltd.

### **Shri M.C. Mittal**

General Manager  
Union Bank of India

### **Shri Mohar Singh**

General Manager  
Bank of Baroda

### **Shri Gobinda Banerjee**

General Manager  
Punjab National Bank

### **Shri E. Shivalingam**

General Manager  
UCO Bank

### **Shri P.C. Srivastav**

General Manager  
Central Bank of India

### **Shri N. Narasa Reddy**

General Manager  
Canara Bank

Articles to be published in this journal may be mailed to [fa.afcl@gmail.com](mailto:fa.afcl@gmail.com) only. Authors may indicate their postal address and contact number. Articles may be between 4,000 to 6,000 words. Relevant photographs may also be sent.

Views expressed by the authors do not necessarily reflect those of the Agricultural Finance Corporation Ltd. No permission is necessary to reproduce contents except for the copyright text.



# EDITORIAL

Human life has evolved in various ways and has been managing with a mix of natural and manmade devices. From times immemorial, the human race has been intertwined with nature and hence man needs to work closely with it to make the world a better place. The need is to develop pro nature devices. Articles on biofertilizers, ecological pest management, biotech crops and groundwater pollution explore this aspect in detail. Sometimes nature may need to be tamed, the article on Parthenium Hysterophorus talks about once such nature's menace.

Not only the production aspect but the entire agriculture value chain needs to be more contained and integrated. Production losses in food commodities, which are estimated to be in the range of Rs.75000-100000 crore per annum, are something that our country can do without especially in these times of high food inflation. India, with the advantages of manpower, plentiful sunlight, water, land mass and wide variability of climate and soil is being increasingly recognized as the bread basket of the world. It has great and untapped potential to emerge as a major global player in marketing and supply of agricultural products. Articles on horticulture development, agroprocessing, fencing, ICT and plant protection equipments, discuss such issues and the like.

The article on commodity groups brings out the significance of organized agricultural groups in mitigating the plight of farmers for whom agriculture is just not a business but a way of life.

Hope you find this issue informative and enlightening.

Please do leave your suggestions and comments at [fa.afcl@gmail.com](mailto:fa.afcl@gmail.com)

**A.K. Garg**  
Editor-in-Chief

# I N S



## Annual Subscription

India, Nepal and  
Bangladesh Rs. 600/-

Other Countries  
(By Air Mail) US\$70

Single Copy Rs. 50/-

Agricultural Finance  
Corporation Limited

Dhanraj Mahal, Chhatrapati  
Shivaji Maharaj Marg,  
Mumbai 400 001

Tel: 91-022-22028924  
Fax: 91-022-22028966  
Email: afcl@vsnl.com  
URL: www.afcindia.org.in

## Developing Horticulture Sector in India.....6

By Subodh Agarwal

## Biofertilizers: An Eco-Friendly Way to Replace Chemical Fertilizers.....8

By Deepali and Kamal K. Gangwar

## Fenzgard.....10

## Agro-Processing Industries in India

## Growth, Status and Prospects.....12

By R.P. Kachru

## Role of ICT in Agricultural Marketing and Extension Management.....17

By Satyaveer Singh & Subah Singh Yadav

## Green to Evergreen Revolution: Ecological and Evolutionary Perspective .....21

By P.C. Kesavan and S. Malarvannan

## Groundwater Pollution due to Overuse of Nitrogenous Fertilizers .....24

By Ram Naresh

# I D E



## Plant Protection Equipment Role, Types and Suitability ..... 26

By Vimal Pratap Pandey, Roop Kishore, V.P. Chaudhary, and B. Gangwar

## Safety in Usage of Plant Protection Equipment ..... 28

By Vimal Pratap Pandey, Roop Kishore, V.P. Chaudhary, and B. Gangwar

## Role of Commodity Groups in the Age of Organized Retailing ..... 31

By Shibi Sebastian and A. Rathinsamy

## Parthenium Hysterophorus A Growing Menace to the Environment .... 36

By Dr. Amarjeet, Dr. Attar Singh, Dr. Satish Mehta and Dr. S.S. Punia

## Book Review ..... 39

## Agri News ..... 40

### Editorial Board

#### Editor-in-Chief

Shri A.K. Garg

#### Editor

Roopa Somasundaran  
Monisha Chattopadhyay

#### Associate Editor

Linda Brady Hawke

#### Event/Advertising

Amit Kumar Gupta  
91-120-4727111  
akgupta@lbassociates.com

#### Design

Atul Kumar  
Jayant Manohar

Published by  
**Agricultural Finance  
Corporation Ltd.**

Dhanraj Mahal, Chhatrapati  
Shivaji Maharaj Marg,  
Mumbai 400 001

Produced by  
**L.B. Associates Pvt Ltd.**  
H-108, Sector 63, Noida - 201301  
Tel: 91-120-2427280/82,  
Fax: 91-120-2427108  
Email: binoy@lbassociates.com  
Website: www.lbassociates.com



# Developing Horticulture Sector in India



By Subodh Agarwal\*

**T**he horticulture sector encompasses a wide range of crops e.g., fruit crops, vegetable crops, potato and tuber crops, ornamental crops, medicinal and aromatic crops, spices and plantation crops. It is the fastest growing sector within agriculture. It contributes in poverty alleviation, nutritional security and provides ample scope to farmers for increasing their incomes. It also helps in sustaining a large number of agro-based industries which generate huge employment opportunities. India, with its wide variability of climate and soil, is highly favourable for growing a large number of horticultural crops. Presently the contribution of the horticulture sector to India's agricultural GDP is 28 percent. The horticulture sector can significantly contribute towards the national goal of achieving 4.0 percent growth in agriculture.

## Current Scenario

After the Green Revolution in the mid-sixties, it became clear that horticulture,

for which the Indian topography and agro climate are well suited, is the best option. India has emerged as the largest producer of mango, banana and cashew nuts and the second largest producer of fruits & vegetables in the world.

The most significant development in the last decade is that horticulture has moved from rural confines to commercial production and this changing scenario has encouraged private sector investment in production system management. The last decade has seen technological infusions like micro-irrigation, precision farming, greenhouse cultivation, and improved post harvest management, impacting the development, but during the process various issues have emerged.

## Role of Banks in Development of this Sector

Institutional finance has a prominent role to play in meeting the fund requirements for strengthening the supply base of the horticulture and plantation sector. The

credit requirement for this sector during the tenth plan period has been estimated as Rs.18,420 crore. In order to meet this target, banks have been asked to give special focus to horticulture by increasing investment in this sector.

Commercial banks have devised strategies to boost their advances to the horticulture sector either through direct lending or by tie up arrangements with SHGs, NGOs and Corporates etc. This has motivated the farmers to undertake horticultural activities. Schemes with relaxed norms, particularly for small and marginal farmers, are available with all the leading banks for increasing production as well as for infrastructure development.

## Constraints in Development of Horticulture

- Inadequate Post Harvest Infrastructure and Processing Facilities;
- Poor Marketing Infrastructure;

- High Investments and Long Gestation Period;
- Post Harvest Losses;
- Trading and Marketing bottlenecks;
- Sale of the Produce by Small and Marginal Farmers;
- Market Distortions;
- Banking Facilities;
- Market Intelligence;
- Exploitation by Commission Agents/ Traders.

### Policy Environment for Horticultural Development

The development of the horticultural sector is supported by a large number of institutions both at the central and state levels. The National Horticulture Board (NHB) in the ministry of agriculture is the central institution responsible for facilitating the development of this sector. Its mandate includes:

- Encouraging the development of commercial horticulture through demonstration farms;
- Developing post harvest management infrastructure;
- Strengthening market information systems and maintaining horticultural database;
- Assisting R&D programmes; and,
- Providing training and education to



farmers and the processing industry for improving agronomic practices and adoption of new technologies.

The horticultural sector has received considerable attention in recent years as it is recognised as a potentially important source of growth, employment generation and foreign exchange earnings. The emphasis being given to this sector is reflected by the establishment of National Horticulture Mission in 2004 with an overall objective of enhancing production of horticultural crops by 2011-12. The specific objectives of National Horticulture Mission are: doubling horticultural production to 300 million tonnes by 2011-12; establishment of convergence and synergy among various

on-going and planned programmes in the field of horticultural development; and, promote the development and dissemination of technologies by blending traditional wisdom and frontier knowledge. The priority areas under the mission include horticultural research and development, improvement of post harvest management and promotion of processing and marketing of horticultural crops. The special attention is devoted to the promotion of horticultural export through establishment of focal Agricultural Export Zones (AEZs).

Some of the main reforms are: removal of licensing requirements and government control over cold storage fees; amendments of APMC Acts to allow contract farming, private sector investments in wholesale markets and direct marketing between buyers and sellers; approval of foreign direct investment (FDI) in food processing and marketing with the exception of retail marketing; removal/relaxation of quantitative restrictions on import and export of food items (except items on the negative list) and capital goods; abolition of minimum export prices (MEPs); and, tax reforms including the adoption of VAT to replace purchase and sales taxes in several states.



*Contributor: Assistant Professor (Agribusiness), CCS-HAU, Hisar*

# Biofertilizers: An Eco-Friendly Way to Replace Chemical Fertilizers

By Deepali and Kamal K. Gangwar \*

The excessive use of chemical fertilizers in agriculture has various adverse effects on soil. It depletes water holding capacity, soil fertility and causes disparity in soil nutrients. There was a strong need to develop low cost, effective and eco-friendly fertilizers which work without disturbing nature. Now, certain species of micro-organisms are widely used which have unique properties to provide natural products, and serve as a good substitute of chemical fertilizers.

## What is biofertilizer?

A number of micro-organisms (bacteria fungi and algae) are considered beneficial for agriculture and used as biofertilizers.

## Why biofertilizers?

Biofertilizers are supposed to be a safe alternative to chemical fertilizers to minimize the ecological disturbance. Biofertilizers are cost effective, eco-friendly and when they are required in bulk they can be generated at the farm itself. They increase crop yield up to 10-40 percent and fix nitrogen up to 40-50 kg. They improve soil texture, pH, and other properties of soil. They produce plant growth promoting substances IAA amino acids, vitamins etc. They have 75 percent moisture and it could be applied to the field directly. Biofertilizers contained 3.5-4 percent nitrogen, 2-2.5 percent phosphorus and 1.5 percent potassium. In terms of N: P: K, it was found to be superior to farmyard manure and other type of manure.

## Microbes used as Biofertilizer

Microbes are effective in inducing plant growth as they secrete plant growth promoters (auxins, abscisic acid, gibberellic acid, cytokinin, ethylene),



enhance seed germination and root growth. They also play a significant role in decomposition of organic material and enrichment of compost.

## Nitrogen fixing Bacteria

**Rhizobia:** Legumes plants have root nodules, where atmospheric nitrogen fixation is done by bacteria belonging to genera, Rhizobium, Bradyrhizobium, Sinorhizobium, Azorhizobium and Mesorhizobium collectively called as rhizobia. When rhizobial culture is inoculated in field, pulse crops yield can be increased due to rhizobial symbiosis. Rhizobium can fix 15-20 N/ha and increase crop yield up to 20 percent.

**Azorhizobium:** It is a stem nodule forming bacteria and fixes nitrogen symbionts of the stem. It also produces large amount of IAA that promotes plant growth.

**Bradyrhizobium:** Bradyrhizobium is reported to be a good nitrogen fixer. Bradyrhizobium strain inoculation with Mucuna seeds enhances total organic carbon, N<sub>2</sub>, phosphorus and potassium in the soil. It increases plant growth and consequently plant biomass, reduces in the weed population and increases soil microbial population..

## Diazotrophs

These are aerobic chemolithotrophs and anaerobic photoautotrophs. These are non-nodule forming bacteria. They include numbers of the families:

**Azotobacteraceae (e.g. Azotobacter):** They are free living, aerobic, photoautotrophic, non-symbiotic bacteria. They secrete vitamin-B complex, gibberellins, naphthalene, acetic acid and other substances that inhibit certain root pathogens. It improves root growth and



uptake of plant nutrients. It occurs in the roots of *Paspalum notatum* (tropical grasses) and other spp. It adds 15-93 Kg N/ha/annum on *P. notatum* roots. *Azotobacter indicum* occurs in acidic soil and sugarcane plant roots. It can be applied in cereals, millets, vegetables and flowers through seedlings soil treatment.

**Spirillaceae (e.g. *Azospirillum* and *Herbaspirillum*):** These are gram negative, free living, associative symbiotic and non-nodule forming, aerobic bacteria that occurs in the roots of dicots and monocot plants i.e. corn, sorghum, wheat etc. *Azospirillum* is found to be very effective in increasing 10-15 percent yield of cereal crops and fixes N<sub>2</sub> up to 20-40 percent kg/ha. Different *A. brasiliense* strains inoculation in the wheat seed causes increase in seed germination, plant growth, plumule and radicle length. *Herbaspirillum* species occurs in roots, stems and leaves of sugarcane and rice. They produce growth promoters (IAA, Gibberellins, Cytokinins), enhance root development and uptake of plant nutrients (N, P & K).

**Acetobacter Diazotrophicus:** Another diazotroph is *Acetobacter diazotrophicus* which occurs in roots, stem and leaves of sugarcane and sugar beat crops as nitrogen fixer and applied through soil treatment. It also produces growth promoters e.g. IAA and helps in nutrients uptake, seed germination and root growth. This bacterium fixes nitrogen upto 15kg /ha/year and enhance upto 0.5 – 1 percent crop yield.

**Cyanobacteria (Blue green algae):** *Nostoc*, *Anabaena*, *Oscillatoria*, *Aulosira*, *Lyngbya* etc. are the prokaryotic

organisms and phototropic in nature. They play an important role in enriching paddy field soil by fixing atmospheric nitrogen, supply vitamin B complex and growth promoting substance which makes the plant grow vigorously. Cyanobacteria fixes 20-30 kg/N/ha and increases 10-15 percent crop yield when applied at 10 kg/ha.

**Azolla – Anabaena Symbiosis:** It is a free floating, aquatic fern found on water surface having a cyanobacterial symbiont *Anabaena azollae* in their leaves. It fixes atmospheric nitrogen in paddy field and excrete organic nitrogen in water during its growth and also immediately upon trampling. *Azolla* contributes nitrogen, phosphorus (15-20 Kg/ha/month), potassium (20-25 kg/ha/month) and organic carbon etc. It increases 10-20 percent yield of paddy crops and also suppresses weed growth. *Azolla* also absorbs traces of potassium from irrigation water and can be used as green manure before rice planting. *Azolla* spp. are metal tolerant and hence, can be applied near heavy metal polluted areas.

**Phosphate Solubilising Bacteria:** *Pseudomonas fluorescens*, *Bacillus megatherium* var. *phosphaticum*, *Acrobacter acrogens*, *nitrobacter* spp., *Escherichia freundii*, *Serratia* spp., *Pseudomonas striata*, *Bacillus polymyxa* bacterias have phosphate solubilising ability. 'Phosphobacterin' are the bacterial fertilizers containing cells of *Bacillus megatherium* var. *phosphaticum*, prepared firstly by USSR scientists. They increase crop yield by about 10 to 20 percent and also produce plant growth promoting hormones which helps in phosphate solubilising activity of soil.

**Phosphate Solubilizing Fungi:** Some fungi also have phosphate dissolving ability e.g. *Aspergillus niger*, *Aspergillus awamori*, *Penicillium digitatum* etc.

#### Plant Growth Promoting Rhizobacteria (PGPR)

They are also called as microbial pesticides e.g. *Bacillus* spp. and *Pseudomonas fluorescens*. *Serratia* spp. and *Ochrobactrum* spp. are able to promote growth of plants. *Pseudomonas fluorescens* application to Black pepper enhanced uptake of nutrients which increased plant biomass. Fluorescent

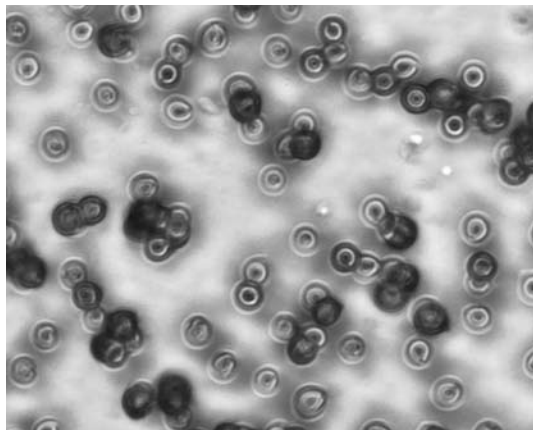


rhizobacteria improves the growth of *H. brasiliensis*.

**Mycorrhiza:** Mycorrhizas are developed due to the symbiosis between some specific root inhabiting fungi and plant roots. They absorb nutrients such as manganese, phosphorus, iron, sulphur, zinc etc. from the soil and pass it to the plant. Mycorrhizal fungus increases the yield of crops by 30-40 percent and also produces plant growth promoting substances.

**VAM Fungi or Endomycorrhiza:** They occur commonly in the roots of crop plants. VAM fungal hyphae enhance the uptake of phosphorus and other nutrients that are responsible for plant growth stimulation including roots and shoot length. VAM also enhances the growth of black pepper and protects from *Phytophthora capsici*, *Radopholus similis* and *Meloidogyne incognita*. VAM fungi enhance water uptake in plants and also provides heavy metals tolerance to plants.

**Contributors:** Deepali and Kamal K. Gangwar Punjab State Council for Science and Technology, Chandigarh.



# Fenzgard

*Based at Coimbatore, South India, Fenzgard deals in innovative fences for perimeter access control. Their intelligent standalone fencing systems ensure active security at industries, offices, residences and farmland. Mr. George Eapen, Managing Director of Fenzgard, was kind enough to submit the following interview.*



*Mr. George Eapen*

## In a country like India, how important is fencing?

India will soon be a bread basket to the world, with the advantages of manpower, plentiful sunlight, water and land mass. Agriculture will emerge as a major industry in India, driven by the global demand for food and its goal of becoming self reliant. Without the basic infrastructure of a good fence, no farmer will want to take any risk, while investing in agriculture. Crop losses happen more on account of wildlife incursions and to a smaller extent, theft. With the increase of wildlife population in India and their shrinking habitats, the man-animal conflict is only likely to increase with every passing day. Active fences are a necessity today.

Electric fencing can be a viable solution to address these problems, provided the fence does not eat the crop. The farmer is assured of safety, only if safety marking such as IEC. EN/CE, equivalent to BIS 302-2-76 is found sealed on the energizer. A mere piece of paper, such as a test report of a sample tested will not protect the legal interest of the farmer or the funding agency, in the event of fatality near an electric fence. Solar charging only completes the cycle of safety, when employing safety certified energizers. Mere solar charging does not make the fence itself safe, if the energizer is not safety certified.



## Describe the different fencing solutions you offer?

Fenzgard can by design offer control solutions for any species from snake to elephant, as a singular species or as a combination of all the animal species found at any given site. The patented design of the Offset fences are for dedicated elephant control. Combination fences come in 3 standard sizes:

- 1m high fence, to control sheep, wild boar, dogs etc.
- 1.5m high fences will control all of the above, plus cattle, bear, panther and to an extent, humans.
- 2m high flexible fences are used to control all of the above species, plus large impacting animals like Nilgai, Gaur, Deer and Elephants.

**In rural areas, how do you implement fencing especially when people are skeptical about the expenditure?**

Every farmer needs a good fence, to protect the crop and the farm infrastructure. Neo-farmers have no hesitation to invest in a quality fence, with 20 years life.

Traditional farmers who have availed of Bank loans may have suffered losses earlier, due to crop damage, bad yields, etc. They will find it difficult to invest scarce funds for this primary infrastructure, as they are financially weak and will look forward to additional bank funding for this capital expenditure. When the Bank is hesitant to extend any further help, they are forced to purchase local electric fences, without safety certification and warranty, wherein there is also a recurring cost involved, in replacing worn out components, besides the risks.

We convince the hard-pressed farmer to approach the bank again and invest 20 percent as margin money, to avail the 8-year term loan for a professional, permanent fence. Well protected, the farmer will be empowered to cultivate cash crops and inter-crops, which would not have been possible earlier. This is a win-win situation for both the farmer and the Banks, as a financially stressed-out farmer can be enabled to make a rapid recovery. Subsidies are offered for fences by some State Governments. However quality will not take a back seat, if the subsidies are routed through the Bank accounts of farmers, who have taken loans for fences.

**How affordable are the fencing solutions for the Indian market?**

Affordability is in the eye of the beholder. Just as a farmer can afford to avail institutional finance for a jeep or car, from both Banks and private finance, he can invest on a fence with help from Banks. Crop protection has now become a necessity.

**How do you promote or create awareness about fencing and agriculture insurance amongst the Indian population?**

Agriculture Insurance is not very popular among farmers for many reasons, mainly due to lack of information and guidance. Insurance agencies are also not very forthcoming when farmers enquire about reduced insurance premiums, on a well protected farm. Since the risk factor involving crop loss can be addressed with a good fence, it follows that the risk premium should be reduced. However, it is the banks, which can really push the issue of insurance, as it covers their risk of lending. The farmer will gladly take an insurance policy, if it is made mandatory for availing a farm loan.

**Fenzgard provides general and agriculture insurance. Kindly elaborate.**

Sorry, you got that wrong. We do not offer, arrange or provide



insurance cover. We only try to make the farmers aware and the banks to mitigate the risks.

**What are the areas that are covered by insurance?**

Insurance is available these days, for any activity under the sun.

**What measures do you suggest for educating people about agriculture insurance?**

Education of the farmer and implementation by the Insurance agencies will have to go hand in hand. If banks insist on taking insurance cover for all agriculture advances, the farmers will definitely like to cover all the risks, even if it means paying a small premium.

**How will agriculture insurance benefit the society?**

Society needs to sustain the farmer in his field, if a food crisis is to be avoided. With the flight of rural manpower from agriculture operations, high cost of inputs, poor returns, crop damage etc., many farmers are abandoning their fields and converting them into real estate. The farmer is normally a very resilient person but it can be the last straw, when in spite of his best efforts, he suffers losses on account of wildlife damage. Subsidies may be one way to sustain a farmer with some of the agriculture inputs, however only a pro-active insurance cover can sustain the farmer's will, at the end of the day, to stay back and give agriculture yet another try, next season.

**What is the future of agriculture insurance in India?**

Agriculture insurance has to be an integral part of planning, for sustaining the food security of our country. The Indian farmers have survived despair long enough, which cannot be easily appreciated by consumers in the urban areas. Unless the farmer is assured that there is a bright future in agriculture, he will definitely look for better pastures in the cities to sustain his family. Once he abandons the field for a white collared job, there is no way he will come back to the blue collared job of agriculture. Insurance cover is also pertinent to ensure that the next generation of farmers, who are generally more educated, continue with the traditional vocation of farming.



# Agro-Processing Industries in India *Growth, Status and Prospects*

By R.P. Kachru\*

**A**gro processing could be defined as a set of techno-economic activities carried out for conservation and handling of agricultural produce, and to make it usable as food, feed, fibre, fuel or industrial raw material. Hence, the scope of the agro-processing industry encompasses all operations from the stage of harvest till the material reaches the end users in the desired form, packaging, quantity, quality and price.

Agro-processing is now regarded as the sunrise sector of the Indian economy in view of its large potential for growth and likely socio-economic impact specifically on employment and income generation. Some estimates suggest that in developed countries, up to 14 percent of the total workforce is engaged in the agro-processing sector directly or indirectly. However, in India, only about 3 percent of the workforce finds employment in this sector revealing its underdeveloped state and vast untapped potential for employment. Properly developed, the agro-processing sector can make India a major player at the global level for marketing and supply of processed food, feed and a wide range of other plant and animal products.

## Trends in Agricultural Production

At the start of the twentieth century, Indian agriculture was in a stage of subsistence. By the year 2000-2001, India started producing about 700 million tonnes (Mt) of biological materials per year including food grains, oilseeds, fruits, vegetables, sugarcane, milk, eggs, meat, fish, tea, coffee, fibre crops, floricultural produce, forest produce and so on. The country has diverse agro-climatic conditions and consumer preferences and hence it produces a vast variety of agricultural and livestock materials. As can be seen, India holds a major share for some of these products in the global context. However, their market potential is not being fully realized due to poor post-harvest management and inadequate infrastructure, and programmes for processing agro-produce.

## Extent of Post Harvest Losses

On account of poor post-harvest management, the losses in farm produce in India have been assessed to be of a very high order. Various studies have estimated post production losses in food commodities to the tune of Rs. 75,000-1,00,000 crores per annum. It may be mentioned here that the estimated losses include losses during storage, handling and milling/processing. It does not include losses at the consumer's end.

**Table 1. Production status change over last fifty years**

Commodity	1950-51 Mt	Mt
<b>Food grains</b>	50	206 (99-2K)
<b>Oil seeds</b>	5	24.5
<b>Fruits</b>	12	41
<b>Vegetables</b>	10	72
Potatoes	1.7	25 (24.2) (1998)
Onion	1.0	5.5 (4.75)
Mushroom		40 kt
<b>Livestock &amp; Poultry</b>		
Milk	17	78 (99-2K)
Meat	0.7 (1971-72)	4.6
Eggs	10 bn(#) (1980-81)	30 bn(#) (99-2K)
<b>Fish</b>	0.75	5.6 (99-2K)
Marine		2.9
Fresh water		2.7
<b>Honey</b>	0.7 kt (1963-64)	5.5 kt
<b>Coconut</b>	4.5 bn(#)	15 bn(#)
<b>Spices</b>		3
<b>Sugarcane</b>	57	309.4
<b>Certified seeds</b>		0.75
<b>Lac</b>	40 kt	20 kt
<b>Fibre crops</b>		
Cotton	0.7	2.5
Jute	0.67	1.67
Coir	0.13 (1954-55)	0.34
Wool	32 kt (1980-81)	45 kt

It is also estimated that the extent of losses could be brought down to less than 50 percent of the existing level with proper transfer and adoption of agro processing technology. For reducing the rest of the losses, new initiatives are called for. Hence, it would be in the long term interest of the economy to invest in developing suitable infrastructure such as proper grain storage structures, cold stores and processing systems to avoid the losses.

only about 200 out of them could be considered as full time R&D workers in agro-processing.

R&D Work in agro-processing carried out in India during the last 50 years are categorized as follows:

- Studies on physical, biochemical, nutritional, and engineering properties/characteristics of different food, feed, fibre, and industrial raw materials.

**Table: Present level of production of different types of food commodities and their estimates of post-harvest losses**

Type of Food Commodity	Present Level of Production			Post-harvest Losses		
	Quantity (Mt)	Average Price (Rs/t)	Value (Rs. in Crore)		Quantity (Mt)	Monetary Value (Rs. in Crore)
1. Durables (cereals, pulses, oilseeds, etc.)	230	10,000	230,000	10	23.0	23,000
2. Semi-perishables (potato, onion, sweet potato, tapioca etc.)	40	3,000	12,000	15	6.0	1,800
3. Perishables (fruits, vegetables, milk, meat, fish, eggs etc.)	210	15,000	315,000	20	42.0	63,000
<b>Total/Average</b>	<b>480</b>	<b>11,604</b>	<b>557,000</b>	<b>14.8</b>	<b>71.0</b>	<b>87,800</b>

*\* On a conservative scale*

**Research & Development in Agro Processing Sector**

A significant increase has taken place after the early fifties in the number of institutions engaged in agro processing research. In the area of teaching, presently there are 18 universities/ colleges offering first degree, 11 offering post graduate and 7 offering Ph.D. degree. Although nearly 2000 scientists were associated with agro-processing R&D in the year 2000-2001,

**Agro-processing is now regarded as the sunrise sector of the Indian economy in view of its large potential for growth and likely socio-economic impact specifically on employment and income generation**



- Response studies of different biological materials, their storage, handling, and moisture conditioning.
- Refinement of traditional equipment and processes for production of different foods, feeds, fibres and fuel materials for better quality, higher capacity, energy efficiency, and reduced drudgery to workers.
- Development of new produces and processes for better nutrition, convenience and taste.
- Enhancement of shelf life of the produce, safe storage/ packaging and development of better performing materials.
- Better economic utilization of agricultural residues, by-products and recycling of wastes.

## INVESTIGATION

- Design and Development of instruments and equipment for post harvest operations and their evaluation, feasibility analysis, field trials/multi-location evaluation etc.
- Design, layout planning and development of pilot plants, agricultural produce bulk handling systems and area specific agro-processing models.
- Studies and modelling/simulation of post harvest systems and industry for the purpose of optimization, forecasting and policy analysis.
- Energy auditing and use of non-renewable sources of energy for post harvest operations.
- Product quality analysis, sensory evaluation and consumer acceptance studies.
- Work conditions, safety and pollution control.

**Technologies:** Among large number of technologies developed, the most popular ones include:

- Agriculture produce refinement equipment such as, cleaners, graders and driers for on-farm operations as well as industrial operations.
- Processes and equipment for parboiling of rice, preparation of puffed rice and flaked rice.
- Development of processes and equipment for processing of pulses to produce dhal for higher recovery and better quality.
- Development of driers using agricultural residues, by-products and solar energy.
- Adoption and development of processes, and equipment for production of protein rich produces such as full fat soy flour, soy drink/soy milk, soy paneer (TOFU) and soy fortified baked products.
- Development of equipment such as, leaf cup and dona making machine, multipurpose mills, mini flour mill, grain pearlors, maize dehuskers, shellers, groundnut decorticators, fruit graders, juice extractors, high recovery mechanical oil expellers and improved storage structures for cereals, pulses, oilseeds, onion and potato.
- Processes and equipment for production of high quality ground spices and spice mix, development of raw materials and processes for production of instant sweets, curries, snack foods, instant soft drinks, idli, dosa, sambhar mixes/powders, egg powder, production and packaging of milk products such as shrikhand, butter milk, paneer, ghee and sweets.
- Equipment for high recovery of sugarcane juice, processes for production of high quality and liquid jaggery.
- Processes, equipment and pilot plants for production of various industrial raw material including dyes and pharmaceutical products.
- Improved technology for processing of jute sticks to yield jute fibre and impregnation, preparation of jute based textile materials and bags.



- Control of stored grain insects by using chemical and physical methods, storage structures for on-farm, trade, and process plant level operations.

Some work has also been done in the area of processing forest produce such as oil extraction from oil bearing materials, collection and processing of resins and production of dyes, chemicals and pharmaceutical products. The latest developments have been in the area of floriculture. Due to high export potential, R&D work has been initiated at some centres on pre-cooling, packaging, and transport of cut flowers and low cost designs of green houses. Agro-processing models have also been developed for some of the agro-climatic regions in the Country.

In the area of agro-processing of fruits and vegetables, development of tools and techniques for harvesting, pre-cooling of freshly harvested produce, minimal processing, controlled ripening, juice extraction, concentration and storage has been done. Similarly, in the area of spices and condiments, floriculture, production of mushrooms, honey, eggs and fish, technologies have been developed for post harvest loss reduction and value addition.

Strong R&D support will have to be continued to overcome these and many other problems to ensure that our agro-processing technology becomes competitive at the global level. As stated earlier, in spite of the problems, agro-processing technology in India has continued to make steady progress towards modernization.

### Swot Analysis of Agro-Processing Industry Infrastructure in India

#### Strengths:

- Round the year availability of raw materials.



**Table 3. Recent Trends in Agro Processing Technologies**

S. No.	Crop/ Item	Recent products, processes, trends and technologies
1	Rice	Fully automatic modern rice mills Partially cooked/quick cooking rice Breakfast cereals and value-added products Attractive packaging and branding
2	Wheat	Fully automatic roller flour mills Whole bran wheat flour Fortified wheat flour Attractive packaging and branding Large number of baked products Automatic chapatti making machines
3	Maize	Corn flour-packaged and branded Corn flakes and value-added products including ready-to-eat snacks (salted & sweetened) Starch material, corn oil with specific consumer desired attributes Cattle feed Baby corn Large, automatic corn processing plants
4	Coarse Cereals	Value-added products including breakfast foods & extruded fortified tasty products Industrial raw materials
5	Pulses	Automatic processing units for pulses with driers, colour sorters and packaging unit Attractive consumer packaging with branding Cold storing of processed pulses Snack foods and other value added products
6	Soybean	Production of full fat soy flour/enzyme active soy flour for bakery and fortified foods Ready-to-eat snack foods

- Social acceptability of agro-processing as important area and support from the central government.
- Vast network of manufacturing facilities all over the country.
- Vast domestic market.

**Weaknesses:**

- High requirement of working capital.
- Low availability of new reliable and better accuracy instruments and equipments.
- Inadequate automation w.r.t. information management.
- Remuneration less attractive for talent in comparison to contemporary disciplines.

- Inadequately developed linkages between R&D labs and industry.

**Opportunities:**

- Large crop and material base in the country due to agro-ecological variability offers vast potential for agro processing activities.
- Integration of developments in contemporary technologies such as electronics, material science, computer, bio-technology etc. offer vast scope for rapid improvement and progress.
- Opening of global markets may lead to export of our developed technologies and facilitate generation of additional income and employment opportunities.



### Threats:

- Competition from global players.
- Loss of trained manpower to other industries and other professions due to better working conditions prevailing there may lead to further shortage of manpower.
- Rapid developments in contemporary and requirements of the industry may lead to fast obsolescence.

### Plan and Strategy

The objectives of agro-processing programmes in India should be to:

- Minimize product losses,
- Add maximum value,
- Achieve high quality standards,
- Keep processing cost low,
- Ensure that a fair share of added value goes to the producer.

**Achieving the Strategy:** To achieve these objectives the following strategy is suggested:

National plan for improvement and extension of agro-processing technology at farm, traditional small industry and modern industry levels should be prepared. The plan should take into account the diversity in resources and needs of different regions in the Country. It should include programme details and implementation schedule for the first four or five years. The progress of plan implementation should be periodically reviewed to allow adjustments and corrective measures, and

**A significant increase has taken place after the early fifties in the number of institutions engaged in agro processing research. In the area of teaching, presently there are 18 universities/ colleges offering first degree, 11 offering post graduate and 7 offering Ph.D. degree. Although nearly 2000 scientists were associated with agro-processing R&D in the year 2000-2001, only about 200 out of them could be considered as full time R&D workers in agro-processing**

to develop programme details for the years beyond the period under review.

Thrust areas for research and development should be identified and medium term research and development programme should be prepared and implemented to support the national plan for improvement and extension of agro-processing technology at different levels. Treatment and utilization of effluents from agro-processing industry should be included in the R.D. programme.

Emphasis should be put on the establishment of new agro-industrial plants in the production catchments to minimize transport cost, make use lower cost land and more abundant water supply, create employment opportunity in the rural sector and utilize process waste and by-products for feed, irrigation and manure.

Infrastructure in the production catchments selected for agro-industrial development should be improved. Because of uncertain grid power supply to rural areas, decentralized power generation using locally available resources may become an integral part of agro-industrial development. Similarly, if the raw materials and processed products are perishable or semi-perishable in nature, cold chain will have to be established.

The national plan should provide for management of agro-industrial activities in the catchment area, both by private companies and individuals as well as cooperatives.

Financial incentives and support should be provided on liberal scale to promote the modernization of agro-processing industry and for establishing new such industries in production catchments.

Arrangements to supply market information to the farmer and agro-processor should be put in place.

*Contributor: Research conducted by Indian Council of Agricultural Research, New Delhi under Assistant. Director General (Process Engineering).*

# Role of ICT in Agricultural Marketing and Extension Management

By Satyaveer Singh & Subah Singh Yadav\*



## Importance and Objectives of Agriculture Marketing

The farmer has realized the importance of adopting new techniques of production and he is making efforts for generating higher income and improving standards of living. As a consequence, the cropping pattern is no longer dictated by what he needs for his own personal consumption but what is responsive to the market in terms of prices received by him. While the trade is organised the farmers are not conversant with the complexities of the marketing system which is becoming more and more complicated. The major objectives of the agricultural marketing areas are as under:

- To enable the primary producers to get the best possible returns i.e price information (When, Where and How Much Quantity);
- To provide facilities for lifting all produce, the farmers are willing, to sell at an incentive price;
- To reduce the price difference between the primary producer

and ultimate consumers at reasonable price without impairing quality of the produce (MIS), and;

- To provide a transparent platform for auctions in Mandi Yard (E-Auctions);
- To provide storage facilities, charges and availability of 'go downs' etc;
- To provide adequate information on transport facilities which could enable him to take his surplus produce to the mandi rather than dispose it of in the village itself to the village money-lender-cum-merchant at low prices;
- To provide information on good agricultural practices in IT based extension.

## Thrust Area of Information Communication Tools in Agriculture Markets

In order to achieve these objectives, a number of thrust areas have been identified where Information Technology (IT) can play a crucial role in leveraging traditional methods of



agricultural marketing. Some of these are:

- Agricultural Market Intelligence System (AMIS);
- Mobile Electronic Auctioning System (MEAS);
- Electronic Display Boards (Rural Connectivity);
- Agricultural Extension through ICT;
- Virtual Markets (VM)

### Agricultural Market Intelligence System (AMIS)

Agricultural marketing essentially deals with post harvest management of produce and finding competitive markets for getting best available returns. In order to reduce the risk of marginalisation and vulnerability of small farmers, who constitute about 76.3 percent of total farmers of the country, it is necessary to develop an 'Agricultural Market Information System' (AIMS) that is accessible to the resource-poor farming community. Internet technology based applications on agricultural resources are expected to facilitate agriculture-based development of rural and economically backward areas in the country. Design of agricultural market information system is crucial for the support of various management systems at the national, state, district and village levels.

of agricultural marketing (involving storage, packaging, infrastructure, services) agricultural extension and transfer of technology, agro-meteorology, agri-business, quality assurance and agricultural inputs (viz. seeds, fertilizers, manures).

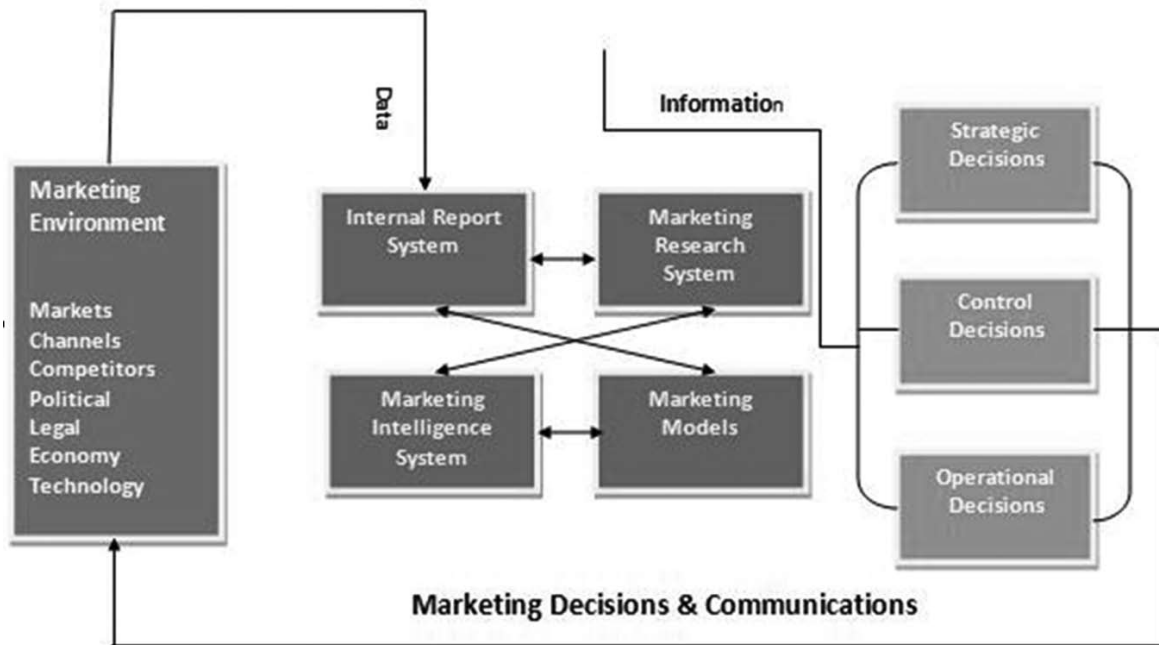
The AIMS also plays an important role in creating awareness for wholesale and retail price information among the stakeholders. A cost and margin study for each major commodity is to be conducted in the country. At each municipal/consumer market, Government should mandatory place an electronic display board and flash out the maximum and minimum price of the commodities. The maximum and minimum price can be calculated on the finding of cost and margin study and other expenses as under:

$$\text{Max Price (Commodity)} = \text{Cost Margin Study} + \text{Variation Factor} + \text{Marketing Cost} \pm 15\%$$

$$\text{Cost Margin} = \text{Input Cost} + \text{Pesticide} + \text{Labour} + \text{Sorting/Grading} + \text{Packaging} + \text{Transportation} + \text{Market Charges} + \text{Losses (PHM)}$$

Variation Factor = Variation factor based on market escalation in all above items

Marketing Cost = Middlemen's share from wholesale to

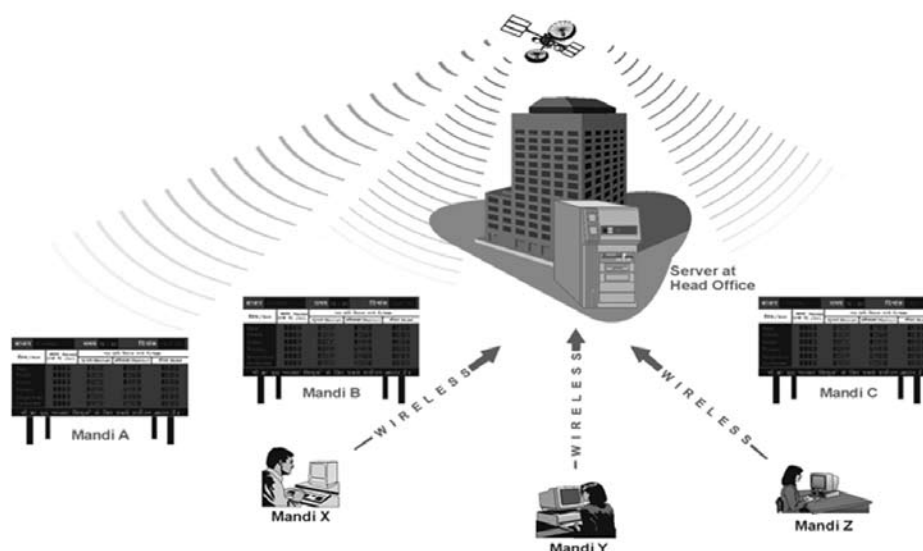


The AIMS model will be an informatics model aimed towards developing a reliable and integrated system, wherein all the information associated with marketing is readily available. This informatics model is based on – multi-database information system; knowledge based expert system; geographical information system; and online distributed query capabilities. Informatics for an agricultural marketing information system requires coordinated inter-sectoral approach and application of appropriate information technology tools in the area

consumer market and losses

Marketing cost will differ from place-to-place and commodity-to-commodity. It is dependent on the location, distance, and transportation etc. A distributed database is to be developed and to be connected with the concerned Electronic Display Board in the markets.

ICT has the potential to provide agro-information services that are: Affordable; Relevant (timely & customised); Searchable;



and, Up-to-date. Large sections of the farming community, particularly the rural folk, do not have access to the huge knowledge base acquired by agriculture universities, extension centres and businesses. While tele-centres are beginning to do the Indian rural landscape, one of the big barriers remains the lack of agro content that is: In the language of farmers; Relevant to their needs; and, Delivered in a form that is of immediate use.

**Mobile Electronic Auctioning System (MEAS)**

In the Mandi there are hundreds of Traders/Commission Agents, who perform bidding. Sometimes, the farmer does not know what price his produce fetches. It takes at least one day to find out the quantity of a particular commodity. In the existing AIMS, instant or online information of the commodity arrival and price information is not available in the State/Central Portals. To overcome the above problem, IT can play an important role.

The Mobile Electronic Auction System can be put in place in each market in the existing environment. The benefit of the mobile electronic auction systems is to reduce the capital investment (big auction hall, display hall and hardware cost of computers etc). In the Mobile Auction System a central Server is to be placed in the Market Yard and through Wi-Fi or wireless connect with the mobile van. In the mobile van a big size electronic display board is placed and through remote keypad, bidding information is to be updated in the server. One or more Mobile Vans can serve the whole bidding process of the market yard in a transparent manner and also provide on the spot real time auctioning information. To install the MEAS in the market yard, certain changes are required in the APMC functioning. Enforcement for total auction on E-platform, prior auction produce to be graded in lots and information of farmers, commission agents, quantity etc. is to be fed in the computer. A major difficulty is that a large number of farmers and traders consider the social contact at traditional auctions highly important. EASE however, sees its role as a provider

of additional or complementary services. The company aims to replace traditional auctions by electronic auctions, or to introduce them in new areas, where social contact has little or no importance or where the advantages of an electronic auction outweigh those of the more traditional system. Traditional auctions can still be held parallel to the electronic auctions, if this is desired.

**Agricultural marketing essentially deals with post harvest management of produce and finding competitive markets for getting best available returns. In order to reduce the risk of marginalisation and vulnerability of small farmers, who constitute about 76.3 percent of total farmers of the country**

**Benefit of MEAS**

Introducing the Electronic Auctioning System for the Mandi Organizations is beneficial in many aspects, for instance:

**Transparency:** The first and important objective of the system is to increase transparency. Normally and traditionally traders use their own ways to auction and there is not any standard or single system for all the traders.

**Standardize the Processing:** At the moment the system is in the testing state, and with practical feedback and improvements, this system will become a standardized system.

**Strong Database:** The historical database will be maintained and APMC can have information which can be useful for future analysis in price trends and other analysis.

SMS Bidding: Registered buyers can also participate in the bidding through their mobile phones.

## Rural Connectivity for Agricultural Market Information

The primary objective of a market information service is to increase the degree of knowledge of market participants (farmers, traders and consumers) about the market. Improved access to information leads to an improved understanding of the market. This means that the decisions made by the participants should be more informed and profitability of their operations should be enhanced.

Information will be updated by GSM, CDMA technology. The existing system will be equipped with power supply on a regular basis at least 4-5 hours through battery back up. Village Electronic Boards should be connected with the District/State markets through GSM/CDMA technology. The concerned APMCs will look after the operational and maintenance part of the display boards.

## Extension through ICT Application

ICT models deliver both governmental and non-governmental services to the farming community. The current ICT initiatives in India have also been assessed to identify the gaps in the existing agricultural practices. There have been considerable improvements in collection of content during the past few decades. Some of the content for the need of farmers in the villages is based on the survey as under:

- 75 percent farmers consider radio as a potent mechanism of entertainment. Radio coverage can effectively utilize FM technology and agriculture related information can also be transmitted along with entertainment preferable on regional basis.
- One of the facts that emerged out of the survey is that about 41 percent of farmers are dependent on the Market Yard for obtaining information. This establishes the need to open an Information Centre in each APMC and disseminate such information through Electronic Format, Cable TV, after updating it at an appropriate time.

**In the Mandi there are hundreds of Traders/ Commission Agents, who perform bidding. Sometimes, the farmer does not know what price his produce fetches. It takes at least one day to find out the quantity of a particular commodity. In the existing AIMS, instant or online information of the commodity arrival and price information is not available in the State/Central Portals. To overcome the above problem, IT can play an important role**

- The survey under reference clearly indicates the vulnerability of 17 percent of farmers and middle level standard of 65 percent of farmers. All these farmers face sever difficulties in taking credit from banks and other financial institutions. Therefore, a complete package containing essential information for getting loan from banking system can be prepared.
- Farmers are completely devoid of the information about taxes and other charges on commodities. This issue can be easily addressed by arranging one day workshop/training at APMC level for the farmers within their area of operation.
- A complete regional database (Agri-Rural Development Scheme, Marketing of Milk, Health & Education) or effective linkage with the already available database at district or state level for diffusing the information at market level can be ensured.
- Each Mandi should be projected as a hub of micro information centre and it should also be backed up with a minimum 128 kbps bandwidth.
- Similarly, programmes for agriculture and agricultural marketing related information may be organised to impart necessary training to farmers so that they may be aware of modern technology and agricultural marketing.

## Virtual Markets (Farmers Market)

The Internet is ushering in a new era of agricultural marketing using website

electronic store fronts or profit centres, or database marketing, including Internet Commodity (Virtual Markets).

A group of farmers can register on the internet and upload available agricultural commodities on a daily basis. Buyers can view the portal and quote the price of commodities. With mutual consent they can sell and buy their produce. Government should provide a platform for easy and transparent B2B business rules. Government should also provide a litigation redressal system in this process.

## Advantages of Farmer Markets

There is no need to transport the products to the traditional marketplaces anymore. Thus, the products are only moved when sold, and because the buyers are able to schedule the routes of their vans/lorries more effectively with the information, costs are minimised.

The fees for participating in FM are less than those associated with traditional markets. Furthermore, the bidders tend to stay for the period of an electronic auction, whereas the attendance of buyers at traditional auction places tends to be erratic. A further advantage is the ability of FM to offer additional services. Data on past and current auctions is stored in an electronic format, allowing FM to perform analysis of trends in supply and demand comparatively easily. Such information is not only more up-to-date, but can also be supplied relatively cheaply.

*Contributors: Satyaveer Singh, MIS Expert, Asian Development Bank, under TA-4890, Subah Singh Yadav, Chief Manager, Bank of Baroda, Training Centre, Patna*





## Green to Evergreen Revolution: Ecological and Evolutionary Perspectives in Pest Management

By P.C. Kesavan and S. Malarvannan\*

### Green to Evergreen Revolution

The purpose of this article is to describe why the 'exploitative' green revolution of the 1960s and 1970s needs to be transformed into an 'evergreen revolution' (eco-friendly 'second' green revolution), and the effective eco-friendly approaches to manage crop pests, especially the lepidop-teran borers such as American bollworm (*Helicoverpa armigera*) and brinjal fruit and shoot borer (*Leucinodes orbonalis*) at below 'economic injury level'.

Today, it is widely acknowledged that the 'yield gains' associated with the green revolution of the 1960s and 1970s have tapered off largely because of deterioration in the structure, quality and fertility of the soil. Further, the groundwater source for irrigation has become greatly depleted, as also the useful genes locked up in several locally adapted indigenous varieties and land races, for future food security. This is so because the low-yielding but locally adapted indigenous varieties are no

longer widely cultivated in view of the greater economic attractiveness of the high-yielding green-revolution varieties of wheat and rice. The goal, rather myopic, is immediate economic gains than 'long-term sustainable yields' by maintaining ecological integrity, especially of soil, freshwater, biodiversity, renewable energy, etc.

### Eco-microenterprise of Biopesticide

With primary goals of achieving both food security and livelihood security in perpetuity without causing degradation of the ecological foundations of agriculture, care needs to be taken to develop and use biopesticides and biofertilizers within Integrated Pest and Nutrition Management (IPNM) schedules. In the scientific literature, it is well-documented that chemical pesticides are not pro-nature, pro-poor and pro-women. Because they kill several non-target beneficial organisms (e.g. pollinators, predators, parasitic wasps,

earthworms, birds, etc.), they are not eco-friendly. The carcinogenic action of pesticide residues and the increased incidence of cancers among the farmers and their family members in the green revolution belt is well documented. Further, the chemical pesticides are becoming increasingly expensive, costing beyond the means of the resource-poor, marginal and small farmers. Further, the chemical pesticides are not amenable to be produced in the huts and small houses of the marginal farming and landless women in terms of high-level technology, capital investment and management. So, it is not pro-women in nature. Hence, MSSRF has demystified the production of a biopesticide, an egg parasitoid, *T. chilonis* (Hymenoptera, Trichogrammatidae) and trained several landless women in over dozens of villages in Tamil Nadu and Puducherry to culture and market these. The *Trichogramma*, an effective egg parasitoid, lays its eggs on the eggs of cotton bollworm (*H. armigera*). On hatching, the *Trichogramma* larvae feed on the egg contents of the bollworm

leading to significant reduction in the population of the pest. The 'economic injury level' is not totally eliminated, but consistently managed in a 'win-win' manner between ecology, health of the farmers and economics. The biopesticide effectively reduces the damage caused by bollworms to a level that still allows appreciable levels of productivity and profit, leaves no toxic residue to nontarget organisms (i.e. biodiversity is left intact) and does not increase the incidence of cancers to the exposed workers and members of the farming families. In addition, the predator and parasitic species which are not targeted and killed by *T. chilonis*, also participate in attacking the bollworm. The largely illiterate, landless women forming themselves into SHGs (Self Help Groups) are trained to produce *Trichogramma* biopesticide in large quantities by culturing these on rice moth (*Coryca cephalonica*). The training is imparted through a 'pedagogic method of learning by doing'. The details of culturing *Coryca* and *Trichogramma* and distribution of the parasitized eggs to the farmers at a certain price, or selling these to companies on reasonable profit are published elsewhere. The production and marketing of *Tricho-*gramma biopesticide by landless women SHGs for eco-friendly management of bollworm is a good example of a pro-nature, pro-poor and pro-women technology. It is strikingly pro-poor and pro-women in orientation because it provides income-generating, eco-friendly livelihood for landless women who earlier had been living in abject poverty. It is also pro-nature since its use does not diminish the continued presence of a larger number of predator and other parasitic species in the fields in comparison to those fields, where mostly



chemical pesticides in non-integrated pest management (IPM) mode are used.

**Bt-transgenics in Evergreen Revolution**

Studies reveal that Bt-transgenic crops could adversely affect the non-target monarch butterfly larvae. A matter of even greater concern, however, is that

challenged by observations that CryIAb is toxic to the beneficial predator, *Chrysoperla carnea*, which belongs to Neuroptera. There have been studies describing the adverse effects of Bt-corn litter and Bt-transgenic plant root exudates on the earthworm (*Lumbricus terrestris*).

GM hybrid expressing a single Bt-toxic protein, were collected during 2009 from cotton fields in Gujarat. These were also found to resist normally lethal concentrations of Bt-toxin fed to them in the laboratory.

**With primary goals of achieving both food security and livelihood security in perpetuity without causing degradation of the ecological foundations of agriculture, care needs to be taken to develop and use biopesticides and biofertilizers within Integrated Pest and Nutrition Management (IPNM) schedules**

Right from the beginning, evolutionary biologists have been cautioning that successive generations of bollworm feeding on Bt-cotton would develop resistance to the toxin on account of mutations (possibly directed mutagenesis) and natural selection. Not all the bollworms in the Bt-cotton are killed by the Bt-toxin. Several of them survive and reproduce. It is in these survivors that mutations in the gametes conferring resistance to Bt-toxin spontaneously occur. When the gametes carrying mutant alleles participate in fertilization, the resulting embryos carrying these alleles initially in heterozygous state may show some resistance. The natural selection within the Bt-transgenic population would, however, favour the Bt-resistant allele in successive reproduction. In other words, gametes bearing the Bt+ (resistant) allele would gain advantage

it could cause harm to organisms other than lepidopterans. The claim that Bt-Cry toxin proteins do not cause any harm to non-lepidopteran insect species is





in a random mating population. In the succeeding generations, there will be increasing number of homozygous Bt-resistant bollworms – ‘the super pest’. With Bt-resistant genes already present in their genomes, it should not take a long time for them to develop appreciable resistance against bollgard-2 as well. Since the very beginning, the protagonists of Bt-transgenics have been insisting on growing several rows of non-Bt-crops as ‘refuge crop’ to attract the borers away from the trans-genic crops. Commercial expediency rather than a strong scientific premise of sustainable agriculture in the best interests of the resource-poor, marginal cotton growers has led to the decision to rush Bt-cotton into market. It must also be mentioned here that Bt-transgenic hybrid cottons developed with the intention of getting better yields have much in common with the ‘negative aspects’ of the green revolution. These require not only high-level inputs of chemical fertilizers, irrigation, etc. but also application of chemical pesticides to buttress the killing effect of Bt-toxicity.

The distinction between ‘biotic’ and ‘abiotic’ stress to crop plants needs to be kept in view in developing trans-genics as a solution. Environmental factors (salinity, drought, etc.) exerting ‘abiotic’ stress on the other hand, would be free from the



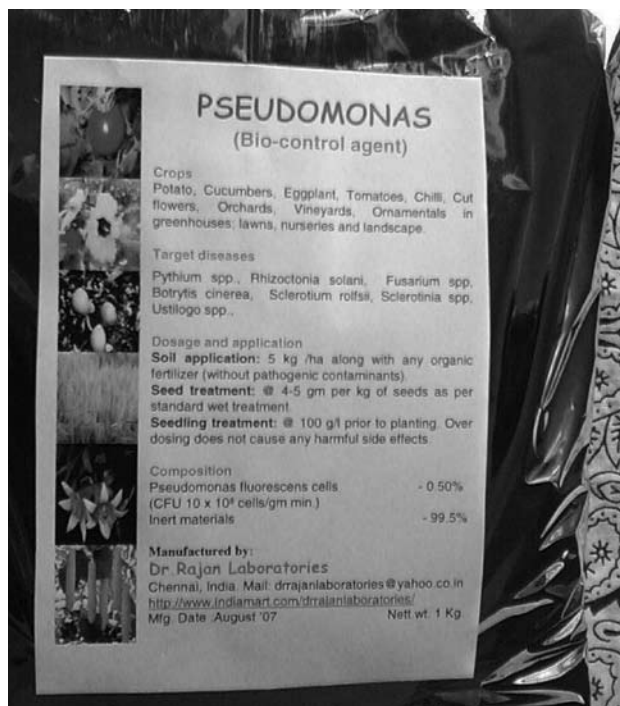
dynamics of organic evolution, and the transgenic crops with genetic shielding for salinity and drought tolerance might, therefore, be more stable. These facts emphasize the need for greater priority to conserve biodiversity, particularly agro-biodiversity.

### Specific to Brinjal (Eggplant)

The transgenic Bt-brinjal would, in the initial years, be significantly free from severe damage by shoot borer EFSB, although the damage caused by various other pests would remain the same or

even increase. The major problem will be that EFSB in the Bt-brinjal would be favoured by Darwinian evolution to develop Bt-resistant EFSB. As mentioned earlier, this has already happened in the case of Bt-cotton. There are no data available on the adverse effects, if any, on the Trathala larvae, developing in the EFSB larvae feeding on shoots and fruits of Bt-brinjal. The Bt-transgenic brinjal provides a suitable medium for origin of Bt-resistant mutations, and natural selection favouring the emergence of Bt-resistant EFSB. This certainly is a risky prospect, especially in view of the fact that India is a primary centre of origin of brinjal. Well over 2500 varieties of brinjal (*S. melongena*) are reported to grow in India, and several of them are also naturally resistant to EFSB to varying degrees. With such a rich biodiversity providing useful genes, it is imprudent to develop Bt-transgenic brinjal that inevitably would break down within a few years.

Since Bt-transgenics could break down with the evolution of Bt-resistant EFSB, it does not seem to be a sustainable solution for consideration of inclusion under the evergreen revolution, both from eco-agricultural and micro-eco-entrepreneurial points of view.



**Contributor:** Research conducted by M.S. Swaminathan Research Foundation, Tara-  
mani, Chennai 600 113, India



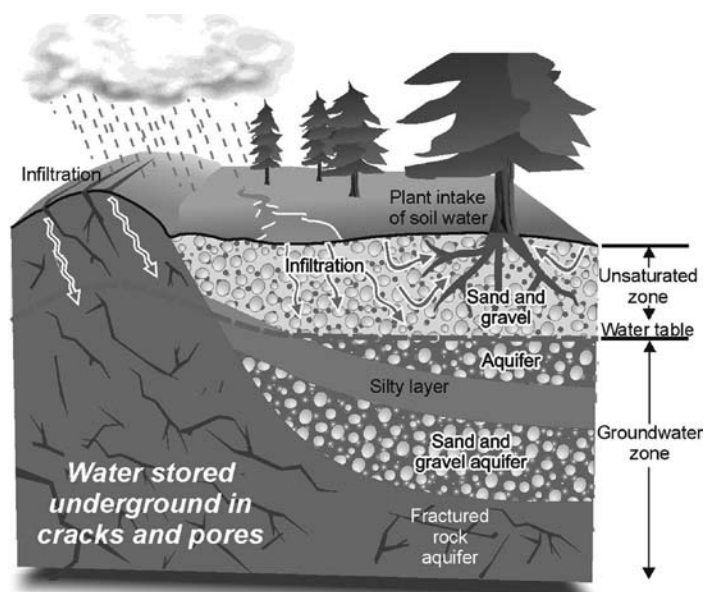
# Groundwater Pollution due to Overuse of Nitrogenous Fertilizers

By Ram Naresh\*

After independence our nation's primary aim was to achieve self-sufficiency in food production. To achieve this aim we incorporated the primary means of maximizing the yields of agricultural crops through use of fertilizers, pesticides and other chemicals besides improving the inherent quality of the seeds. Though it helped our nation in producing the food for an ever-increasing population, the unsustainable path used to maximize the yield caused some grave concerns like that of groundwater pollution. Nearly five decades after the Green Revolution the sustainability of Indian agriculture, and thereby the country's food security, are both facing a serious challenge.

Water is vital to life, maintenance of ecological balance, economic development and sustenance of civilizations. Planning and management of water resources and its optimal use are a matter of urgency for most countries of the world, and even more so for India with a huge population. Growing population and expanding economic activities exert increasing demands on water for varied needs – domestic, industrial, agricultural etc. Groundwater is one of the important resources and is being tapped for irrigation and public health water supplies for providing drinking water. On the other hand, quality of water resources is getting degraded with increasing urbanization and industrialization. The quality of both surface water in the rivers and groundwater is deteriorating due to industrial water pollution, pollution due to disposal of municipal waste water, and drastically due to increasing use of agrochemicals, fertilizers etc.

The introduction of synthetic fertilizers and fertilizer responsive varieties along



with irrigation did help in a jump in production but in recent decades, there has been increasing concern on the adverse impacts that synthetic fertilizers have on the environment and sustainability of ecosystem.

Intensive agriculture, with high use of synthetic fertilizers and chemical pesticides, was introduced in India in the 1960s as part of the Green Revolution. As a result, consumption of synthetic fertilizers increased from a mere 0.07 Mt (million tons) in 1950-51 to a staggering 23.15 Mt in the year 2008-09 (Fertilizer Association of India); a drastic 300 times increase. The synthetic fertilizer usage in the country shows significant variation from region to region. However, in the most agriculture intensive districts (78 districts out of 528 major districts in India), synthetic N-P-K (Nitrogen, Phosphorus and Potassium) fertilizer consumption is more than 200 kg/ha, a rate that is twice the country average. Six crops – rice, wheat, cotton, sugar cane,

rapeseed and mustard – consume about two-thirds of the synthetic fertilizer applied. The irrigated area, accounting for 40 percent of the total agricultural area, receives 60 percent of the total fertilizer applied.

Nitrogen fertilizers are most important for the growth of plants and hence are used in highest proportions. In the year 2006-07, out of a total consumption of 21.7 Mt of N-P-K nutrients, N alone comprised 13.8 Mt, which is roughly two thirds of the total fertilizer consumption. For instance, while the recommended ratio between N, P and K is 4:2:1, the actual ratio in 2005-06 in Punjab was 20:6:1 and in Haryana 30:9:1, indicating a huge overuse of Nitrogenous fertilizers. However, since much of this Nitrogen is used inefficiently, significant amounts escape into the air, or seep into the soil and underground water, which in turn results in a host of environmental and human health problems, like climate change and dead zones in the oceans

to cancer and reproductive risks. Since crop utilizes only 25 to 71 percent of total nitrogen fertilizers (Powlson et. al., 1986 and Williams, 1992), the rest of it either remains in the soil or is lost from the soil-plant system through leaching, denitrification or ammonia volatilization. A significant amount of applied fertilizer moves into deeper layers of soil due to percolation as nitrate and ultimately joins the groundwater.

The prodigious and incessant use of nitrogenous fertilizers has resulted in concentration of Nitrate-N ions in the groundwater higher than the World Health Organization limits. This rising trend in nitrate concentration is found to be directly related to increased use of nitrogenous fertilizers.

The higher concentration of nitrate is considered carcinogenic and produces blue babies. Blue baby syndrome (or Methaemoglobinaemia) is a disease of bottle-fed infants, which occurs when nitrate level increases beyond 22.6 mg/l Nitrate-N in drinking water (Young, 1975). The oxygen carrying haemoglobin reacts with nitrate to form Methaemoglobin which hampers transportation of oxygen causing infants to appear blue. If the concentration of Nitrate-N in ground water reaches 50 mg/l, it may cause gastric cancer in adults. The function of central nervous system (CNS) may also be adversely affected by nitrate rich water. A high level of nitrate in ground water has correlation with gastric cancer, nervous system impairment and birth defects (Kovan, 1989). Also a positive correlation has been found between nitrate concentration and liver cancers. Due to these harmful effects of high

**Water is vital to life, maintenance of ecological balance, economic development and sustenance of civilizations. Planning and management of water resources and its optimal use are a matter of urgency for most countries of the world**

nitrate concentration, the concern for groundwater pollution is growing day by day. Groundwater remediation is very expensive and usually not feasible, so prevention of pollution is the key to the solution. A feasible and viable check on this problem can be initiated by first assessing and marking the areas which are more prone to become contaminated as a result of excessive use of Nitrogenous fertilizers. Once identified, these areas can then be enforced with restricted fertilizer use regulations or may become focus of attention for preventing contamination of the underlying groundwater sources. The pollution vulnerability maps of the affected regions of the nation can be useful for both land-use planning and for groundwater quality monitoring. They may also provide information to law-makers, land-use planners and developers regarding the spatial distribution of the vulnerability to pollution.

The recent increase in emphasis on environmental protection is demonstrated by the formulation of many laws that aim at preventing rather than repairing environmental damages. In USA, Canada, Australia and other advanced countries, groundwater has been mapped for its vulnerability to different kinds of pollutions and laws have been enforced in pollution prone areas regarding use of fertilizers, pesticides and other pollutants.

The construction of groundwater pollution maps can be considered as a critical first-step in implementing groundwater management programs. The more we delay it now, the more



difficult it will be for us to conserve our fragile natural resources in the future. Identification of the vulnerable area is the key need of our country. Vulnerable areas should get intensive efforts to maximize the efficiency of nitrogenous fertilizers so as to reduce the risk of nitrate pollution from fertilizers. The application rates should be adjusted to ensure both optimum crop yields and permissible nitrate leaching loss, and it must be enforced with strict laws so as to safeguard our basic human right to safe drinking water.

**References:**

1. Kovan J (1988) *Protecting ground water quality: Mid-West policy alternatives, in proceedings of the agricultural impacts on ground water - A conference National Water Wells Association, Des Moines, Iowa, pp 11-24.*
2. Powlson D S, Preden G, Johnson A C and Jenkinson T S (1986) *The nitrogen cycle in broad bark wheat experiment: Recovery and losses of 15 N - labeled fertilizer applied in spring and inputs of nitrogen from the atmosphere. Jr. of Agric. Sci. Cambridge 107:591-609.*
3. Williams P H (1992) *The role of fertilizer in environmental pollution. In Proc. int. symp. Nutrient management for sustained productivity. Punjab Agricultural University, Ludhiana: 195-215.*
4. Young K (1975) *Geology: The paradox of Earth and Man. pp 526. Houghton Mifflin Company, Boston, USA.*
5. <http://www.faidelhi.org/statistics.htm>

**Contributor:** Ram Naresh is Senior Research Fellow, Collage of Agricultural Engineering & Technology, CCS Haryana Agricultural University, Hisar, Haryana; Cell: 08950094020; Email: ramnaresh55@gmail.com



# Plant Protection Equipment Role, Types and Suitability

By Vimal Pratap Pandey, Roop Kishore, V.P. Chaudhary, and B. Gangwar \*

Much of the plant protection equipment is designed to apply the desired chemicals in the form of spray, dust or mist. Different types of dusters and sprayers have been developed. These can be operated by hand, a small engine and also by a tractor. Except for the ultra low volume and the electro static sprayers, all other equipment has been in existence for the past 40-50 years.

## Sprayers

Sprayers are used for spraying chemicals in the form of minute particles either mixed with water or any other solvent. Sprayers break the liquid into droplets of appropriate sizes and spread them uniformly over the surface or space. Another function is to regulate the amount of insecticide so as to avoid excessive application that might prove harmful or wasteful. For proper application, a sprayer that delivers droplets large enough to wet the surface readily should be used. Extremely fine droplets less than 100 micron size tend to be diverted by air currents and get wasted. Crops should, as far as possible, be treated in regular swaths. By use of a boom, uniform application can be obtained with constant output of the machine and uniform forward travel.

**Working Procedure of Sprayers:** Spraying is employed for a variety of purposes such as the following:

- Herbicides in order to reduce competition from weeds;
- Protective fungicides in order to minimise the effects of fungus diseases;
- Insecticides for controlling various kinds of insect pests;
- Micro-nutrients such as manganese or boron on cereal crops.

The main function of a sprayer is to break the liquid into droplets of effective size and distribute them uniformly over the surface or space to be protected. Types of sprayers are as follow:

**Hand/Foot Operated Sprayers:** These may be compression or knapsack type. The pressure used in these sprayers ranges from 1 to 7 kg/cm<sup>2</sup>.

**Engine Operated Sprayers:** Power sprayers may be knapsack type or trolley mounted. Pressure in these units ranges from 20 to 56 kg/cm<sup>2</sup>.

**Lever Operated Sprayers (Rocker Sprayers):** These are mounted on a small platform on which the operator stands while rocking a long hand lever in a 'push-pull' action. The suction hose is placed in the spray container (not provided) and an eight metre discharge hose connects to the spraying lance.

**Trigger Operated and Hand Compression Sprayers:** These small, hand held sprayers are suitable for the treatment of individual plants or very small plots. They are usually made of plastic or brass, with a calibrated reservoir of 1-1.5 litres capacity. The spray can be gradually adjusted from a fine mist to a continuous jet, by twisting the nozzle. In the simplest type, the liquid is pumped out directly, by trigger action. In other types, the reservoir is first pressurized using a plunger.

**Atomizers:** These piston-action hand sprayers are available with either intermittent or continuous action. They are suitable for agricultural use and also to disinfect buildings. Brass, copper and plastic atomizers of 0.5 to 1.0 litre capacity are available.

**Pedal Operated Sprayer:** The cylinder of this sprayer is pumped by a double spring, foot pedal in the manner of a tyre pressure pump. It is easier to use



if one person operates the foot pedal while another holds and directs the spray lance. The sprayer is supplied with hoses, lance and nozzle but without the spray container.

**Booms and Nozzles:** The large variety of booms and nozzles supplied by many manufacturers of knapsack sprayers reflects the range of chemicals used and the crops to which they are applied. An eight nozzle boom of 400 cm length and a five nozzle boom of 150 cm are available.

**Power Knapsack Combined Dusters and Mist Blowers (Spray Mist):** Although primarily designed as a sprayer this knapsack type unit is generally supplied with dusting accessories. Optional attachments are also available for ULV spraying. The unit has a 10 litre (10 kg) tank and is powered by a 35 cc two stroke, air-cooled engine with rope start. The discharge capacity is 0.5- 2.0 lit/min for liquid sprays and 0.7-2.0 kg/min for dusts.



**ASPEE Tractor-Mount Sprayer:** The sprayer carries 400 lit of chemical in a glass fibre tank or in two steel drums mounted on a steel frame fitted with a standard which can also be used to fill the tank. The version illustrated is fitted with an overhead spray boom for treating tall crops grown in rows. The spray can cover two swaths of 9 m on either side. A 2.5 m wide path must be provided in the crop after every 18 m interval to allow the tractor to pass.

**Power Sprayer:** The Sigma power sprayer comprises of a horizontal piston pump and a petrol engine or electric motor mounted on a steel frame. The frame can be provided with wheels or carrying handles. The pumps available include single, double or triple cylinder versions and engines of appropriate power are provided to drive them. The pumps are fitted with a 3 m suction hose and a 15 m delivery hose which can be coupled to a lance or spray gun.

**Motorized Knapsack Mist Blower-cum-Duster:** It is suitable for low volume pesticide spraying and dust application on foliage of crop for control of insects, pests, etc. It consists of blower, tank for chemical, and a high speed petrol engine (5000-7000 rpm). The air blast from blower at a very high velocity strikes and carries the liquid chemical in mist form. The spray jet strikes at a long distance up to 10 m. It is useful for low volume spraying because it creates very fine spray droplets. The machine can be adapted for ULV spraying with the use of very fine aperture dosage tube.

**Hand Held ULV Sprayer:** It can spray at low volume (LV) and ultra low volume (ULV) rates with water and oil based chemicals, respectively. These sprayers produce very fine spray suitable for foliar application. The light weight hand held ULV sprayers have a plastic spinning disc with small DC motor, which drives the disc at 7000-9000 rpm. Because of high speed of disc, liquid chemical gets disintegrated into fine droplets. Wind transports the spray droplets. For accurate spraying wind should be neither too gentle (less than 3 km/h) nor too strong (more than 22 km/h).

**CDA Crop Sprayer:** This sprayer has been developed using Controlled Droplet Atomizers (CDA) and is suitable for

spraying all types of chemicals at desired application rates with optimum spray droplet size. The sprayer can be used either as a push type unit or can be rear mounted on a tractor. It is suitable for spraying crops up to 1 metre height. The Micromax-III, CD atomizer has three rotational speeds of 2000, 3500 and 5000 rpm to produce droplets of 250, 130 and 70 micron sizes, suitable for application of herbicides, insecticides and fungicides. The unit can apply chemicals at application rates varying from 5 to 64 l/ha. The field capacity of the sprayer, with tractor operation, was 0.76 ha/h with effective swath of 5.5 metres.

### Dusters

Dusters are the equipment used for applying chemicals in dust form in the field. They spread the chemicals in dust form over the surface of the foliage of the crop plants. There are several types of dusters, described as under:

**Bellow Type Dusters:** These lightweight dusters use hand operated bellows to disperse the powder. It is carried on a shoulder strap.

**Hand Rotary Dusters:** These spinning disc dust applicators are worn at the operator's waist and supported by a neck strap. They are hand cranked and the flexible discharge hose is hand held.

**Shoulder Carried Hand Operated Rotary Dusters:** These are a type of hand cranked dusters which can be used for all kinds of powders and dusts. The hopper is separated from the cranking mechanism and carried behind the elbow. This is to improve the balance of the duster when carried on the shoulder strap.

**Sigma Dusters:** These consist of galvanized steel with 7 litre hopper and lance. The fan casing and impeller are made of mild steel of 7 kg weight.

### Present Development in Plant Protection Equipment

**Wide Swath Spray Boom for Tall Crop:** It was developed at Indian Institute of Sugarcane Research, Lucknow. The boom consists of two aluminium square sections of 1.8 and 2.7 metre lengths, joined together to make 'T' shape. The top members are kept at an angle of 20° to horizontal. The two swivelled nozzles



are fixed at both ends and connected with two foot pumps. For regulating flow of liquid two stop cocks are provided in the hose. The nozzles make a spray trajectory of 10.4 m swath. It costs Rs 650/- excluding pump assembly and its cost of operation is Rs 35-40/ha. The effective field capacity and the application rate is 0.05 ha/h and 100-150 percent, respectively.

**Self Propelled High Clearance Sprayer:** It is a self propelled unit suitable for spraying on tall crops like cotton. The machine consists of two rear steered wheels and two front lugged wheels and is powered with a 20 hp diesel engine through a gear box, tank, hydraulic pump and boom fitted with 15 nozzles. It costs Rs 1,80,000/- and its cost of operation is Rs 35/ ha. The effective field capacity and field efficiency were 1.6-2.0 ha/h and 70-80 percent, respectively.

**Self Propelled Boom Sprayer:** To meet the requirement of a high capacity effective sprayer, a self propelled boom sprayer with 14 nozzles was developed at ANGRAU, Hyderabad centre of AICRP on FIM. It was mounted on a frame of self propelled vertical conveyor reaper. The spacing of nozzles can be varied from 300 to 600 mm. The height of boom can be varied from 400 to 1200 mm. The effective field capacity and field efficiency were 0.06 ha/h and 61 percent respectively.

**Contributors:** Vimal Pratap Pandey (Research. Scholar); Roop Kishore (S.R.F. Agronomy); V.P. Chaudhary (Scientist); and B. Gangwar (Project Director), Project Directorate for Farming System Research (ICAR), Modipuram, Meerut-250110; Mobile: 09451881809; Email: vimal2724@gmail.com

# Safety in Usage of Plant Protection Equipment

By Vimal Pratap Pandey, Roop Kishore, V.P. Chaudhary, and B. Gangwar \*

**H**erbicides are used extensively throughout the world for the destruction of unwanted plants, whether on a large scale as part of crop control or on a small scale as part of lawn maintenance. Once applied, an herbicide will remain on-site for an extended period of time. While safe for the most part, herbicides can be dangerous when used incorrectly. As such, in order to minimize risk while using herbicides, there are a few safety points that should be kept in mind.

Also, along with general safety precautions, there are certain specific safety precautions. Herbicides should be handled with care during use and storage. Instructions provided along with the herbicide products should be familiarized with before beginning application. These instructions include application amounts, methods to follow for application and hazards. While using an herbicide exposed skin should be protected. A long-sleeve shirt, pants, neoprene gloves and safety goggles should be worn during application. To prevent accidental ingestion, a mask should be worn over the face and nose. Any equipment used for spraying herbicides should be used for the herbicides only. Residue is difficult to remove from the sprayers, and remnants can be harmful if sprayers are used for other purposes.

## Toxicity

Although toxic, most herbicides do not possess the long-term environmental effects that many pesticides do. The greatest danger due to toxicity is mostly chronic ingestion, which poses limited risks during pregnancy or may lead to the formation of tumours. Herbicides are rated by the EPA for safety using one-word symbols mentioned on the product's label. These safety levels are,



in rising order of risk, caution, warning and danger. Specific safety concerns can be found on product material safety data sheets (MSDS) released by manufacturers. The sheets may also be found online in the National MSDS Repository shown in the resources section.

## Aerated Steam Therapy

Sugarcane crops often become susceptible to set borne diseases. The crops can grow healthy, if protected from such diseases. Sugarcane can be protected by two methods, Hot Water Treatment and Hot Air Treatment. In hot water treatment of sugarcane, the cane is heated with hot water at 50°C for 2 hours. In hot air treatment of sugarcane, the cane is treated with hot air at 54°C for 8 hours.

## Emergency Safety Procedures

All herbicides should be treated with caution, though the higher the FDA

risks, the more the danger during application. If a person happens to inhale an herbicide, he/she should move to an area with fresh air. If the person has difficulty in breathing, a physician should be contacted immediately. For exposure to skin or clothing, contaminated clothing should be removed and affected skin should be rinsed with water for 15-20 minutes. If there are any signs of irritation, a physician should be contacted.

In case of eye contact, the affected eye should be rinsed for 15-20 minutes. If the affected person wears contacts, he/she should rinse the eye for five minutes before removing the lens, then continue rinsing. If pain or irritation persists a physician should be contacted.

If herbicide is swallowed, a poison control centre should be called immediately for treatment advice. As far as possible, herbicides should not be administered alone.

### General Safety Precautions

- The instructions on the product label should be read carefully before choosing and using herbicides.
- A pesticide should never be used carelessly.
- It should be checked whether the product can be used on the plants the user wishes to treat, in the way he/she wants to use it and at the time of year he/she wants to use it.
- The product should be mixed according to the instructions. Extra amount should never be added for 'better results'.
- The herbicide should be applied thoroughly and evenly, without under-treating or over-treating.
- Herbicides should be sprayed thoroughly covering upper surface and underneath of leaves, stems and buds.
- Spraying in bright sunlight should be avoided as the water droplets can cause scorch. Open flowers should not be sprayed as they are delicate.
- Herbicides should be sprayed in the evenings when pollinating insects are less likely to be on the wing. Spraying in the evening in summer, when it is cooler, may be more effective.
- The sprayer should be washed

**Along with general safety precautions, there are certain specific safety precautions. Herbicides should be handled with care during use and storage. Instructions provided along with the herbicide products should be familiarized with before beginning application. These instructions include application amounts, methods to follow for application and hazards**

thoroughly after use with a few drops of detergent, and rinsed well till clean water comes out through the nozzle.

- Pesticides should be stored in a safe place out of the reach of children and pets.
- When spraying, children and pets should be kept away until the application has dried.



- Some weeds are naturally poisonous, e.g. ragwort. They do not lose their toxicity even when killed.

### Frequently Asked Questions Regarding Spraying

1. What kinds of precautions are recommended if spraying is scheduled in Agriculture?

The active ingredients of the pesticide product as it is used for application for mosquito control generally break down quickly and do not leave a toxic residue. You can reduce/eliminate his/her exposure risk to the insecticide by staying indoors during spraying. Otherwise, no special precautions are recommended.

If individuals want to take extra steps to minimize or avoid exposure, what steps can be taken?

Common sense steps that can be followed in areas where spraying is scheduled to take place include:

- Doors and windows should be kept closed and fans should be turned off during the time spraying occurs in the vicinity. Air conditioners should be turned off unless they have a setting for re-circulating indoor air. In very hot weather, windows should be opened or fans and air conditioners should be turned on soon after the spraying is completed in the vicinity. If one cannot ensure that his/her air conditioner can be set to re-circulate indoor air, then it should be turned off during spraying in the vicinity.
- Home grown fruits and vegetables should be rinsed with water.
- Pets should be kept indoors when spraying occurs in the vicinity, so as to minimize their risk of exposure. Pets that remain outdoors could be exposed to small amounts of pyrethroids, but would not be expected to experience adverse health effects from the spraying as many products that are used directly on pets to control ticks and insects also contain small amounts of sumithrin, a pesticide.
- Skin or clothes or other items that get exposed to the sprayed pesticide, should be washed with soap and water.



- If the spray gets in the eyes, they should be immediately rinsed with water or eye drops, and a doctor should be called.
- Because Anvil breaks down quickly in sunlight and water, and considering dilution factors, no special precaution or waiting periods are recommended for outdoor swimming pools or beaches.

## 2. What pesticide product should be used in aerial spraying?

The most preferable product that can be used in aerial spraying is called Anvil. Anvil (or similar products) is the same product routinely used in ground spraying. Anvil contains sumithrin, which is a man-made pesticide product similar to the natural components of the chrysanthemum flower that is used to control mosquitoes in outdoor residential and recreational areas. Sumithrin can also be found in other pesticide products used indoors in pet shampoo and lice treatments and on pets to control ticks and insects, such as fleas and ants. Piperonyl butoxide is also an active ingredient in Anvil that enhances the ability of sumithrin to kill mosquitoes.

## 3. What kinds of health problems can be associated with exposure to Anvil?

In occupational studies where significant exposures occurred, loss of coordination, tremors or tingling and numbness in areas of skin contact have been observed. However, with targeted and appropriate spraying, a very low concentration (a maximum of 0.62 ounces active ingredient per acre) is used and exposure to levels that cause health problems are not expected.

## 4. What health impacts among the general population can be expected with the spraying of Anvil?

Due to the very low concentrations of Anvil used to control mosquitoes during spraying, adverse health effects are not expected.

## 5. Could there be health concerns if one is pregnant?

As with all chemical exposures, pregnant women should take care to avoid them. Sumithrin is unlikely to affect pregnancy outcomes in people as a result of



aerial spraying. Although some effects occurred in laboratory animals that were given large amounts of sumithrin during pregnancy, these amounts far exceeded the amounts that individuals are likely to contact from the prescribed requirement of Anvil for aerial spraying.

## 6. Could the spraying result in long-term health effects?

Sumithrin did not cause cancer in rodents when they were fed high levels for their lifetime. Experimental studies have reported that piperonyl butoxide causes liver tumours in rodents when they are fed high levels of piperonyl butoxide every day for a long period of time. The amount of piperonyl butoxide ingested by animals in these studies, however, far exceeds the amount humans might be exposed to as a result of the aerial use of Anvil to control mosquitoes. Although uncertainties exist, available information indicates that piperonyl butoxide is unlikely to cause cancer in humans as a result of its use to control mosquitoes.

## 7. What are the environmental characteristics and impacts of sumithrin?

Sumithrin is rapidly inactivated and decomposed by exposure to light and air with a half-life of less than one day in the air, and on plants and other surfaces subject to sunlight. It does not dissolve easily in water, and is broken down by

micro-organisms in streams and water bodies that receive sunlight. Thus, residues in water would not be expected. Because of environmental fate and dilution characteristics and the fact that spraying does not occur over drinking water supply reservoirs, opportunities for exposure via drinking water are not expected. Anvil and other pyrethroid pesticides are toxic to terrestrial and aquatic invertebrates (e.g., dragonflies, beetles) and to fish. However, as the size of the fish pool or pond decreases the risk to the fishes increase. The risks to large natural water bodies are minimal. Thus, one may want to cover a small ornamental fish pond in his/her yard during the night of spraying.

## 8. If I am a beekeeper, should I take special precautions to protect them prior to or following aerial spraying?

No. Pyrethroid applications at night will not impact honeybee colonies since honeybees are inside the hives at night.

**Contributors:** Vimal Pratap Pandey (Research Scholar); Roop Kishore (S.R.F. Agronomy); V.P. Chaudhary (Scientist); and B. Gangwar (Project Director), Project Directorate for Farming System Research (ICAR), Modipuram, Meerut-250110; Mobile: 09451881809; Email: vimal2724@gmail.com

# Role of Commodity Groups in the Age of Organized Retailing

By Shibi Sebastian and A. Rathinsamy\*

Farming in India is and has been the primary occupation for the majority of the population since ancient times. Yet a high rate of farmer suicides in our country (2,40,000 farmers suicides during the period of 1995 to 2009<sup>11</sup>) is a sad fact.

The scenario is bright as we move forward in the agricultural supply chain but if we move backwards in the chain we find that the producers are not satisfied. The reason is clear, lower price realization at the farmers' end. For example, for tomatoes, farmers in India earn only 30 percent of customer price while in more developed markets they earn between 50-70 percent<sup>12</sup>. They are not in a position to determine the price for their own produce in spite of the hard work they do in order to reap harvests. The procurement price for essential cereals and commercial crops is determined at the government level. Organized marketing of agricultural commodities is being promoted in the country through a network of regulated markets. However, they are not fully satisfying the requirements of the farmers.

## Organized Retailing in India

Retail sales in India of farm produce such as cereals, millets, edible oils, fruits and vegetables etc, has traditionally been in the hands of small retailers and vendors who typically buy their stocks from local wholesalers within close physical proximity. This retailer is located at the end of a long chain of intermediaries and middlemen with the producer (farmer) at origin of the chain. Some of these middlemen buy their stocks from their upstream partners while some others play an agency role where they work on a brokerage basis and take no ownership of the stocks they move.

The overall state of the retail sector in India is highly fragmented and organized retail in the country is at a very nascent stage. There are about 12 million retail outlets spread across India. More than 80 percent of these 12 million outlets are run by small family businesses which use only household labour<sup>6</sup>. Traditionally, small store (Kirana) retailing has been one of the easiest ways to generate self – employment, as it requires limited investment in land, capital and labour. Consequently, India has one of the highest retail densities in the world at 6 percent (12 million retail shops for about 209 million households). India's peers, such as China and Brazil, took 10-15 years to raise the share of their organized retail sectors from 5 percent when they began, to 20 and 38 percent respectively. India too is moving towards growth and maturity in the retail sector at a fast pace.

In this transition phase from an unorganized and fragmented retail sector to a more organized and large format retailing in



India, especially in the context of farm and horticultural produce retail, there have been obvious hiccups.

In this situation, it is high time that the farmers find an alternative mechanism to safeguard their interests and they should group themselves to raise their voice and produce better quality and higher quantity of produce to pick up the opportunity. It is logical therefore to explore the linkage between the two core activities for better socio-economic development.

## Commodity Interest Groups and Farmers Association

Interest groups are formed at the village level comprising of less than 20 members. They are provided with technical and promotional guidance by the state Department of Agriculture. Apart from this a sum of Rs 5,000/- is given to each group for their activities. Groups may be formed based on commodity or marketing or storage etc.

The commodity interest groups are now being promoted by ATMA<sup>3</sup> at the district level. These can be grouped further to form federations. The commodity association is defined as organization that bring together a wide spectrum of interest groups related to a particular commodity or sector (such as horticulture) in a particular area, whether the commodity is for export, for the domestic market or for both. Such associations can draw membership from individual farmers, from crop buyers, processors, distributors and exporters, as well as from

**The overall state of the retail sector in India is highly fragmented and organized retail in the country is at a very nascent stage. There are about 12 million retail outlets spread across India. More than 80 percent of these 12 million outlets are run by small family businesses which use only household labour<sup>6</sup>. Traditionally, small store (Kirana) retailing has been one of the easiest ways to generate self – employment, as it requires limited investment in land, capital and labour**

suppliers of support services. Sometimes government agencies can also become members. The interest group<sup>1</sup> is a group of independent farmers with a shared goal and interest and should be self managed.

### Benefits of Forming a Group

#### Direct Benefits

- Policy making - commodity associations can play an important role as a focal point for policy dialogue with government.
- Regulatory functioning – They can have control over regulatory functions like setting or advising on grades and standards.
- Promotional / marketing function of trademarks or quality signs: They can support research, promote export and domestic market and provide information and statistics (market intelligence). Buy back arrangements can also be made.
- Purchase of inputs - They can arrange for supply of quality inputs like seeds, fertilizers, pesticides, machineries, feeds, medicines, etc.. The purchase may be done in bulk in order to reduce the cost
- Information inputs. The association can arrange for field visits, exposure visits, demonstrations and exhibitions.

#### Indirect Benefits

- Improved buying and selling power
- High motivation
- Builds social cohesion.

### Objectives

The major objectives of forming interest groups are:

- To address production and marketing issues
- To develop 'self help' approaches



- To provide pooled resources
- To allow members to exploit economy of scale
- To provide a forum for training and information sharing
- To provide a focal point for technical and training activities

### Activities of a Group

- Conduct meetings
- Engage in information sharing (including networking with other groups)
- Receive technical training
- Conduct field trials
- Organize bulk selling and purchasing
- Develop market networks and make market assessments
- Support individual members on needs basis
- Manage a 'revolving' fund for group activities
- Identify technical and product opportunities

### Interest Groups in India

The following are the major interest groups functioning in India:

#### Organic Farming Association of India<sup>9</sup>

The organic farming association is a national level organization which certifies the farms as organic. The certification is done through the agency of trained organic farmers themselves. The ultimate objective of the association is to produce poison-free food for Indian consumers and to achieve this by maintaining the living fertility of Indian soils. The association also provides



information related to organic farming to its members and also means to market their produce.

- Develop integrated plant protection schedule against local pest and diseases.
- Study measures to keep down cost of cultivation.

### Associations in Maharashtra<sup>5</sup>

#### Commodity Wise Associations/Cooperative Societies in Maharashtra

S. No.	Name of Commodity	Name of Association/ Co-op Society
01	Pomegranate	Akhil Maharashtra Dalimb Utpadak Sanshodhan Sangh, Pune
02	Guava	Guava Growers Association of India, Dist. Ahmednagar
03	Aonla	Maharashtra Rajya Aonla Utpadak Sahakari Society Dist. Ahmednagar
04	Custard apple	Maharashtra Rajya Sitaphal Utpadak Sangh, Pune
05	Organic Farming	Maharashtra Organic Farming Federation, Pune
06	Grape	Maharashtra Rajya Draksha Bagayatdar Sangh (Maharashtra State Grape Growers Association), Pune-37
07	Vegetables	All India Vegetable Growers Association, Dt Pune
08	Grape	Maharashtra Grapes Growers Co-op. Society (MAHAGRAPES), Pune 411 037
09	Fig	Maharashtra Rajya Anjeer Utpadak Sahakari Sangh Pune 411 037
10	Medicinal and Aromatic plants	Maharashtra Rajya Sugandhi Aushadhi Vanaspati Utpadak Prakriya Sangh, Pune 411 021.
11	Banana	Maharashtra Rajya Keli Utpadak Sahakari Sangh (MAHA BANANA), Jalgaon 425 003
12	Mango	Deogarh Taluka Amba Utpadak Sahakari Society, Dist.Ratnagiri
13	Mango	Ratnagiri Taluka Amba Utpadak Society, Ratnagiri
14	Mango	Kelasi Parisar Amba Utpadak Society, Dist. Ratnagiri
15	Mango	Malgund Parisar Amba Utpadak Sahakari Society, Dist. Ratnagiri

### Maharashtra Pomegranate Growers Research Association, Pune<sup>8</sup>

This association provides technological knowledge for growing quality fruits and information about domestic and overseas market to grower members. It promotes pomegranate cultivation by rendering advice on pesticides, growth hormones etc., helps to undertake research on cost effective cultivation of quality pomegranates through research institutes, provides facilities for storing and processing the fruits and arranges visits to advanced pomegranate farms and post harvest processing plants within India and overseas. It is a registered association which promotes the cultivation of a single commodity.

### Grape Growers Associations, Maharashtra<sup>7</sup>

The grape growers association has prolific spread with a large membership and wide activities. The mission of the grape growers association, Maharashtra is given below:

- Consider plans and schemes for all round development of the grape crop in the state.
- Work in regular contact with all research organizations and institutes to distribute new & improved information to grape growers.

### Coconut Producers' Society, Kerala<sup>4</sup>

Coconut growers of 13 districts of Kerala have formed district level associations and they in turn have registered with the Coconut Development Board. They have two way communications on matters like latest technology, schemes, input supply, market intelligence and the like.

### UPASI<sup>10</sup> - United Planters Association of Southern India

It is an association which has made prolific growth and laid its mark over decades. Today there are 13 district planters associations and 3 state planters associations affiliated to UPASI. The programmes and activities of UPASI encompass research and welfare schemes for workers. UPASI and State Planters Association have been entering into settlements leading to comparatively better industrial relations in the plantation industry. UPASI is an apex body of planters of tea, coffee, rubber, pepper and cardamom.

### Mission of UPASI

- To promote, diffuse and disseminate knowledge relating to planting and the plantation industry.

- To promote trade, commerce and industry and aid its development. To undertake scientific research in all aspects relating to plantation crops. To promote united or concerted actions among members in all parts of the world taking into consideration the interests of the various planting industries in Southern India.
- To collect, classify, circulate and publish statistics and other information relating to production, distribution, finance, employment conditions and any other matters that affect the planting industries of Southern India; and to present in whatever manner necessary the true facts relating to the planting industries so as to promote public understanding and appreciation of matters pertaining to those industries.

**United Planters Association of Southern India is an association which has made prolific growth and laid its mark over decades. Today there are 13 district planters associations and 3 state planters associations affiliated to UPASI. The programmes and activities of UPASI encompass research and welfare schemes for workers. UPASI and State Planters Association have been entering into settlements leading to comparatively better industrial relations in the plantation industry. UPASI is an apex body of planters of tea, coffee, rubber, pepper and cardamom**

### Tamil Nadu Growers' Federations

The growers of major producing districts have formed district level associations. They have in turn combined to form the Tamil Nadu Growers Federation. They have pooled themselves to raise their timely concerns to the government. Here is a list of such Associations in Tamil Nadu<sup>1</sup>

- Precision Farmers Association location
- Banana Growers Association
- Pomegranate Growers Association
- Floriculturists
- Maize Growers Association
- Grape Growers Association
- Medicinal Plants Growers Association
- Sugarcane Growers Association



- Organic farmers association
- Tea growers association
- Cardamom planters association

### Case study of Banana Marketing Group – Odaipatti, Theni district, Tamil Nadu

Just one year after inception, Th. Kannan (9365848931) is full of spirits to speak of his new venture under ATMA- commodity Interest Group. The group consists of 12 members from various communities and different age groups. Comprising of farmers it was formed by the Chinnamanur block officials under ATMA-Marketing services for marketing of Banana's from Odaipatti village. This group procures banana from the farmers field @ Rs. 6/kg on an average day and transports it to Koyambedu market, Chennai where it is sold for Rs. 9. The traders present there in turn do the storage and processing before selling it to the retail for Rs.12/- . Banana flows from similar groups at Virudhunagar and Sattur. Hence, it becomes a federated task. The group gets a gross amount of Rs. 21,000/- per truck of 7 tonnes per day. The truck which returns from Chennai is loaded with other fruits like Apple, Orange, etc., to be marketed at the fruit stalls (Pazhamudhir Cholai) run by the team in Odaipatti. Thus, the team makes two way profit by this transportation. Apart from this, Kannan and team underwent training at TNAU, Coimbatore for mass multiplication of Trichichoderma and Pseudomonas. They are at present multiplying these agents and selling it locally. They have also ventured into the production and sale of mushroom spawn. They are proud producers of high quality mushroom spawn. They sell them to Dindigul. Thus, this team of twelve, with the initial assistance of ATMA has ventured into a number of revenue generating enterprises and has raised their standard of living.

Banana growers association comprising of about 60 farmers is functioning in Theni district. The association has conducted

seminars under the financial assistance of NHB. Further guidance is sought from scientists for plant protection measures. The association is in the process of establishing cold storage units for the benefit of the farmers. However lack of continued spirits and co-operation among members have created obstacles in eliminating the threats of middle men.

### Conclusion

Farmers associations and commodity interest groups have been formed randomly with various objectives and rationale. The various associations help in partnership with various institutes for technical back up and buy back arrangement. They provide amicable linkage between farmers and the industry. The major activities of these groups include:

- Conducting meetings – buyer seller meet, technology meet etc.
- Trainings
- Field visits
- Market intelligence and networking
- Bulk purchasing and marketing
- Linkage with government and policy makers

It is high time that these commodity interest groups be organized and work in a professional way so that the objectives or destinations set may be attained.

The reasons for small number of commodity associations may be attributed to lack of funds, lack of awareness of the potential reluctance to collaborate due to difference of opinion among chain actors over a variety of reasons.



It is suggested that the type of association formed should depend on the commodity. The group should not discriminate on the basis of caste or religion. The group should not be used as a vehicle for furthering personal interests. Small scale farmers are the most vulnerable class hence it is needed to include them in the groups. In order to keep pace with the fast growing organized retail sector, information and communication technologies should be utilized to the maximum. Youth in the villages can be involved for these activities.

Commodity interest groups when formed in the right spirit can become change makers in the society. Its potential is great with careful group cohesion and it can raise the standard of living of the farmers.

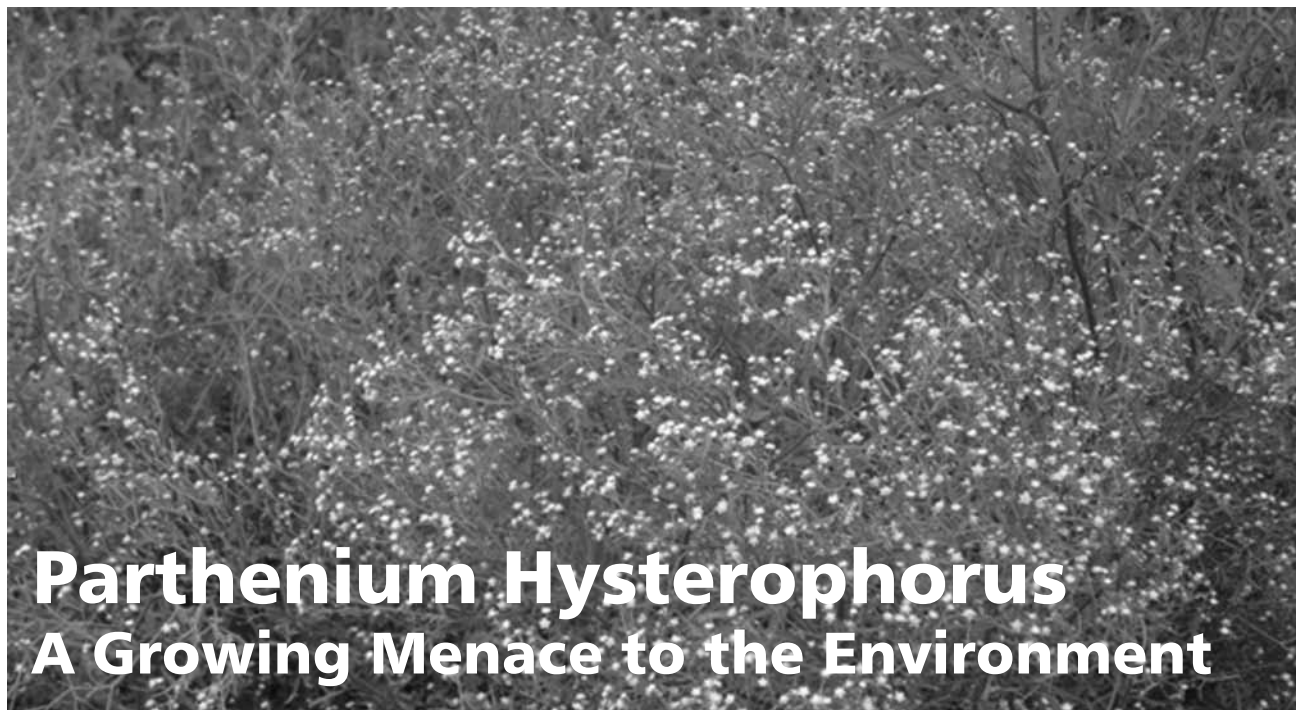
In sum, the farmers should realize a fair price through direct access to the market. Many a time the initial spirits slow down over the years due to a number of reasons. These organizations should be strengthened either by internal changes or by external intervention. The reasons for the glut should be analysed by posing a number of questions and finding out alternate solutions. The demand level at the farmers' level should be high so that the organizations can keep progressing. Large scale retailers should be identified and a link established for continuous flow of farm produces in order to raise the farm level price. Attaining higher price requires bulk quantity and standard quality. This can be achieved through group work.

### References:

1. *About farmers association* [www.agritechportal.com](http://www.agritechportal.com) as viewed on 28.10.11
2. Andrew W. Shepherd and Jean Joseph Cadilhon. 2009 *Commodity associations: a tool for supply chain development?* JAO <ftp://ftp.fao.org/docrep/fao/012/0945e/i0945e00.pdf>
3. [atma-vistor.nic.in/projects/revise-ATMA-Guidelines.pdf](http://atma-vistor.nic.in/projects/revise-ATMA-Guidelines.pdf)
4. *Coconut Producers societies* at <http://coconutboard.nic.in/cps.htm> as viewed on 01.11.11
5. *Commodity wise associations/co-operatives societies in Maharashtra* at <http://www.kvk.pravara.com/asso.htm>
6. *FAO/AFMA workshop on the role of commodity associations in Asia and the pacific. Draft conclusions and recommendations.*
7. *Grape growers association, Maharashtra* at <http://maharashtragrapes.com/aims-and-objectives.htm>
8. *Maharashtra Pomegranate Growers Research Association* at <http://www.pomegranateindia.org> as viewed on 28.10.11
9. *Organic farming association of India* at <http://ofai.org/> as viewed on 31.10.11
10. *UPASI* at <http://www.upasi.org/> as viewed on 01.11.10
11. *Farmer suicides increases at an alarming rate* at *IBN Live* dated Jan. 18, 2011 as viewed at <http://ibnlive.in.com> on 30.11.11.
12. *FDI in Retail: A 360 degree advantage* No. 28, 2011, in *CII News Update* in <http://www.ciionline.org> as viewed on 30.11.11.

Contributor: Asst. Prof. (Ag Extn)\* Professor and Head Dept of Social Sciences, Hort. College and Research Institute, Periyakulam, Theni





# Parthenium Hysterophorus A Growing Menace to the Environment

By Dr. Amarjeet, Dr. Attar Singh, Dr. Satish Mehta  
and Dr. S.S. Punia \*

Since its introduction in 1955, *Parthenium hysterophorus* has spread over an area of about 35 million hectares in India. The parthenium plant can grow on any type of soil producing 5000-25,000 seeds. It is a poisonous weed containing parthenin – a sesquiterpene lactone causing allergy, dermatitis, asthma, hay fever etc. in human beings. It is also harmful to animals. This can be controlled by uprooting manually before flowering during rainy season or by spraying glyphosate @ 1-1.5 percent or metribuzin @ 0.3-0.5 percent. A host specific insect, the Mexican Beetle (*Zygogramma bicolorata*), also remains active on this weed from June to October. About 500-1000 beetles are required for their establishment and effective control of *Parthenium*. However a community approach is needed to be adopted for its management.

*Parthenium hysterophorus* is an herbaceous annual plant belonging to compositae family. It is known by different names viz. congress grass, gajar ghas, chatak chandni, white top, gajri etc. in different parts of the country. It is considered to have emerged from Mexico, America and Trinidad. It was reported in India from Pune, for the first time in 1955. Since then it has spread to over about 35 million hectares of land. Earlier it was found only on waste and non-agricultural land like roadsides, railway tracks, parks and panchayati land but now it has also started infesting agricultural land.

The plant of *Parthenium* grows to a height of 1.5-2.5 meters with profuse branches and leaves that are covered with fine hairs. The flowers are white in colour. The plant starts flowering four weeks after emergence and this can happen at any time throughout the year (Nguyen et al, 2010). The seeds are very light in weight and can disperse very easily to distant places

with wind, water, farm machinery, human beings and animals. The population density may vary from 25 to 70 plants per square meter. One plant can produce 5000 to 25,000 seeds. The production of seed per plant has been reported to be as high as 15,000 by a typical mature plant in central Queensland (Haseler 1976) and in India 30,000 seeds (Joshi 1991). It can grow under all types of soil and weather conditions.

## Harmful effects of Parthenium

It is a poisonous weed containing parthenin – a sesquiterpene lactone. If fed to milch animals it may affect the quality and production of milk. It reduces the ornamental and aesthetic value of our residential areas, parks, schools and other public places. It also affects fodder production by infesting grasslands and pasture. It has allelopathic effect on crops. A study conducted by Singh (et al, 2002) reveals that germination and growth of *Ageratum conyzoides* was severely reduced by parthenin in the concentration range of 50, 100, and 200  $\mu\text{M}$ , while at 400  $\mu\text{M}$  a complete inhibition of germination was observed. Above all, it is a serious threat to our biodiversity and environment.

## Control Measures

**Manual and Mechanical Control:** The *Parthenium* may be controlled manually by uprooting the plants before flowering on a rainy day or mechanically with help of machinery like tractor drawn harrow or grass mower etc. However, care must be taken to wear gloves while uprooting the plants manually.

**Chemical Control:** The chemical control includes use of chemicals to control the weeds. *Parthenium* can be controlled

**Parthenium hysterophorus is an herbaceous annual plant belonging to compositae family. It is known by different names viz. congress grass, gajar ghas, chatak chandni, white top, gajri etc. in different parts of the country. It is considered to have emerged from Mexico, America and Trinidad. It was reported in India from Pune, for the first time in 1955. Since then it has spread to over about 35 million hectares of land**

with the use of chemicals like Glyphoste @ 1 to 1.5 percent or Metribuzin @ 0.3 to 0.5 percent. Besides this, it can also be controlled by spraying 2,4-D, Atrazine, Simazine, Alachlor etc.

**Biological Control:** Biological control is the intentional manipulation of natural enemies by man for the purpose of controlling weeds. It does not eradicate the weeds completely but keeps population below average in the absence of the bio control agents. Under this method the bio agents are imported from the native countries to other countries where the weeds had entered and became invasive. This is a less expensive, permanent, pollution free and most successful approach when used under integrated weed management system. Parthenium is controlled by an insect Mexican beetle: *Zygogramma bicolorata* Pallister (Coleoptera: chrysomeliadae).

For biological control of Parthenium in India, *Zygogramma bicolorata* was imported from Mexico in 1982 and first time



*Zygogramma bicolorata*

released in the fields of Bangalore in 1984. The beetles are off white or light reddish in colour with dark brown longitudinal markings on elytra, measuring about 6 mm in length.



*KVK Bhiwani organizing Parthenium awareness week*

The beetles remain most active in field during June to October. One female can lay up to 2500 eggs during life span. It completes its life cycle in 27-32 days and can complete 4-5 generations from June to October. Single adult of this can eat foliage of one Parthenium plant in 6-8 weeks. Release of 500-1000 beetles at one spot is adequate for its establishment and control of Parthenium.

**Control by Competitive Plants:** The infestation of the Parthenium can also be removed by the presence of certain competitive plants like *Cassia sericea*, *Cassia tora*, *Tagetes erecta*, *Tephrosia purpurea* etc. The seeds of these plants should be broadcasted in the Parthenium infested areas before onset of the monsoon.

It is imperative to mention here that community approach involving all stakeholders from the society should be adopted to manage the Parthenium. The individualistic approach may not yield the desired results because of its presence on common land and extremely fast dispersal through light weight seeds. Therefore, the collective efforts are needed to sensitize the general public through various means like awareness camps, trainings etc. The Directorate of Weed Research, Jabalpur (M.P) has already initiated organizing Parthenium Awareness Week every year in the month of August in collaboration with SAUs, Research Institutes, KVKs etc.

**Contributors:** Dr. Amarjeet, Dr. Attar Singh and Dr. Satish Mehta are Scientists at Krishi Vigyan Kendra Bhiwani 127 021, India; Dr. S.S. Punia is a Scientist (weed management) at Department of Agronomy, CCS HAU Hisar 125004, India

Friday, December 16, 2011

## Promotion of Food Processing-Agro Industries in Punjab

**T**oday the Associated Chambers of Commerce and Industry of India (ASSOCHAM) along with the Ministry of Food Processing Industry, GOI organised Food & Agri Processors Conclave Linking clusters to Market at PAU, Ludhiana, Punjab. **ASSOCHAM Sr. Director, Dr.Om.S.Tyagi** stated that the promotion of food Processing & agro based industry in Punjab is meaningfully beneficial for the growers. He said there is a need that the farm universities like PAU, Government Extension Agencies, NABARD, Punjab National Bank & other banks as well as the corporate sector would need to collaborate closely for developing agriculture sector related entrepreneurship in the state.

Food and Agri sector has a strong base in the state and there is plenty of scope for scaling up agro-based industries like food processing.

“Traditional skills, knowledge based small scale industries (SSI) must be set up across the state through technological, capital infusion and innovative marketing practices; since the sector has created significant number of jobs and enhanced rural industrialization. Besides, government must adopt cluster based approach for further developing MSME sector”, **Dr. Tyagi** said.

ASSOCHAM observed that there is a vast potential for the promotion of food processing industry in the state and stressed for optimally benefiting from the available schemes for value addition to enhance the income of growers.

ASSOCHAM also stressed for establishing cold stores, cold chain and effectively utilizing post harvest technologies for securing enhance income for the growers. . He added that agriculture, horticulture, and other allied sectors, if developed on scientific line, have vast scope for promoting growth in the state.

**Dr. Baldev Singh Dhillon, Hon'ble Vice Chancellor, PAU** was addressing the entrepreneurs at the inaugural function. Dr. Baldev Singh Dhillon said that there is need for taking innovative measures for establishing strong linkages between clusters & market. In this context, he added that there is also need for evolving new approaches to ensure requisite research inputs, technological support & new ideas to secure the desired results.

He stated that Agro based industry is an encouraging economic activity. He said that processing and value addition to fruits and vegetables will not only improve income opportunities but also generate viable means of direct and indirect employment in both on farm and off farm sectors. The Vice Chancellor asked the private enterprise to come and tap this huge space and appealed the relevant market players, who are attending the event, to invest in the process and add value to this segment leading win to win situation for all the stake holders.

**President Punjab Kissan Club, Shri Pavittar Pal Singh Pangli** appreciated the contribution of the ASSOCHAM as well as PAU in making the State self-sufficient in food production and said new technologies and recommendations generated by the ASSOCHAM had enhanced farmers' economic well being.

On this occasion, the Director of extension education, **Dr MS Gill, and Dr. H.S. Bajwa**, Senior Extension Specialist, PAU were also present and shared there views on the occasion. Dr. Tyagi praised Shri Pangli for his exemplary works which are a lesson for every progressive farmer and agricultural scientist, and set him apart from the rest of the world. Dr. Tyagi presented a vote of thanks to all the dignitaries and the participants

(ASSOCHAM)



## Wisdom: 365 Thoughts from Indian Masters (Offerings for Humanity) By Danielle Föllmi

A work of humanity on a universal scale, a work of reconciliation between nature and culture, Indian Wisdom celebrates those who live in harmony with the forces of earth and sky, who aspire to nirvana – the highest level of heart, body and mind-consciousness. This remarkable book by Danielle and Olivier Föllmi, authors of 15 previous books on Buddhism, presents the wise words of a great master, philosopher, or poet for every day of the year, accompanied by Olivier's beautiful, moving photographs of Indian people and places. The effect is transformative, awakening our senses and preparing our souls to receive these simple yet profound teachings.



Contemporary specialists on Indian culture have contributed to Indian Wisdom, which draws on such ancient yet timeless sources as poems by Rabindranath Tagore and Krishnamurti; the longest epic in world literature, the Mahabharata; and the most significant of the Hindu sacred writings, the Vedas. A treasure in both content and form, this inspirational book artfully conveys the essence of India. Danielle and Olivier Föllmi have written 15 books about Buddhism, including Abrams' Buddhist Himalayas. They are the official photographers of the Dalai Lama and recipients of the World Press award. The Föllmis divide their time between the Alps and the Himalayas.

## The Book of Herbal Wisdom: Using Plants as Medicines By Mathew Wood

Mathew Wood is recognized worldwide as one of the United States' most renowned herbalists. His previous book, *Seven Herbs: Plants as Healers*, was a watershed in teaching herbal healing as a part of total wellness. In *The Book of Herbal Wisdom*, this is continued and enlarged in wonderful detail. This is a must-read for anyone working in the natural health field or interested in self healing with herbs. For those of us who consider not only our physical relationship to the herbs, but also those of the metaphysical, this book is invaluable. It affirms that when we work closely with nature, and the energies of the herbs and herbal medicine, we all are much better off. This is a work that empowers the reader and gives them a very deep knowledge of the herbs discussed.



## The India Way: How India's Top Business Leaders Are Revolutionizing Management By Peter Cappelli, Harbir Singh, Jitendra Singh and Michael Useem



Exploding growth. Soaring investment. Incoming talent waves. India's top companies are scoring remarkable successes on these fronts – and more. How? Instead of adopting management practices that dominate Western businesses, they're applying fresh practices of their own in strategy, leadership, talent and organizational culture.

In *The India Way*, the Wharton School India Team unveils these companies' secrets. Drawing on interviews with leaders of India's largest firms – including Mukesh Ambani of Reliance Industries, Narayana Murthy of Infosys Technologies and

Vineet Nayar of HCL Technologies – the authors identify what Indian managers do differently, including:

- Looking beyond stockholders' interests to public mission and national purpose;
- Drawing on improvisation, adaptation, and resilience to overcome endless hurdles;
- Identifying products and services of compelling value to customers; and,
- Investing in talent and building a stirring culture.

The authors explain how these innovations work within Indian companies, identifying those likely to remain indigenous and those that can be adapted to the Western context.

With its in-depth analysis and research, 'The India Way' offers valuable insights for all managers seeking to strengthen their organization's performance.

## Half of the Indian Farmers in Debt: NSSO Researchers

The new study by the National Sample Survey Organization (NSSO) shows that 1 in 2 farmer households are in debt. The report reveals that 43.42 million farmers out of 89.35 million are not capable of paying back the debt they have accumulated. Andhra Pradesh, Tamil Nadu and Punjab are topping in the debt list. The survey analysis claims that 81 percent of the farmers in AP are in debt, following in a percentage of 74.5, Tamil Nadu top the second place of farmer debt chart, while Punjab with 65.4 percent, Kerala 64.4 percent and Karnataka 61.6 percent in the chart.

The figures top UP in the debt list where it found that 6.9 million farmers are in debt, AP with 4.9 million and Maharashtra of it 3.6 million farmers. The survey was conducted in 6,638

villages and took 51,770 sample studies from the year of 2003. Reportedly more than 50 percent of debts have gone for loans to source the capital or current expenditure for farming. Quoting this survey report, Union Minister of State Agriculture Harish Rawat mentioned 'crop failures drive farmers into a debt trap'.

Established in 1950, the National Sample Survey reorganized in 1970 under a single Government organization and was renamed as National Sample Survey Organization (NSSO). Involving in regular socio-economic surveys, NSSO is one of the renowned organizations of India on the same. For the impartial and independent data collection the organization works under the direct control of Governing Council.

---

## Fifty Percent of Farmers in Debt; Can FDI save Them?

**Bangalore:** Agriculture in India has a noteworthy history and it has always been the chief economic sector. Employing two-thirds of the population, the agriculture sector itself provides one-third of the GDP. India tops the second place in farm output and made agriculture as its biggest economic source. The agriculture sector is considered as the supplier of food, fodder, and raw materials for a vast section of the industry. Thus, the growth of Indian agriculture can be counted as the necessary condition for 'inclusive growth'.

**Half of the Indian Farmers in Debt:** NSSO Researchers: The new study by the National Sample Survey Organization (NSSO) shows that 1 in 2 farmer households are in debt. The report reveals that 43.42 million farmers out of 89.35 million are not capable of paying back the debt they have accumulated. Andhra Pradesh, Tamil Nadu and Punjab are topping in the debt list. The survey analysis claims that 81 percent of the farmers in AP are in debt, following in a percentage of 74.5, Tamil Nadu top the second place of farmer debt chart, while Punjab with 65.4 percent, Kerala 64.4 percent and Karnataka 61.6 percent in the chart.

The figures top UP in the debt list where it found that 6.9 million farmers are in debt, AP with 4.9 million and Maharashtra of it 3.6 million farmers. The survey was conducted in 6,638 villages and took 51,770 sample studies from the year of 2003. Reportedly more than 50 percent of debts have gone for loans to source the capital or current expenditure for farming. Quoting this survey report, Union Minister of State Agriculture Harish Rawat mentioned 'crop failures drive farmers into a debt trap'.

Established in 1950, the National Sample Survey reorganized in 1970 under a single Government organization and was renamed as National Sample Survey Organization (NSSO). Involving in regular socio-economic surveys, NSSO is one of the renowned

organizations of India on the same. For the impartial and independent data collection the organization works under the direct control of Governing Council.

**Agriculture in India, Today:** The growth of agriculture and allied sectors is still a decisive factor in the overall performance of the Indian economy. According to the Central Statistics Office's (CSOs) report, the agriculture and allied sector accounted for 14.2 percent of the gross domestic product (GDP). This release of 2010-11 advance estimates shows the GDP at constant 2004-05 prices.

A rapid change in the GDP has occurred in the recent past years as in 2009-10, agriculture and allied sector accounted for 14.6 percent compared to the 15.7 percent of GDP it marked it 2008-09. And it was 19.0 percent in the years of 2004-05. Accounting the average GDP growth during 2004-05 to 2010-11, it has increased by 8.62 percent while the agriculture sector marked the growth of only 3.46 percent. The role of agriculture sector still remains the major economic sector by producing 58 percent of the employment.

The Gross Capital Formation (GCF) in agriculture and allied sectors as a proportion to the GDP in the sector declined around 14 percent during 2004-05 to 2006-07. Though, there is a remarkable improvement in this figure during the current Five Year Plan (2007-2012). It increased to 16.03 percent in 2007-08 and further to 19.67 percent in 2008-09 (provisional) and to 20.30 percent in 2009-10. However, the GCF in agriculture and allied sectors relative to overall GDP has remained slow at around 2.5 to 3.0 percent. As a result the share of GCF in agriculture and allied sector in total GCF has remained in the range of 6.6 to 8.2 percent during 2004-05 to 2009-10. There is need to considerably increased investment in agriculture, both by the private and public sectors to make certain sustained target growth of 4 percent per annum.

*(Source: Silicon India)*

## Satellite Mapping to Help in Fishing



**Hyderabad:** A satellite imagery experiment was conducted successfully to locate fish shoals, which are expected to benefit the fishermen of Andhra Pradesh, the state with the longest coastline in the country. Through satellite mapping, availability of fish at a particular area in the ocean is identified and is conveyed to the fishermen. This will help in saving time, as well as the fuel they use for their boats, while going in search of fish. The experiment was conducted by the National Agricultural Innovation Project (NAIP) in a small fishermen pocket in Maharashtra's Ratnagiri village.

NAIP is a project of the Indian Council of Agriculture Research (ICAR) and is meant to support poverty alleviation programmes and income generation schemes by the development and application of innovative agricultural methods in partnership with farmer's groups, private sector, civil society organisations and other stakeholders.

According to sources, about 450 fishermen in Ratnagiri district could save about 50,000 litres of diesel by using satellite imagery rather than searching manually. They were all registered with a local office of the NAIP to receive SMS alerts about the fish reserves.

According to NAIP national director Dr Bangali Baboo, fish move in the same area for three days. Hence, the satellite image guidance is successful. The presence of fish in a particular pocket is identified based on the murkiness of the water. Fish heavily disturb water; hence it looks mucky, while the rest of the area appears clean. "We are now proposing to the planning commission and the fisheries department (Central Marine Fisheries Research Institute) to extend the satellite imagery system to the entire coastline across the country and save fuel", Baboo, told media in Hyderabad.

NAIP is a Rs. 1200 crore project with 80 percent funding from the World Bank and the rest from the Indian government. It implements 834 projects in India. "Some projects are successful and some are not. The Ratnagiri experiment has been successful", he said. The project will go on until June of 2014.

*(Source: Times of India)*

## India can Boost Agri production through Innovation: ICAR

**H**derabad, Nov 19 (PTI): India can compete with other countries not only in improving the agricultural food grain production but also through better processing techniques and improved market strategies, a top official of the Indian Council of Agricultural Research (ICAR) said today. "Crop science technologies can be rediscovered for further development of the agriculture crops sector. Low glycemic index food grains like barley and oats, while long grain rice can be used for diabetic patients. It is important to give the descriptive inscriptions of rice varieties which may be helpful for industry to develop such products with low glycemic index," Swapan Kumar Dutta, Deputy Director General (crop sciences), ICAR said. He was speaking after inaugurating the business meet "Innovations for Industry Meet in Crop Science," at the National Academy of Agricultural Research Management (NAARM) here. The Zonal Technology Management (ZTM) – Business Planning and Development Unit (BPDU), South Zone, Cochin in collaboration with NAARM organised this meet to facilitate interaction between innovators and entrepreneurs from the

field of agriculture on the same platform to captivate the immense business opportunities hidden in technologies and knowledge created at the crop science research institutions in India. Dutta asserted that a health drink can be prepared from sorghum, millets and rice like is being done in other countries. Dr T.K. Srinivasa Gopal, Director, Central Institute of Fisheries Technology (CIFT), Cochin briefed the agri-business incubation drive initiated by ICAR and hailed the role of the ZTM and BPDU, established at CIFT, Cochin. Dr Bangali Baboo, national director at the National Agricultural Innovation Project (NAIP), ICAR, who was the guest of honour on the occasion, said with innovation, information technology and biotechnology, India can compete globally. "Innovation, which is nothing but translation of new ideas for social benefit, can be done by anybody. Even farmers can be innovators, he observed. A booklet titled "Innovations – A Technology Showcase in Crop Science" prepared by ZTM-BPD, was released by Dutta on the occasion.

*(Source: IBN Live)*





# Agricultural Finance Corporation Ltd.

The Editor  
Financing Agriculture  
Agricultural Finance Corporation Ltd.  
Dhanraj Mahal, 1<sup>st</sup> floor  
Chhatrapati Shivaji Maharaj Marg  
Mumbai 400 001

## SUBSCRIPTION FOR 'FINANCING AGRICULTURE'

I / We request you to enroll me / our organization as a subscriber to the Monthly Journal  
"Financing Agriculture" for a period of \_\_\_\_\_ year(s).

*Details are as under*

Name: \_\_\_\_\_

Mailing Address: \_\_\_\_\_

City: \_\_\_\_\_ State: \_\_\_\_\_

Pin Code: \_\_\_\_\_

Email: \_\_\_\_\_

Subscription Period: One, Two, Three, Year (s) \_\_\_\_\_

Subscription Amount: Rs. \_\_\_\_\_

(Rs: 600/- for one year; Rs.1200/- for two years; Rs.1800/- for three years)

*Remittance details: Demand Draft / Cheque No.*

Date: \_\_\_\_\_ Bank: \_\_\_\_\_

Cheque / Demand Draft should be drawn in favour of  
**M/s. Agricultural Finance Corporation Ltd., Payable at Mumbai.**  
Add Rs.25/- towards collection charges for outstation cheques.

SIGNATURE: \_\_\_\_\_

DATE: \_\_\_\_\_



# Agricultural Finance Corporation Ltd.

## *Technical Support Institution Committed to Rural Prosperity (Wholly owned by Commercial Banks, NABARD, EXIM Bank)*

**Vision:** To facilitate increased flow of institutional credit and other support services for rural prosperity.

**Mission:** To continue to be leading agri-consulting organization by providing timely, appropriate and feasible client – specific end to end solutions not only in India but in other developing countries.

### Consulting Services

Specialised services which by no means are exhaustive, can be classified as:

- Agribusiness Management
- Water Resources Management
- Watershed Development and Management
- Environment Impact Assessment & Environment Management Plans
- Horticulture & Plantation
- Micro Enterprises and Micro-Finance
- Fishery, Forestry, Wasteland Development
- Gender Development
- Resettlement & Rehabilitation
- CDM Services

### Capacity Building and Training

Projects included in this category are:

- Consultancy for World Bank Assisted Process Monitoring of Andhra Pradesh Rural Poverty Reduction Project – Phase-II (Zone-II) – Society for the Elimination of Rural Poverty, Government of Andhra Pradesh – 2007-08
- Implementation of DFID funded Western Orissa Rural Livelihood Project (WORLP) – Watershed Development Mission, Govt. Of Orissa – 2005-2010
- Comprehensive Watershed Development Project in Karnataka - Watershed Development Department (WDD)- Government of Karnataka – 2006-07
- Madhya Pradesh Tribal Development Project - The International Fund for Agriculture Development (IFAD), Rome – 1997

### Grass Roots level Livelihood Implementation

AFC has undertaken large scale Agricultural Extension Programme in 820 Blocks covering all 71 districts of Uttar Pradesh.

The mission of the implementation project is to increase the farm productivity, profitability and sustainability of farming systems, efficient use of natural resources and agricultural inputs etc., by customised farmers' trainings at village cluster level and to provide online information on weather parameters, demand and use of agricultural inputs and market intelligence.

### Organic Farming

This project involves the adoption and certification of Organic Farming in 22000 hectares.

### Watershed Development

AFC is implementing Livelihood Development Programme based on Watershed Development with funding by DFID, and NABARD.

### Panchayati Raj Institutions

AFC has set up an independent division for providing support services in terms of grass roots level planning, training of various stakeholders in UP, Bihar and Jharkhand. AFC has prepared Perspective District Plans in 25 districts of Uttar Pradesh under Backward Region Grant Fund (BRGF). AFC has also conducted TNA and prepared Training Manual for PRIs in Jharkhand.

The PRI division will also provide the following services:

- Organise training programmes for the senior & middle level executives of the NGOs.
- Capacity building of the ERs and various stakeholders.
- Conduct research studies, develop learning material for each level on local self governance, organise seminars and workshops, promote exchange of academic expertise on various aspects related to local planning & DPCs, disseminate specialised information and provide expert advice to all concerned.
- Take up advocacy role to strengthen democratic process, particularly grassroots level democracy through decentralised institutions.
- Lay special emphasis on involving the poor, marginalised and weaker sections of the society in the democratic governance.





# The Primary Infrastructure for Agriculture



## Solar Electric Fence, for any species control

- Safety certified equipment from Germany.
- 10 years warranty on fence.
- Eligible for 8-year Term Loans from all Banks.



**Fenzgard India Pvt. Ltd.**

Address:  
1/329, Rangammal Colony  
NGGO Colony Post, Coimbatore  
Tamil Nadu - 641 022  
INDIA

info@fenzgard.com  
Mob : +91 94421 38380  
Tel : +91-422-2646178  
Fax: +91-422-2646179  
www.fenzgard.com