

FINANCING AGRICULTURE

Vol. 41 Issue 6 November-December 2009

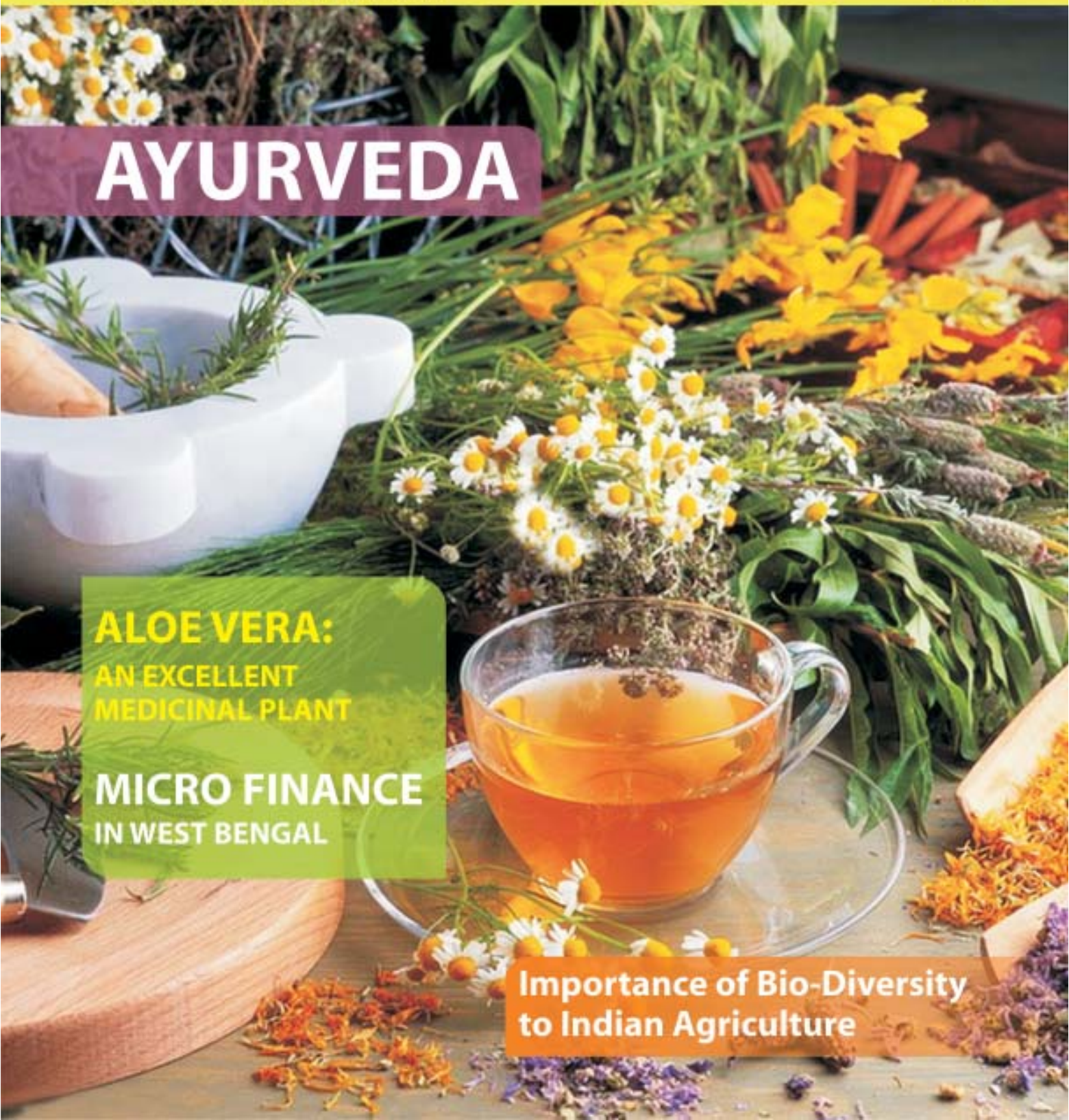
Rs. 50/-

AYURVEDA

ALOE VERA:
AN EXCELLENT
MEDICINAL PLANT

MICRO FINANCE
IN WEST BENGAL

**Importance of Bio-Diversity
to Indian Agriculture**



Agricultural Loans



Reap a better harvest

Prosper with our range of agricultural loan products
with easy credit for your farm activities.

Conditions Apply

सिंडिकेटबैंक

आपका विश्वस्तनीय एवं मैत्रीपूर्ण वित्तीय भागीदार



SyndicateBank

Your faithful & friendly financial partner

www.syndicatebank.in

...now younger than ever

Honorary Advisory Board

Shri Y.C. Nanda
Chairman
AFC Ltd.

Shri A.K. Garg
Managing Director
AFC Ltd.

Shri L.N. Vasudev Rao
General Manager
Union Bank of India

Shri G.C. Sharma
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

Shri P.M. Kshirsagar
General Manager
AFC Ltd.

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

Dear Reader,

Alternative medicine to which Ayurveda, Siddha, Unani and Homeopathy belong is a hugely growing sector not only within the country but also internationally as they are seen to be more physiologically friendly than modern medicine. Their formulations are based on herbs and medicinal plants which have evolved through the centuries and are found in ancient texts. Modern research is also going on for introducing newer formulations.

According to the National Medicinal Plants Board, the domestic trade of traditional medicine and herbal industry is of the order of Rs.80 billion and exports account for Rs.10 billion. The trade is of the order of US \$ 120 billion and is dominated by China. India's share is rather negligible.

However, the point to be noted is that these medicinal plants are mostly forest based with very little being grown as a commercial proposition. The Indian subcontinent is one of the world's 12 leading Biodiversity Centres, encompassing 16 different agro-climatic zones. It has been estimated that about 45,000 plant species (nearly 20% of the global species) occurs in the Sub-continent. About 3,500 species of both higher and lower plant groups are of medicinal values. More than 80 percent of medicinal and aromatic plants (MAP) are collected from 17 million hectares of Indian forest land. However, many of these, due to over-exploitation have become rare or endangered ones leading to rapid genetic loss of medicinal plants.

It is here that the Government needs to quickly step in and ensure that production of alternative medicine is not confined to produce from forests alone but becomes a high income generating alternative agricultural operation for farmers. Towards this end, a massive extension programme needs to be launched on cultivation practices for the proper cultivation of the medicinal plants along with provision of assured supply of quality planting materials to the farmers. Only then will India be able to be a major player in the field of alternative medicine which can not only be a huge source of livelihood but contribute hugely to the agriculture GDP of the country and exports through value addition.

I take this opportunity to inform our readers that from January 2010 onwards, your magazine would become a monthly. Readers can now look forward to getting to know more about what is happening in the agriculture and allied fields in the country and elsewhere. We hope to receive your continued patronage without which we would not have been able to survive for four decades.

A.K. Garg
Editor-in-Chief

I N S



Annual Subscription

India, Nepal and
Bangladesh Rs. 300/-

Other Countries
(By Air Mail) US\$35

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

Ayurveda	6
Manish Sharma	
Aloe Vera: An Excellent Medicinal Plant	10
S.Divya Devi and K. Kannusamy	
Impact of Climate Change on Human and Food Security	13
Dr. S. Saravanakumar	
Constraints Faced and Suggestions made by the Agricultural Community Radio Listeners in Pune District	16
R.L. Parab, Dr P. A. Sawant and Dr. S.L. Sananse	
Mobile Phones Messages Using Behaviour and Adoption of Various Technologies by the Beneficiary Farmers	20
R.L. Parab, Dr. P. A. Sawant and Dr. S.L. Sananse	

I D E



Micro Finance in West Bengal A Case Study	28
<i>Manas Bhattacharjee</i>	
Precision Farming	32
<i>Dr. S.K. Sharma, Dr. M.K. Maji and Prof. K.N. Tiwari</i>	
Importance of Bio-Diversity to Indian Agriculture	37
<i>K. Venkataraman</i>	
Agri News	43
Agri Technology News	45

Editorial Board

Editor-in-Chief

Shri A.K. Garg

Editor

G. Kalyan Kumar

Associate Editor

Linda Brady Hawke

Desk Editor

Manish Sharma

Events & Advertising

Ritu Khanduri
91-9891173723

Design

Atul Kumar

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



Ayurveda

By Manish Sharma

*Priyogah shamyet vyadhim yah
Anyamqamudiret;
Naso vishudhah shudhastu shamyedwau
na kopyet.
(Vagbhatta A. H. Su. 13:16)*

The therapy which pacifies diseases and gives rise to other diseases is not pure therapy. The pure is one which pacifies without erupting other problems.

Introduction

Ayurveda is an alternative/natural form of medicine. It has been in practice since time immemorial and is one of India's oldest medicinal systems. Some of the other natural/alternative streams of medicine which are recognized by the Government of India are: Siddha; Unani; Yoga; Naturopathy; and, Homoeopathy. Out of these Yoga and Naturopathy are drugless therapies.

The domestic trade of the AYUSH (Ayurveda, Yoga & Naturopathy, Unani, Siddha & Homeopathy) industry is of the order of Rs. 80 to 90 billion. The Indian medicinal plants and their products also account of exports in the range of Rs.

10 billion. There is global resurgence in traditional and alternative healthcare systems resulting in world herbal trade which stands at US\$120 billion and is expected to reach US\$7 trillion by 2050. Indian share in the world trade, at present, however, is quite low.

Importance of Ayurveda

Ayurveda is a safe and side-effect free form of medication. Its use has been documented since 5000 BC. The success story of Ayurvedic medicinal plants has truly been remarkable.

Government Regulations

The Central Council of Indian Medicine for Ayurveda, Siddha & Unani was established through an act of parliament in 1970. The objectives of the act are:

- To regulate the standard of education;
- Registration of practitioners;

“In India, 60 percent of registered physicians are involved in non-allopathic systems of medicine. In addition to the nearly 400,000 ayurvedic practitioners, there are over 170,000 homeopathic physicians; India has about 500,000 medical doctors

- Code of Medical Ethics.

For drug regulation, the Indian Drugs & Cosmetics Act applies. Schedule T further regulates the Ayurvedic industry through the following measures:

- Raw materials used in manufacturing of drugs are authentic, of prescribed quality and free from contamination;
- The manufacturing process is as has been prescribed and maintains standards of purity;
- Adequate quality control measures are taken; and,
- The manufactured drug which is released for sale is of acceptable quality.

To achieve the objectives listed above each licensee shall evolve methodology and procedures for manufacture of drugs which should be documented as a manual and kept for reference and inspection. Vaidyas, Sidhdhas and Hakeems dispensing medicines to their own patients are exempted.

Besides these, the Raw materials used are also subjected stringent quality control. These are:

1. Separate and adequate facilities for:
 - Raw materials of metallic origin;
 - Raw materials of mineral origin;
 - Raw materials from animal source;

- Fresh herbs;
 - Dry herbs or plant parts;
 - Excipients etc.;
 - Volatile oils, perfumes and flavours; and,
 - Plant extracts, exudates and resins.
2. Labelling under ' Under Test', ' Approved' and ' Rejected'

National Medicinal Plants Board

The National Medicinal Plants Board and 30 State/U.T. Medicinal Plants Boards have been set up to provide quality raw material for preparation of drugs by ensuring:

1. Survey and inventorization of medicinal plants;
2. *In-situ* conservation and *ex-situ* cultivation of medicinal plants;
3. Production of quality planting material;
4. Creating and developing infrastructure for the purpose of value addition, storage & packing of drugs conforming to international standards;
5. Research & Development in medicinal plants sector;
6. Scientific, technological and economic research on medicinal plants;

7. Develop proper harvesting techniques, semi-processing of produces viz., collection, grading, drying, storage, packing etc;
8. Priority Plants List – 60 in number; and
9. Area under ex-situ cultivation – 25,000 hectares

Government Support to Ayurveda

Under the 11th five year plan (2007-2012), the Government has given subsidies to the Department of Ayurveda, Yoga and Naturopathy, Unani, Siddha and Homoeopathy (AYUSH), which include major plans for the ayurveda industry like:

- To upgrade quality control department, improve quality-manufacturing unit as per cGMP, US Food and Drug Administration (FDA), UK's Medicines and Healthcare products Regulatory Agency (MHRA) and the European Union (EU) guidelines; and,
- To set up GMP standards for botanical products as well as it be should defined as per WHO standards.

AYUSH has set up a scheme for ayurvedic manufacturing companies, known as 'Ayush Cluster', where it will give assistance of Rs 10 crore for forming such clusters anywhere in India. The



Department of Science & Technology is also involved in promoting Ayurveda and is inviting proposals to setup joint R&D centres.

Industry View

“The major challenges faced by the industry is with relation to the standardization of products, market access (reach into micro interiors), high level of fragmentation of the market and presence of too many small and localised players” – *Kiran Das, General Manager-Exports & Herbal Anglo-French Drugs & Industries*

“There is an urgent need for new investment in modern research, improved marketing and government support to sustain the ancient medicinal system” – *S.C. Sehgal, Chairman and Managing Director Ozone Group.*

“Every manufacturer must make efforts to understand the resource and identities of its traditional plant input material and also concentrate upon investing in backward integration projects for attaining resources identity” – *Ranjit Anand Puranik, General Secretary Ayurvedic Drug Manufacturers Association (ADMA).*

“One of the major hurdles in the wider acceptability of ayurveda and its products is the lack of proper

standardization techniques and its unpreparedness to accept global challenges” - *Dr. Durga Prasad, Senior Manager-Medical Marketing Dabur India*

“As people are becoming more health conscious rather than curative, they are adopting preventive healthcare measures. This category of product is also not under price control. So for the near future, we have robust plans for ayurveda R&D activity” - *Ranjit Sahani, Vice Chairman and Managing Director, Novartis India*

“In India, 60 percent of registered physicians are involved in non-allopathic systems of medicine. In addition to the nearly 400,000 ayurvedic practitioners, there are over 170,000 homeopathic physicians; India has about 500,000 medical doctors (similar to the number in the US, but serving nearly four times as many people). Dependence on ayurvedic medicine is heavy in certain regions of India, such as Kerala in the southwest. Many ayurvedic practitioners in small villages are not registered” - *A R Ramasubramania Raja, President-Finance, Arya Vaidya Pharmacy*

Case Study – Commonwealth Games 2010

Ayurvedic and Medical Tourism industries are likely to be the largest



ASSOCHAM ANALYSIS ON CWG IMPACT ON AYURVEDIC & MEDICAL TOURISM		
Business	Ayurvedic Industry Rs. 500 crore	Medical Tourism Rs.300 crore
Tourists Spending	Rs.10,000-Rs.35,000/-	Rs. 40,000- Rs.1,20,000./-
Employment Opportunities	40,000 Ayurveda, spa & Medical Tourism Professionals	



beneficiary of 2010 Commonwealth Games and may gain by around Rs. 800 crore, according to The Associated Chambers of Commerce and Industry of India (ASSOCHAM).

In a Paper brought out by ASSOCHAM on 'Prospects for Ayurvedic & Medical Tourism Industries during CWG 2010', it was predicted that the ayurvedic industry would alone earn a business of Rs. 500 crore and revenue prospects for medical tourism are predicted for estimated amount of Rs. 300 crore. “The job opportunities that would arise for professionals of these two promising industries are projected for 40,000 people,” said the ASSOCHAM President, Mr. Venugopal N. Dhoot while releasing the estimates.

The ASSOCHAM Chief clarified that revenue generation for ayurvedic industry will be mainly driven through Spa centres, which means pampering exterior of those tourists that stay in



various hotels, from 5 star to 1 star.

Mr. Dhoot pointed out that ASSOCHAM estimates are based on the assumption that over 1800 athlete participation would be bare minimum for 2010 commonwealth games in a variety of sporting disciplines and tourist arrivals for the people is projected for 6-7 lakh overseas visitors. The countries of which maximum outflow of tourists would emerge include UK, Canada, Australia, Malaysia, South Africa, Singapore, Sri Lanka etc. Over 4 lakh domestic tourists are expected for the sporting event.

Case Study 2 – The Indian Spa Industry

According to ASSOCHAM estimates, the Indian spa industry is expected to receive investment of US\$35 billion in the next 3-4 years. However, the profit margins in the spa industry was as high as 60-65% and the domestic spa industry is offering a mix of traditional ayurvedic,

as well as Chinese, Thai and Swedish healing techniques.

Case Study 3 – Medical Tourism

Currently, the medical tourism market in India is estimated to be worth over US\$300 million with approx. 170,000 foreign patients coming in every year and is expected to grow into a US\$2 billion business by 2012 with advantages of low-cost medical and surgery treatment compared to US and EU.

ASSOCHAM has suggested that ministries of health and tourism should jointly set up a separate Department and training institutes to bridge the gap of skilled professionals in this field and also authorize the ayurvedic and herbal centres.

Some of the major treatments in the ayurveda and spa centres include rejuvenative programmes & therapy (Rasayana Chikitsa), body immunization & longevity treatment, body sudation

Currently, the medical tourism market in India is estimated to be worth over US\$300 million with approx. 170,000 foreign patients coming in every year and is expected to grow into a US\$2 billion business by 2012 with advantages of low-cost medical and surgery treatment compared to US and EU

(Sweda Karma), and panchakarma treatment etc.

Conclusion

Needless to say, the increasing popularity of Ayurveda can help the farmers to improve their financial condition. Farmers need to be made aware of the right farming procedure in order to help them cultivate these medicinal plants the right way.

The 2nd part of the cover story focuses on Aloe Vera. Aloe Vera is making its mark in both medical as well as cosmetic markets. It's a plant which has many benefits; you will discover these as you read on.

Sources:

1. AAPRA (American Association of Practitioners and Researchers of Ayurveda)
2. National Medicinal Plants Board (www.nmpb.nic.in)
3. LMCST, Jaipur
4. Express Pharma Online (www.expresspharmaonline.com)

Aloe Vera: An Excellent Medicinal Plant

By S.Divya Devi**
K.Kannusamy*

Aloe Vera plant usage has been well known and appreciated for ages. Greek scientists and researchers mentioned the benefits of Aloe Vera plants some 2000 years ago and regarded it as best medicinal plant available. The Aloe Vera plants usage and benefits can't be replaced by any other alternative; it's a globally accepted fact that Aloe Vera has been making its mark from time to time. There are around 250 species of Aloe Vera plants in the world. Aloe Vera plant size varies from one inch to highly complex and spread out colonies consisting of thousand of plants ranging from 2 foot diameter to more. The most commonly known species of Aloe Vera plant is Aloe barbadensis. Aloe Vera plants are basically tropical succulent plants

Aloe Vera shows the best effect on skin problems and presently the benefits of the plants are being shifted to cure many acute and serious diseases.

As Aloe Vera consists of 95 percent water, it is not found in cold regions. That's the reason they are mostly found in tropical and subtropical region, mostly in Africa. Hot climates suit the growth of Aloe Vera plants. Growing Aloe Vera plants in a warm climate makes them flourish and ensures wide spreading. Plant your Aloe Vera in full sun, if not then in light shade. If you're planting it inside the home keep it beside the window for proper sun light. If you are in mild climatic conditions take care to provide adequate sunlight. Aloe Vera plants can survive drought very well but for the benefit of the plant water should be provided.



Origin of Aloe Vera

According to botanists, Aloe Vera plants originated in warm conditions and mostly flourished in tropical and sub tropical regions. Africa is one of the largest homes of Aloe Vera plants. But adaptability is the best policy and selfish human nature carried the plant for their use to various parts of the world. And due to its great adaptable nature and good care, Aloe Vera plants flourished in all regions. Greenhouses provide great support in growing Aloe Vera plants everywhere.

Present Scenario and Promotion of Aloe Vera Plants Uses

In the present day medical community Aloe Vera doesn't have official standings and is not promoted widely for its medicinal uses. But in spite of that the US knows the importance of Aloe Vera plants and is largely cultivating Aloe Vera. Aloe Vera gel is widely used in US for skin treatments such as burns or bruises. Additionally Aloe Vera plants are used in many cosmetic products and are also consumed as a health drink. FDA has approved the use of Aloe Vera plants for the research of cancer treatment and AIDS. More and more research is going on to get the most out from this powerful healing agent.

Cultivation of Aloe Vera

Aloe Vera Plants are easy to grow in frost-free climates. They require well-drained gritty or sandy potting compost in moderate light. If planted in a pot or

other containers, our advice would be to ensure good drainage with holes in the container. Use a good quality soil-based potting mix, with added perlite, grit, or coarse sand. Allow container grown plants to dry prior to re-watering. The plants may become dormant in winter. No moisture is required during this dormancy. In areas that get frost or snow they are best kept indoors in a warm frost-free environment.

Advice about Medicinal Uses of Aloe Vera

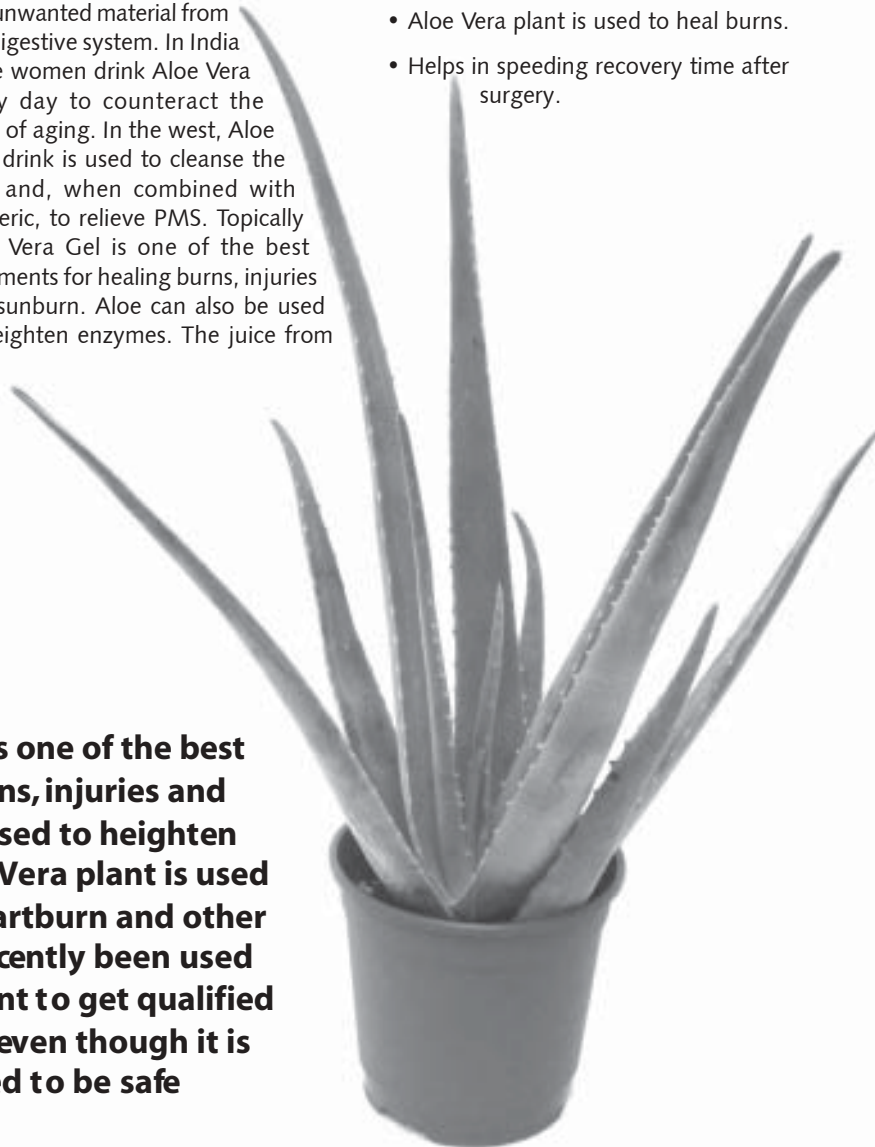
This wonder herb is used for all kinds of digestive problems to regulate female hormones, to counteract wrinkles (Aloe Vera Gel), for constipation, liver problems, ulcers, to heal the gut and to stop bleeding from the intestines, AIDS and to cleanse and remove parasites and unwanted material from the digestive system. In India some women drink Aloe Vera every day to counteract the signs of aging. In the west, Aloe Vera drink is used to cleanse the liver and, when combined with turmeric, to relieve PMS. Topically Aloe Vera Gel is one of the best treatments for healing burns, injuries and sunburn. Aloe can also be used to heighten enzymes. The juice from

Aloe Vera plant is used in the treatment of ulcers, heartburn and other digestive disorders. It has recently been used for athlete's foot. It is important to get qualified advice about Aloe Vera use, even though it is well used and considered to be safe. Apply Aloe Vera and make a difference in your looks.

Introducing Aloe Vera as a medicinal plant would be like making fun of Aloe Vera. It is world wide accepted fact that Aloe Vera is a medicinal plant and has a lot of medicinal uses. While we are mentioning the medicinal uses of Aloe Vera, we all are aware of the healing properties of the plant. Oral intake and topical dressing of Aloe Vera helps in curing various problems. The following are other benefits:

- Aloe Vera is used to heal skin wounds.
- Aloe Vera plant is used to heal burns.
- Helps in speeding recovery time after surgery.

Typically the Aloe Vera Gel is one of the best treatments for healing burns, injuries and sunburn, Aloe can also be used to heighten enzymes. The juice from Aloe Vera plant is used in the treatment of ulcers, heartburn and other digestive disorders. It has recently been used for athlete's foot. It is important to get qualified advice about Aloe Vera use, even though it is well used and considered to be safe



- Aloe Vera gel is used on blisters.
- Aloe Vera Plants are also helpful in healing insect bites.
- Aloe Vera Plants are also helpful in healing rashes.
- Aloe Vera Plants are also helpful in healing sores.
- Aloe Vera Plants are also helpful in healing herpes.
- Aloe Vera Plants are also helpful in healing urinary problems.
- Aloe Vera Plants are also helpful in healing fungus.
- Aloe Vera Plants are also helpful in healing vaginal infections.
- Aloe Vera Plants are also helpful in healing conjunctivitis.
- Aloe Vera Plants are also helpful in healing allergic reactions.
- Aloe gels are applied on dry skins to give them glowing effect.
- Helps in reducing acne.
- Helps to reduce sunburn.
- Aloe Vera helps to fight frostbite.
- Aloe Vera uses includes fighting from shingles.
- It helps in screening out x-ray radiation.
- Aloe Vera used to reduce psoriasis.
- Aloe Vera used to reduce rosaceous.
- Aloe Vera used to reduce warts.
- Wrinkles from aging are reduced by applying Aloe Vera.
- Aloe Vera used to reduce eczema.

Seeing so many medicinal uses of the plant it is pretty easy to say that Aloe Vera is of great importance in our lives and serves great purpose in the medical field as well. Apart from the above-mentioned medicinal uses of Aloe Vera there are other more important points to be noted about the plant which are of more importance and of critical understanding:

AIDS Cure: Aloe Vera is showing great potential in the fight against AIDS. Researchers will get the best potential result out of Aloe Vera plants for cure of AIDS.

Cancer Cure: Aloe Vera plants are proving to be great help for cancer patients by activating white blood cells which promote growth of non-cancerous cells. Researchers have found the cancer fighting properties of Aloe Vera and are making a difference.

Benefit from the booming effect of Aloe Vera plant products in the market

Aloe Vera is a name on which you can rely for your medicinal and cosmetic treatments. Once used, you will be addicted to using the Aloe Vera plant products more and more. And surely you will be recommending it to others as well. Due to its composition of minerals, vitamins, proteins, amino acids, polysaccharides, enzymes and biological stimulators, Aloe Vera products are highly beneficial.

Aloe Vera can heal frostbite, burns, insect bites, blisters and allergic reactions. It is beneficial for cracked and dry skin, eczema, burns, psoriasis, inflammations and wounds. It is a part of anti-wrinkle creams, facial masks, skin conditioners and lipsticks, lesions and many more. The list is never ending.

Aloe Vera beauty products are widely spread in the market to make your skin soothing and soft.

Aloe Vera Gel

Aloe Vera gel is rich in amino acids, minerals, vitamins and trace elements.

The gel comes from the cactus like leaf and is a very sticky substance; it is tasteless, colourless and odourless. The gel is used throughout not only for its healing properties, but is also used as a food preservative that prolongs the conservation of fresh produce, such as fresh fruit and legumes. In the beauty industry this cooling herb can be traced all the way back to the ancient Egyptians. Cleopatra regarded it as her beauty secret. Aloe Vera can be found widely in the beauty industry.

Red nose, cheeks, or hands as well as chapped hands and noses can be treated by slicing open one of the Aloe's stalks and squeezing the gel liquid onto the affected areas. The gel is even used in detergents. It is also environmentally friendly. Unlike some detergents the surfactants in it are bio-degradable.



Animal Usage

Aloe Vera is often used for animal disorders and is an excellent remedy for some skin conditions such as dermatitis, abscesses, and fungal infections. Gel is normally added to the food and can also be used directly on skin to help combat inflammation. Obtain qualified advice before use.

Conclusion

The medicinal uses of Aloe Vera are never ending. Research on Aloe Vera has shown that it is also helpful in heart problems with great effect. Diabetic patients benefit from the use of Aloe Vera. Major research on Aloe Vera is done to find more and more probabilities and scope of the following 5 qualities of Aloe Vera:

Penetration: The ability of Aloe Vera to reach deepest inside the tissue, a great property of aloe.

Antiseptic: Great antiseptic properties to cure problems

Stimulates cell growth: A great property of Aloe Vera is regeneration of tissues.

Settles nerves: Effectively solves problems of body's nervous system.

Cleanness: Detoxifies and normalizes body's metabolism.

*** Lecturer in Physics, PK.R Arts College for Women, Gobichettipalayam.*

**Lecturer in commerce, PG& Research Department of Commerce, Gobi Arts & Science College, Gobichettipalayam*

Impact of Climate Change on Human and Food Security

By Dr. S. Saravanakumar*

Climate change is easily the biggest challenge before policy planners today. Climate change as a result of global warming will significantly impact on conditions of food supply and food security. Climate change is the major overriding environmental issue of our time and the single greatest challenge facing environmental regulators. It is a growing crisis with economic, health, safety and food production ramifications.

There is a perception among many that global climate change is simply global warming. In fact, global climate change is an integrated system of several atmospheric phenomena and their products. At the surface, concentrations of greenhouse or radioactive gases such as carbon dioxide, chlorofluorocarbons, methane and nitrous oxide have clearly increased since the onset of the industrial revolution. These trace gases, in addition to warming the surface air temperature by trapping some of the energy from the outgoing radiation, when transported into the stratosphere (10-15 km above the surface), destroy the beneficial ozone layer naturally present at that height. Such a loss in the thickness or thinning of the

Ozone layer will permit the increased penetration to the surface of deleterious wavelengths of solar radiation (Ultraviolet or UV [B- band], 280-315 nanometres, 1

nanometre = one billionth of meter), with much concern for consequent increases in the incidence of melanoma or skin cancer.

Average global air temperature has increased by about 0.8 C above pre-industrial levels and a 2001 report by the Intergovernmental Panel on Climate Change projected a rise from 1.4 to 5.8 C by the year 2100. While this prediction is extremely important, there is a significant amount of spatial variability in the air temperature. Local climate in different geographic areas may very well become warmer and drier, cooler and wetter or remain unchanged. Any change in the climate is expected to manifest itself as increases in the frequency of extreme events such as hurricanes, blizzards, heat waves and the number of days without precipitation during the plant-growing season (drought). Increases in air temperature can accelerate crop growth and consequently shorten the growth period. In cereal crops for example, such changes can lead to poor vernalization (e.g., hastened flowering) and reduced yield.

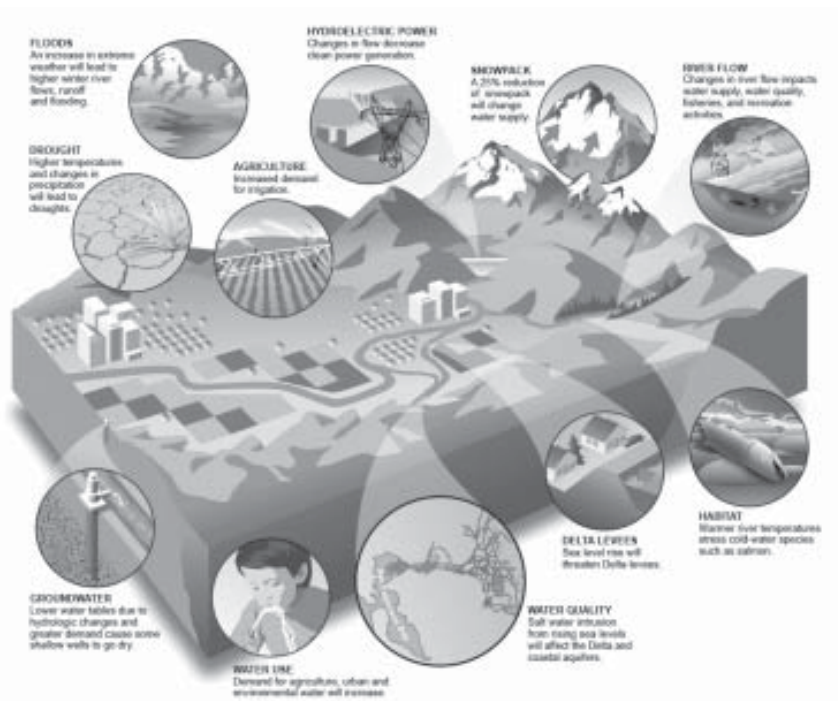
Global temperatures are rising, glaciers are melting fast, sea levels are rising and established climate patterns are turning topsy-turvy, throwing lifestyles out of gear – especially in the developing countries which are still hugely dependent on nature for sustaining livelihoods.

There is also evidence that since the 1950s, in North America, in China and in the former Soviet Union, night time temperatures have increased much more than the daytime values (because of increased cloud cover due to air pollution and formation of hygroscopic, cloud-forming aerosols in the atmosphere), with the potential to reduce reproductive development in many crop species and consequently, their seed yield.

On 9 January 2004, David King, the UK Government's chief scientific adviser claimed that climate change is a far greater threat to the world than international terrorism. In February 2004, John Reid MP, then British Secretary of State for Defence and now Home Secretary argued that climate change may spark conflict between nations. He forecast that violence and political conflict would become more likely in the next 20 to 30 years as climate change turned land into desert, melted ice fields and poisoned water supplies. He listed climate change alongside the major threats in future decades, including terrorism, demographic changes, and global energy demand. "As we look beyond the next decade, we see uncertainty growing; uncertainty about the geopolitical and human consequences of climate change. ...Impacts such as flooding, melting permafrost and desertification could lead to loss of agricultural land, poisoning of water supplies and destruction of economic infrastructure. ...More than 300 million people in Africa currently lack access to safe water; climate change will worsen this dire situation".

John Ashton, the UK Foreign Secretary's Special Representative for Climate Change, said at a conference on 'Climate Change: The Global Security Impact', at the Royal United Services Institute on 24 January 2007, "There is every reason to believe that as the 21st century unfolds, the security story will be bound together with climate change." "Climate change is a security issue because if we don't deal with it, people will die and states will fail," Ashton concluded.

Climate change poses many new threats and challenges to national security and international stability as well as to human security at other scales. The concept of human security was introduced first by UNDP in 1994 and then developed



The environmental dimension of human security has been addressed by an international team working on Global Environmental Change and Human Security (GECHS) and in several studies by the United Nations University Institute for Environment and Human Security (UNU-EHS)

further in a report by the Human Security Commission, co-chaired by Sadako Ogata and Amartya Sen, in its report *Human Security Now* (2003). The environmental dimension of human security has been addressed by an international team working on Global Environmental Change and Human Security (GECHS) and in several studies by the United Nations University Institute for Environment and Human Security (UNU-EHS). In February 1999, during its presidency of the United Nations Security Council, Canada, a founding member of the Human Security Network, put human security on the agenda by addressing conflicts in human beings. In March 2005, then UN Secretary General, Kofi Annan, in his report *In Larger Freedom*, wrote of human security in a broad sense, the issue was placed on the agenda of the UN General Assembly in the fall of 2005.

Health impacts of climate change

including epidemics and insect outbreaks will have a similar effect, also compounding food and livelihood crises. As we have seen with SARS and avian influenza, disease does not respect national boundaries in a globalized world. Changing climate may bring many epidemiological surprises as vector habitats change, sometimes quite rapidly. Projected climate change-related exposures are likely to affect the health status of millions of people, particularly those with low adaptive capacity, through:

1. Increases in malnutrition and consequent disorders, with implications for child growth and development;
2. Increased deaths, disease and injury due to heat waves, floods, storms, fires and droughts;
3. The increased burden of diarrhoea disease;

4. The increased frequency of cardio-respiratory diseases due to higher concentrations of ground level ozone related to climate change; and,
5. The altered spatial distribution of some infectious disease vectors.

Climate change is expected to have some mixed effects, such as the decrease or increase of the range and transmission potential of malaria in Africa. It is very educative to examine the status of the present and projected global agricultural production within these overall scenarios. Currently the ratio of rural to total population for the world is 52%, China; 65%, India, 71%; and, 20% the USA. Similarly the ratio of agricultural to rural populations is for: the world - 80%, China - 94%, India - 73% and the USA - 10%. These are telling statistics of the major dependence of the two most populous countries in the world (China and India) and in addition, some others, on intense human labour for food production and sustainability, compared to the US.

China, India and the US account equally for some 40 percent of the total area in the world under crop production. Yet the agricultural production in metric tons per capita of the total population is for the world – 0.26, China – 0.29, India – 0.20 and the USA – 1.4. The large difference between the statistic for the US and the

others is due mainly to the use of complex and highly mechanized and managed crop production systems in the US, compared to the emphasis on manual labour elsewhere. In the US these types of statistics have led to some adverse, short sighted consequences. There has been a progressive decline in the number of individual farmers and a converse increase in corporate mega farming. In addition fluctuations in the commodity prices, the so-called surplus food supply and imports of foreign plant products have worked negatively against the profitability of individual US farmers and thus, the decline in their numbers.

In the final analysis, scientists will continue to study the critical and important issues of the effects of adverse air quality and climate change on crop production. Unfortunately, some scientists have and will use socio-political reasons to further their own cause. Fortunately, in general, those types of activities are transient by nature (e.g., the rise and fall of the acidic precipitation research program in the US during the 1980s and 90s). At the end, sustaining the future global populations through food production and food security would require scientific integrity and a much broader and holistic understanding of the many coupled, but complex facets of our society and their feedbacks to the

scientists will continue to study the critical and important issues of the effects of adverse air quality and climate change on crop production. Unfortunately, some scientists have and will use socio-political reasons to further their own cause

continuing process of environmental change and its impacts.

Whether one is assessing the impact of climate change from the point of view of intrastate stability and interstate relations or with an eye to the Millennium Development

Goals and the well-being, dignity and aspirations of the poor and marginalized of humanity, the challenges are clear. It is also clear that “No man is an island”, a thought poet John Donne contributed to the collective consciousness of Westerners. Equally true is the fundamental, epithetic insight of many eastern belief systems, in one formulation (in the *Upanishads*): “Thou art that” (*Tat Tvam Asi*) – a profound affirmation of inter-subjectivity, quite apart from its possible metaphysical meanings. In more mundane terms, we are “all in the same boat”. Thus not only must rich countries and wealthy people in those countries cut back on consumption, they must help, support, promote – and not impede – the rest of the world in adapting to a planetary system that is rapidly changing. A timely and adequately funded combination of adaptation and mitigation efforts needs to be encouraged. Adaptation strategies should take account of impacts on all stakeholders, consciously including women, indigenous groups, and ethnic minorities while also drawing from local knowledge and past experiences with coping with climate variability and extreme events.

** Dr. S. Saravanakumar is Lecture in Political Science, Gobi Arts & Science College, Gobichettipalayam, Tamilnadu.*



Constraints Faced and Suggestions made by the Agricultural Community Radio Listeners in Pune District

By R.L. Parab¹, Dr. P.A. Sawant² and Dr. S.L. Sananse³

The present study was carried out on a random sampling of 40 community radio listeners from eight different villages in Baramati and Indapur blocks to study the constraints faced and to seek suggestions from them. The study revealed that they faced constraints like some important programs are not included in the schedule, fewer programs of discussion type information broadcasted, inability to listen due to other work, fewer repetitions of important topics, and short duration of broadcasting. The suggestions were:

- 1. Programs of discussion type information and that of distance education be included in the broadcasting schedule;*
- 2. The repetition of important topics and more duration of broadcasting in the evening. They suggested that 7 am to 9 am and 7 pm to 9 pm were the most suitable times to listen. The time 10 am to 1 pm, 3 pm to 6 pm and 11 pm to 12 pm was unsuitable for listening.*
- 3. They were more interested in rainfall prediction, agricultural news, disease and pest predictions and inputs availability. They were less interested in advertisements, children songs and jokes.*



Introduction

In India farmers live in less accessible and isolated villages both in plains and hills so effective communication is all the more difficult. Among the various mass media, radio is economical technology conveying information quickly, effectively and promptly. Radio can cut across geographic, cultural, and literacy barriers. Singh and Bharti (2007) reported that community radio was enhancing participation of people in the development process; led to capacity building especially in rural areas through education thus providing opportunities to people to upgrade their skills and enhance their creative talent; creating rural network for cottage and village industries; and, strengthening Panchayatiraj institutions and bringing them within easy reach of the rural population and dissipating topical information in areas of agriculture, social welfare, education, health and environment. Community radio means radio broadcasting with the objective of serving the cause of the community in the service area by involving members of the community in the broadcast of the programs. The Krishi Vigyan Kendras are eligible to apply for grant of permission

to run community radio stations. The power of the transmitter allowed is 100 E.I.R.P. However using this power one can cover about 10 to 15 km of radial area.

The community radio station for agriculture in India named Vasundhara Vahini was started at Baramati during the year 2005. The radio station is situated at Vidyanagari, Baramati and Agricultural Development Trusts Krishi Vigyan Kendra, Baramati, Pune has provided technical support to run the programs. The duration for broadcasting is 4 hours in the morning i.e. 6 to 10 am and 4 hours in the evening i.e. 4 to 8 pm. The programs are available at 90.4 MHz frequency on radio. Programs on agricultural messages, disease forecasting for the crops, weekly schedule of works, answers to the questions asked by the farmers, interviews with successful farmers in various crops, interviews with experts on various crops, programs for children, women, youth, health care, success

stories, Marathi songs, reading of novel, and prices of agricultural commodities are being broadcasted.

Methodology

The present study was taken up in eight villages in Baramati (5) and Indapur (3) block in Pune district of Maharashtra because the majority range of Vasundhara Vahini community radio was observed in these two blocks. Approximately 5/8th of the community radio range comes under Baramati block and the remaining under Indapur block. A sample of 40 listeners was selected by random sampling method. A well structured interview schedule was used to collect the data in accordance with the objectives.

One of the objectives of the study was to learn the constraints faced and suggestions made by the listeners of the community radio. The sum total score of each constraint and suggestion was calculated and percentage of respondents was also calculated at the

same time and ranking was given to each constraint and suggestion. The total score under each hour and its percent were calculated and ranking was given to each hour. The listeners were asked about the preference of the programs not broadcasted but needed to be and then these were categorized into more preferred and less preferred and not required categories.

Results

1. Constraints

It was very important to know the reactions of the listeners for improvement in agricultural programs broadcasted from agricultural community radio. With this view, the listener farmers were asked to pose their constraints in listening and understanding the various programs. The data presented in Table 1 shows that out of the nine constraints faced in listening by the listeners the maximum 40 (100%) score was recorded under - some important programs are not included in

Table 1: Constraints observed by the listeners of community radio.

Sl. No.	Constraints	Frequency of listeners	Percentage to frequency of listeners N=40	Rank
1	Some important programs were not included in the schedule	40	100.00	I
2	Discussion type information was less	28	70.00	II
3	Unable to listen due to other work	24	60.00	III
4	Important topics are not repeated again and again	22	55.00	IV
5	Duration of broadcasting was short	20	50.00	V
6	Duration of important program was short	04	10.00	VII
7	Time of the program was not proper	04	10.00	VII
8	Speed of speaking was fast	04	10.00	VII
9	Sound clarity was not good	02	5.00	VIII

The community radio station for agriculture in India named as Vasundhara Vahini was started at Baramati during the year 2005. The radio station is situated at Vidyanagari, Baramati and Agricultural Development Trusts Krishi Vigyan Kendra, Baramati, Pune has provided technical supports to run the programs



the schedule - followed by - less number of programs of discussion type information broadcasted 28 (70%) - unable to listen due to other work 24 (60.00%) - less repetitions of important topics 22 (55%) and short duration of broadcasting 04 (10%) respectively.

The discussion type information programs are easy to understand and are therefore needed by the listeners. The schedule of work of the listeners might be flexible so sometimes they were unable to listen due to other work. The listening behaviour of the listeners indicated that very few of them took notes while listening so they need repetition of important topics. Similar results were obtained by Chandra et al (2004).

2. Suggestions

2.1. General suggestions:

The data presented in Table 2 shows that out of the six general suggestions given by the respondents the maximum score

(40 i.e. 100%) was recorded under some important programs should be included followed by A) programs of discussion type information should be included in broadcasting (28 i.e.70%); B) programs of distance education should be included in the broadcasting schedule (27 i.e. 67.50%); C) repetition of important topics related to agriculture should be done (60.00%); D) less repetitions of important topics (22 i.e. 55.00%), and E) the duration of broadcasting should be extended in the evening (20 i.e. 50%). The findings of the present study are in line with the findings of Kumar and Se (2001), Kumar (2003), Purushottam and Kumar (2004), Manhas et al. (2005) and Praveen and Venkataramaiyyah (2007).

2.2. Suitable time for listening:

It can seen from Table 3 that the most suitable time for listening to the community radio was 7 to 8pm (29 i.e. 72.5%) followed by 8 to 9pm (27 i.e. 67.5%), 7 to 8am (24 i.e. 60%), 8 to

Some other programmes needs to be added in the list for broadcasting like rainfall prediction; agricultural news; teaching through distant education; diseases and pests prediction programmes for spraying of chemicals; pesticides, fertilizers and seed availability programmes

Table 2: Suggestions given by the listeners of the community radio

Sl. No.	Suggestions	Frequency of listeners	Percentage to frequency of listeners N=40	Rank
1	Other programs (e.g. rainfall prediction, agricultural and other news, diseases and pest prediction, seeds fertilizers and pesticides availability, patriotic, folk and Hindi songs) should be included.	40	100	I
2	The programs with discussion type information should be increased.	28	70.00	II
3	The programme of distance education should be included in broadcasting schedule.	27	67.50	II
4	The repetition of important topics related to agriculture should be done.	22	55.00	IV
5	The important and popular programmes should be repeated again and again.	22	55.00	IV
6	The duration of broadcasting should be extended in the evening.	20	50.00	V

9am (18 i.e. 45%), and 9 to 10pm (16 i.e. 40%). The findings of the present study are in line with the findings of Kumar (2003) and Praveen and Venkataramaiyyah (2007).

2.3. Future needs of listeners about the type of programmes:

It can be seen from Table 4 that the most needed programs by listeners which

were not broadcasted were rainfall prediction 2.95 (9.03%) followed by agricultural news 2.92 (8.94%), disease and pest predictions 2.80 (8.57%) and pesticides and fertilizers availability 2.75 (8.41%). So the program preferences of the listeners should also be taken into consideration while adding new programmes in the schedule of broadcasting. These findings are in

Table 3: Suitable time for listeners of community radio

Sl. No.	Time	Frequency of listeners	Percentage to frequency of listeners N=40	Rank
1	7-8 pm	29	72.50	I
2	8-9 pm	27	67.50	II
3	7-8 am	24	60.00	III
4	8-9 am	18	45.00	IV
5	9-10 pm	16	40.00	V
6	6-7 am	13	32.50	VI
7	6-7 pm	11	27.50	VII
8	1-2 pm	08	20.00	VIII
9	2-3 pm	07	17.50	IX
10	9-10 am	06	15.00	X
11	5-6 pm	04	10.00	XI
12	10-11 pm	05	12.50	XII
13	3-4 pm	03	7.50	XIII
14	4-5 pm	02	5.00	XIV
15	12-1 pm	01	2.50	XV
16	10-11 am	00	00	XVI
17	11-12 am	00	00	XVI

Table 4: Future needs of the listeners about the type of programmes

Sl. No.	Programmes	Frequency of more needed listeners	Percentage to frequency of more needed listeners	Average Score	Rank
1	Rainfall predictions	38	95.00	2.95	I
2	Agricultural News	37	92.50	2.92	II
3	Disease and pests predictions	32	80.00	2.80	III
4	Pesticides and fertilizers availability	30	75.00	2.75	IV
5	Seed availability	22	55.00	2.47	V
6	News	18	45.00	2.42	VI
7	Teaching through distant education	16	40.00	2.27	VII
8	Patriotic songs	08	20.00	2.18	VIII
9	Folk songs	08	20.00	2.07	IX
10	Hindi songs	06	15.00	2.02	X
11	Religious songs	07	17.50	1.90	XI
12	Powada	03	07.50	1.80	XII
13	Jokes	03	07.50	1.48	XIII
14	Children songs	01	02.50	1.40	IXV
15	Advertise	02	05.00	1.25	XV

conformity with the finding of Kumar and Se (2001), Farooqi et al. (2002) and Singh et al. (2003).

Conclusion

On the basis of the findings, it can be suggested that interaction based programs are in more demand and there is a need to repeat some of the important

programs. There is also a need for some important programs to be broadcasted during suitable periods for listening. The least important for the listener farmer should be included in the schedule during unsuitable periods of listening. Some other programs need to be added to the list for broadcasting like rainfall prediction; agricultural news; teaching

through distant education; diseases and pests prediction programmes for spraying of chemicals; pesticides, fertilizers and seed availability programs, so that the different extension agencies may prioritize and modify the programming accordingly.

There is a need of more community radio stations throughout the country and strengthening of established radio stations for benefits of the farmers. The available manpower would be best utilized by using community radio as an extension tool in farming communities for extension of innovations by incorporating distant learning in the schedule of programs.

1. Ph.D. Res. Fellow, Y.C.M.O.U., Nashik
2. Professor, Department of Extension Education, College of Agriculture, Dapoli (M.S.)
3. Reader, Dr. B. R. Ambedkar Marathwada University, Aurangabad

Mobile Phones Messages Using Behaviour and Adoption of Various Technologies by the Beneficiary Farmers

By R.L. Parab¹, Dr. P.A. Sawant² and Dr. S.L. Sananse³

The present study was carried out in Baramati, Indapur and Daund blocks of Pune district by selecting 40 agricultural mobile message beneficiary farmers from eight different villages. The specific objectives of the study was to learn about the message using behaviour of the farmers, benefits obtained, adoption of technologies by them and the factors affecting adoption of technologies. The study revealed that the respondents immediately read and shared the message among others and family members. Rainfall prediction messages were useful for number of farm operations like spraying of chemicals, purchase and sowing of seeds, purchase of fertilizers and pesticides, drying and harvesting, intercultural operations etc. Respondents also benefited by messages like field days, trainings and exposure visits. A Majority of them adopted fertilizer and pesticides application technology, method of planting and nutritional management of livestock after receiving the message through mobile phones.

It was observed that significantly positive correlation was observed by 12 independent variables namely age, education, experience in farming, land holding, annual income, area under field and fruit crops, cosmopolitaness, social participation, sources of income, behaviour in using mobile message and activities benefited after the use of message.



Introduction

The mobile phone is handy equipment. It is a wireless and easy to carry equipment used for communication by keeping in the pocket. It is easily accessible anywhere and at any time. Short messaging service (SMS) is an e-mail facility on the mobile phone. This system can work within a few seconds so is very quick in transmitting messages. This software can be used to send the messages in regional language also and reduces cost on stationary, telephone, postage and saves time.

Patnaik *et al.* (2006) stated that the latest revolutionary form of communication is mobile telephony introduced in 1995. This facility of message on mobile phones can also be very well used in agriculture for extension of innovations. The facility of giving messages on agriculture started in Krishi Vigyan Kendra, Baramati, Pune during the year 2005. Today, more than 4000 practicing farmers have recorded their mobile numbers in KVK. For a group of farmers from a particular village who recorded their mobile numbers in the KVK, the KVK provides information on rainfall prediction for future three-four days. Similarly other activities of KVK like field days, trainings, study tours, kisan melas, availability of seeds etc. are also well communicated to the farmers through this service. It was therefore thought appropriate to study the mobile message using behaviour of the beneficiaries'

along with the benefits received by them. So the study was conducted with following specific objectives:

- 1.To learn about the mobile message using behaviour of the farmers;
- 2.To study the benefits received by the farmers after getting the mobile messages;
- 3.To learn about the adoption of technologies after receiving the message and factors associated with adoption.

Methodology

The present study was taken up in eight villages of Baramati (5), Indapur (2) and Daund (1) block in Pune district of Maharashtra where mobile phone message beneficiaries of Krishi Vigyan Kendra were more in number. The number of villages selected from a particular block was on the basis of proportionate number of beneficiary farmers from it. A sample of 40 beneficiaries in eight villages was selected by random sampling method. A well structured interview schedule was used to collect the data according to the objectives of the study. Statistical tools like mean, standard deviation, frequency, percentages, rank, and correlation coefficient were used for analysis of data.

Result:

1. Behaviour in using mobile message facility:

The facility of giving messages on agriculture started in Krishi Vigyan Kendra, Baramati, Pune during the year 2005. Today, more than 4000 practicing farmers have recorded their mobile numbers in KVK

The data presented in Table 1 shows that five parameters were studied in the present study to see behaviour in using mobile messages facility. The maximum average score recorded under time for reading the messages was 2.95(25.28%) followed by messages sharing with others was 2.75 (23.56%) and lastly messages sharing with family members was 2.55 (21.85%). Out of the five parameters studied under mobile message using behaviour the frequency of more users was highest i.e. 38 (95.0%) under time for reading the message i. e immediate reading, followed by 30 (75.00%) under message sharing with others and 23 (57.50%) under message sharing with family members respectively.

Table 1: Mobile message using behaviour of the beneficiary farmers

Sl. No.	Parameters of mobile message using behaviour	Frequency of more users	Percentage to frequency of more users	Average Score	Rank
1	Time for reading the message	38	95.00 (immediate reading of message)	2.95	I
2	Message sharing with others	30	75.0 (regular)	2.75	II
3	Message sharing with family members	23	57.50	2.55 (regular)	III
4	Duration for use of service	04	10.00 (more than 2 years)	1.77	IV
5	Average expenditure per month	08	20.00	1.65 (more than 350 rupees)	V
Total			11.67		

2. Benefits obtained from rainfall prediction messages:

The data presented in Table 2 shows that the rainfall prediction messages were useful for most of the farm operations to take proper decisions at right time. The majority of the farmers benefited for the farm operations namely spraying of chemicals (95%), sowing of seeds (87.5%), application of fertilizers (82.5%), drying of produce (80%) and purchase of pesticides (77.5%) after getting rainfall prediction messages. Fewer numbers were benefited from operations like FYM application (22.5%) and fodder cutting (22.5%) after getting rainfall prediction messages. The findings are consistent with the observations made by Farooqi et al. (2002), Devraj and Chaturvedi (2003), Purushottam and Kumar (2004), Bondale et al. (2005), Manhas et al. (2005a) and Singh et al. (2005).

3. Beneficial messages for the farmers

The data presented in Table 3 shows that out of the four types of messages given by the KVK the farmers perceived that the rainfall prediction messages (30.46%) were most beneficial followed by field day (27.69%), training (23.9%) exposure visit (17.95%). It was further observed that farmers were benefited more frequently by rainfall prediction messages (97.50%) followed BY field days (72.5%), training (37.5%) and exposure visits (15%).

4. Adoption of technologies after getting mobile messages

The data presented in Table 4 shows that the mobile messages beneficiary farmers adopted seven major technologies in their farms. The majority of them adopted fertilizer application technology (87.5%) followed by pesticides application technology (77.5%), method

The rainfall prediction messages were useful in planning for number of operations in the field



Table 2: Benefits obtained from the rainfall prediction messages by the farmers

Sl. No.	Farm operations	Frequency of frequently benefited farmers (No.)	Percentage to frequently benefited farmers (%) N=40	Average Score	Rank
1	Spraying of chemicals	38	95.00	2.95	I
2	Sowing of seed	35	87.50	2.85	II
3	Application of Fertilizer	33	82.50	2.82	III
4	Purchase of Pesticides	31	77.50	2.75	IV
5	Purchase of Seed	30	75.00	2.73	V
6	Drying of produce	32	80.00	2.70	VI
7	Purchase of Fertilizer	29	72.50	2.65	VII
8	Interculture operations	27	67.50	2.62	VIII
9	Harvesting of crops	27	67.50	2.62	VIII
10	Ploughing	26	65.00	2.60	IX
11	Earthing up	16	40.00	2.25	X
12	Fodder cutting	09	22.50	2.00	XI
13	FYM application	09	22.50	1.92	XII
14	Purchase of Implements	01	2.50	1.43	XIII

Table 3: Activities of KVK benefited by the farmers after getting he mobile messages

Sl. No.	Activity of KVK	Frequency of frequently benefited farmers (No.)	Percentage to frequently benefited farmers (%) N=40	Average Score	Rank
1	Rainfall prediction message	39	97.50	2.97	I
2	Field day	29	72.50	2.70	II
3	Training	15	37.50	2.33	III
4	Exposure visit	06	15.00	1.75	IV

Contd. on page 27

Registrations
open

A Seminar on Social Responsibility of Corporate Sector towards Rural Transformations

January, 2010 New Delhi

A photograph of two men standing in a field of tall grass and yellow flowers. The man on the left is younger, with dark hair, wearing a white kurta, and has his right arm extended towards the left. The man on the right is older, with white hair, wearing a blue and orange checkered shirt, and has his left arm around the younger man's shoulder. Both are smiling.

AFC Foundation, duly promoted by Agricultural Finance Corporation Limited is organizing a one day National seminar on the topic "Social Responsibility of Corporate Sector towards Rural Transformations" in the month of **January, 2010** in New Delhi. The seminar aims to provide a single platform to participants to know and share their views about corporate social responsibility and implementation criteria, its role in poverty alleviation and improving the standards of living. The seminar will provide a key insight into various CSR programmes being undertaken by public and private sector bodies, their experiences, lessons and successful case studies.

The event will also create awareness about possibilities to introduce innovative ways and solutions to the most critical emerging issues in the field of corporate social responsibility. In this context, participants are invited from Public sector bodies, Private sector in socially responsible corporate programs, Banks, NGOs, Volunteer Organisations, Government bodies, Trusts, Donor Agencies, and Academics from Management Institutes and Universities.

For registration and further details, please contact:

Dr. Vandana Tatra, Email: vandanatatra.afc@gmail.com, Tel: 011-45503112, 45791192
Ms. Ritu Khanduri, Email: ritu@lbassociates.com, Tel: 0120-4727112, Mob: 09891173723

ORGANISERS

FICCI

Federation of Indian Chambers
of Commerce & Industry

 **UNACOMA**
service

CO-ORGANISER



Ministry of Agriculture
Government of India



3-5 December, 2009, IARI, Pusa, New Delhi, India

1st International Exhibition & Conference on Agri-Machinery, Equipment & Agro Processing Industry



EXHIBITION SCOPE

Agri Machinery & Farm Technologies

- | | | |
|--|---|---|
| <ul style="list-style-type: none"> • Agricultural land levelers • Agricultural dusters • Animal cart • Animal operated implements • All-terrain vehicles (ATVs) • Analytical instruments & equipment • Balers and straw handling • Crop drying • Crop cleaning, grading & weighing equipment • Chemical spraying • Cultivators • Fertilizer drill • Fertilizer spreaders • Forestry machinery • Farm buildings • Farm power • Greenhouse technology • Grassland / Forage harvesting • Ghanis • Harrows | <ul style="list-style-type: none"> • Harvesting machine (Combine) • Hydroponics • Hand operated implements • Irrigation systems and equipment • Land reclamation and development • Maize sheller • Meteorological equipment • Manure spreaders • Miscellaneous equipment • Other agricultural implements • Pesticide sprayers • Power tillers • Potato digger • Paddy separators • Persian wheel • Planter • Plant protection equipment & engines • Plastic Crates and Bins for Horticulture Products and Procurement | <ul style="list-style-type: none"> • Ploughs • Polyhouses • Power and other implements • Primary / secondary tillage • Rice planter • Replacement parts • Seed drill • Storage and handling machinery & equipment • Satellite positioning systems (SPS) • Sowing & planting equipment • Tractors • Trailers • Threshers • Vegetable and root crop harvesting • Weeders • Winnowers • Wheel hoe • Workshop tools & equipment |
|--|---|---|



Agri Services

- Agro services • Animal waste management • Banks & financial institutions • Consultancy • Contract farming • Commodity exchange • Crop drying, storage and disposal • Crop management • Education & training • Grain harvesting • Insurance • Logistics & distribution • Marketing organizations • Nodal government agencies • Packaging • Research & consultancy organisations • Social forestry • Specialised transport system

Agro Processing Industry

- Horticulture, Floriculture & Aquaculture • Livestock • Fruit & Vegetable Processing • Dairy & Poultry Farming • Flour, Pulses & Oil Seed Mills • Crop processing • Crop transport & handling equipment • Freezing & refrigeration equipments

INPUTS

- Agro chemicals • Bio control agents • Bio pesticides • Fertilizers • Hybrid seeds / grains & crops • Insecticides • Nutrients • Pesticides

True, with EIMA Agrimach India 2009... your future is fertile.

For participation, contact: FICCI Trade Fairs Secretariat
Federation House, Tansen Marg, New Delhi - 110 001, India
Tel.: 91 11 23323492 (D), 23738760-70 Fax: 91 11 23359734, 23721504
E-mail: jasmeetsingh@ficci.com • ficciexhibition@ficci.com

Overseas Associate: Unacoma Service Surl, Via Venafro, 5, 00159 Rome, Italy
Tel.: 39 06 432981 • Fax.: 39 06 4076370 E-mail: marco.acerbi@unacoma.it

www.eimaagrimach.in



FINANCING AGRICULTURE

We are going Monthly!

With great pleasure we announce the plan to make Financing Agriculture a monthly magazine with effect from January 2010.

This follows persistent demand from our esteemed readers and related institutions to increase the frequency of the publication.

We thank all our readers for their overwhelming support and cooperation.

We also look forward to your continued support.

Thank you all

A.K. Garg





Agricultural Finance Corporation Ltd.

The Editor
Financing Agriculture
Agricultural Finance Corporation Ltd.
Dhanraj Mahal, 1st 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: _____

Table 4: Adoption of various technologies after getting mobile messages by the farmers

Sl. No.	Technologies Adopted	Frequency of farmers adopted	Percentage to frequently benefited farmers (%) N=40	Rank
1	Fertilizer application	35	87.50	I
2	Pesticide application	31	77.50	II
3	Planting methods	15	37.50	III
4	Nutritional management of livestock	12	30.00	IV
5	Selection of crops and varieties	11	27.50	V
6	Varmicompost production	10	25.00	VI
7	Irrigation methods and techniques	5	12.50	VII

of planting (37.5%) and nutritional management of livestock (30%). The least adopted practice was irrigation method and techniques (12.5%). The findings of the present study are in line with the findings made by Alexander et al. (2004), Purushottam and Kumar (2004), Singh et al. (2005), Bondale et al. (2005) and Manhas et al. (2005a).

5. Factors associated with adoption of technologies

The study revealed that significantly positive correlation was observed by 15 independent variables. The variables age, education, experience in farming, land holding, annual income, area under field and fruit crops, cosmopolitanism, social participation, sources of income, behaviour in using mobile message and activity benefited by the beneficiaries were found positively and significantly associated with adoption of technologies. Family size, livestock owned and duration of mobile use had non-significant association with adoption. The results are in conformity with the results obtained by Zagade et al. (2003).

Conclusion

On the basis of the findings, it can be suggested that the beneficiary farmers had habit of reading and sharing the messages immediately with others. The rainfall prediction messages were useful in planning for number of operations in the field. They benefited in pesticides and fertilizers knowledge and its application, could decide for planting different crops and varieties, nutritional management of livestock and health of animals also. They were benefited by programmes like field

Table 5: Correlation Coefficient of various independent variables with dependent variable adoption of technologies.

Sl. No.	Independent Variable	Variable Code	Person's Correlation Coefficient
1	Age	X-1	0.340*
2	Education	X-2	0.435*
3	Family Members	X-3	0.205 ^{NS}
4	Experience in farming	X-4	0.385*
5	Landholding	X-5	0.659**
6	Annual Income	X-6	0.629**
7	Area under field crops	X-7	0.578**
8	Area under fruit crops	X-8	0.278*
9	Livestock owned	X-9	0.142 ^{NS}
10	Cosmo politeness	X-10	0.313*
11	Social participation	X-11	0.498**
12	Sources of information	X-12	0.544**
13	Duration for use of service	X-13	0.019 ^{NS}
14	Behavior in using mobile message	X-14	0.655**
15	Activity Benefited by the beneficiaries	X-15	0.791**

* Statistically significant at 5% level of significance

** Statistically significant at 1% level of significance

NS - Non significant

days, trainings and exposure visits arranged for them after getting the messages. So the beneficiary farmers were more eager in adoption of the technologies after getting the messages on their mobiles. The dominant variables which explained much variation with dependent variable adoption of technologies needs to be given much attention while formulating the strategies. The future researchers and students should try to find out the factors responsible for remaining variation in adoption of various technologies after

getting the mobile messages. Mobile message using behaviour and adoption indicates that there is a need to promote this innovative extension tool in transfer of technology and to bridge the gap between farmer and extension personnel.

* Ph.D. Res. Fellow, Y.C.M.O.U., Nashik; ** Professor, Department of Extension Education, College of Agriculture, Dapoli (MS.); *** Reader, Dr. B. R. Ambedkar Marathwada University, Aurangabad



Micro Finance in West Bengal A Case Study

By Manas Bhattacharjee*

Introduction

In the planned economic era, there is a story of mixed reaction about the growth and development of the Indian economy. There is no doubt that the economic development of India has brought about a remarkable change in comparison with the economy of British India. However, the fruit of planned economy, which was a cherished aim, has not yet reached the desired sector. Reflection of development visualized a huge gap between rich and poor, urban and rural, and made the progress of our planned economy a little bit cumbersome and puzzling.

In the early days the rural economy was never taken into consideration and no

positive step was taken to tap the potential resources. Rural people were treated as recipients only i.e. receivers of grants and aid. They were never treated as partners in the process of development. However, experience forced policy makers to think seriously about their potentiality.

Genesis: The importance of Micro finance, as it focuses on the economically backward classes as the target group, is a new dimension. The concept of Micro Finance has been designed to identify the local potentiality, available infrastructure, and forward and backward linkages needed for different activities, quality of human resources. Nowadays, Micro Credit has been one

The recovery of loans is based on the collective action by a group of borrowers. The basis of the contract is trust and hence not legally encumbered. Contrary to the conventional wisdom of the big urban bankers, borrowers do not renege on repayment

of the most successful stories in many countries, especially in Bangladesh.

Efficacy: What began as a Micro Finance testing ground in Rural India grew over the years into a successful training of social entrepreneurship, which changed the economic scenario of the rural mass. The success in the field of micro finance had ripple effects on the socio-economic activities in rural life in remote areas. The concept of micro-finance has brought micro-credit to the forefront of discussion in development finance through NGOs/SHGs. It has taken up a number of socio-economic activities while launching its developmental schemes to involve the marginalized people and to improve the credit delivery system. Greater flexibility in delivery modes is the key area of success in the micro-credit concept.

The sole purpose of the micro credit system adopted by the NGOs through SHGs' is to make available credit to the poorest of the poor in the villages. The idea is to activate an enormous amount of unutilized talent amongst the poor people that needed a little bit of financial support and a lot of trust. The formal credit sector was inaccessible since poor people could not arrange collateral security. Credit from the informal sector (money lender) is prohibitively high and unaffordable. The mission is based on the firm belief that self-employment is more likely to provide sustainable livelihoods for poor people than merely subsisting on low employment and poor wages.

Modus Operandi: Through its NGO, West Bengal Minorities Development and Finance Corporation has been successful in making available credit to the poorest of the poor without collateral to be offered for the loans. The recovery of loans is based on the collective action by a group of borrowers. The basis of the contract is trust and hence not legally encumbered. Contrary to the conventional wisdom of the big urban bankers, borrowers do not renege on repayment. Indeed, the recovery of micro finance through SHG association revealed that a peer group could be of lower consequences than the discipline imposed individual incentives. It has always emphasized the distinction between the MFI's concept of micro-credit and other prevailing forms of small-quantum credit obtainable in rural areas, including that from the money-lender and other



The success in the field of micro finance had ripple effects on the socio-economic activities in rural life in remote areas. The concept of micro-finance has brought micro-credit to the forefront of discussion in development finance through NGOs/SHGs. It has taken up a number of socio-economic activities while launching its developmental schemes to involve the marginalized people and to improve the credit delivery system

traditional informal groups, or groups sharing a common economic activity as livelihood. According to the concept, the MFI model focuses on credit as a human right and is targeted to help poor families to help themselves, especially women. Each borrower would have to belong to a group. Borrowers must associate themselves in the group formed by themselves with obligatory vis-à-vis voluntary savings.

The business model of the MFI's scheme reversed the 'Not Creditworthy' status by the formal sector in respect of a vast majority of the rural mass. The loans are given by non-profit organization or organizations owned basically by the borrowers. When other organizations facilitate loans, the prevailing rate of interest is used as a profit to meet the cost of loans notwithstanding the sustainable livelihood factors of the economic outcome from the loan. Naturally, considering the above facts, it has the provision to choose non-profit NGOs whose track record seems to be good for Micro Finance.

Case Study

Post Sanction Case Studies of Loan Assistance to All Bengal Backward Classes Relief & Development Mission (ABCR&D) NGO, Govt of West Bengal.



As assigned by the WBMDFC, the author had the opportunity to design a comprehensive schedule in respect of NGOs and Beneficiaries which have been approved by the WBMDFC and visited the concerned officials of the NGO/Beneficiaries and had threadbare discussion with them to learn the impact of the micro-finance schemes/training imparted to the students. During the Field Study, this writer had the opportunity to study the impact of micro finance in the remote areas of West Bengal and interacted with the beneficiaries who appeared to be quite enthusiastic and receptive. A very good impact in their socio-economic cultural activities was revealed during the interaction. Loans had been sanctioned to beneficiaries that were considered to be handicapped in a socio-cultural and economic context. Low income, scarce capital and subsequent financial limitations are the major constraints in the rural areas, where people have no way out rather than depend on the Village Money Lenders to meet necessities of life. During the survey, it was observed that achieving an ideal livelihood of the rural mass remains a distant dream. Socio-economic activities are also not encouraging. The miserable rural life of the target group is becoming a social stigma in our society. Adaptation

of measures to overcome the situation has become extremely necessary.

Positive efforts and its reflection in respect of society are truly encouraging. For implementation, however, there is scope for further improvement while choosing the NGOs/Institutions. Dedicated manpower is considered to be one of the crucial inputs for achieving success. Limitation of skilled professionals in the rural areas is a major concern for its effective implementation. While launching training programs in the rural areas, educational institutions have to depend on contractual persons, and thorough monitoring is essential for its successful implementation. Because of shortage of manpower faced by the institutions – *persona non grata* – sometimes get involved in these activities and utmost care is necessary to avoid such a situation. However, in the case of Micro finance benefits percolated to the desired sections of the society are appreciably high so far as delivery of credit disbursement is concerned.

Activities of NGO

The following activities are being taken up in the concerned areas:

1. Facilitation of Education for SC and ST Children;

2. Procurement of Micro Credit and formation of SHGs and its working;
3. Training on:
 - Tailoring and Embroidery & Zory Work;
 - Alternative Source of energy and Technology;
 - Food Preservation and Processing;
 - Practical Training on Relief Work;
 - Need based training for Agriculture and Pisciculture etc;
4. Awareness of Women's Legal Support;



5. Social Development Programs such as:
 - Health awareness campaign;
 - Self Help Group awareness;
 - Cancer awareness programme;
 - AIDS awareness Campaigns;
 - Women's Empowerment;
 - Family Welfare Programme;
 - Child Labour;
 - Prevention of atrocities on women;
 - Anti-Dowry Programme.



Besides the above, the NGO has been involved in various types of socio-cultural activities like dance drama, conducting seminars and workshops, street campaigning on environment awareness, pollution control, planting of samplings, use of potable water and smokeless *chullas* etc.

Table 1: Details of Loan has been Sanctioned to the Group Members

S. No.	Amount Received from WBMDFC (Rs in lakh)	No. of beneficiaries covered	Quantam of Loan
1.	Rs 2.0 on 12.1.04	56	Rs. 2000/- to 4000/-
2.	Rs 3.0 on 9.7.04	320	Rs. 1000/- to 3000/-
3.	Rs 5.0 on 23.5.05	194	Rs. 1000/- to 7000/-
4.	Rs. 5.0 on 9.11.05	192	Rs. 1000/- to 6000/-
5.	Rs. 5.0 on 3.5.06	241	Rs. 2000/- to 3000/-
Total		1003	

Source: All Backward Class Relief & Development Mission

Success Story of the Group members and their activities				
Muslimpara Union Samity Group	Service tax	1 st Loan Rs 2000/-	Fully recovered	IGA: Molasses (Khejur Gur) Jaggary
Mrs Rahena Bibi		2 nd Loan Rs 5000/- Rate of interest @ Rs 12% PM	Not yet due	

Impact on the Member

During the interaction it was revealed that the above group member is involved in the activities for Gur Processing and her per day income on an average ranges between 300 and 400 rupees. She had taken initially Rs 2000/- which, had been fully repaid, and took another amount of Rs 5000/-, repayment of which is not yet due. She reported that there is very good scope to engage a large number of local unemployed youth in this trade and to process the same in a more scientific and hygienic manner. The AFC Team observed that repayment of loans is encouraging in the said locality, because of high return in the local small business activities. Small trade like Processing Date-Palm Juice (*Khejur Gur (jiggery) Processing*) is considered to be very lucrative. Raw materials of the same are abundantly available in the nearby locality. Farmers generally take the lease of date palm trees at a cost of Rs 45/- per season (for 3 months). Per day extraction of juice is about 5 litres per tree, the cost of which is considered to be Rs 20/- (@ Rs 4/- per litre). The same is boiled in local chullas (ovens), and the concentrated liquid is placed into indigenously made earthen dice to give different shape on cooling. Dry date leaves are used as fuel for the purpose. The finished product, which is locally called *Khejur Gur*, is very tasty and used for tea making, delicious sweets not only in West Bengal, but in the neighbouring states like Assam, Bihar, Orissa and also in Bangladesh. It has high export value and is a highly remunerative and lucrative business as reported by the borrowers.

Inference

After detailed discussion with the officials of the ABCR&DM and the group members mainly women folk, the following findings are recorded which, need to be considered for the betterment of the group members as well as society as a whole:

1. Formation of Group and nurturing of the members provided by the NGO is highly satisfactory;
2. Quick delivery of credit to the rural mass after an informal discussion;
3. Borrowers are very much receptive, energetic and scrupulously adhere to repayment schedules;
4. Supporting group members' activities especially of the defaulter members who are unable to repay their monthly instalment. Repayment of the loan by other members is highly encouraging;
5. Although, the terms and conditions laid down by the NGO even at the rate of 12% interest and 12% service charge (total 24%) required to be paid by the borrowers are accepted by the borrowers; still, reduction of service charges is required, considering the rate of interest charged;
6. It has been observed that the benefits accrued from the rate of interest as well as service charge collected from the borrowers are not added to the group members' fund. The NGO is enjoying the same benefit, which may not be desirable. Designing of devices has to be generated such that the percentages of benefits to be accrued are percolated to the Groups in a very transparent manner;
7. It is obvious that the NGO requires some funding for

maintenance of establishment cost etc., but group members interest are required to be protected at the same time;

8. Special emphasis is needed to disseminate the concept of SHG and its benefit so that more benefits accrue towards betterment of the society and to remove the acute poverty from the rural mass;
9. The NGO should liberalize the system of Micro Finance Credit Delivery, in which at least 50% benefits (Interest as well as service charges collected from the group members) are required to be shared by the Groups.
10. The system is to be designed in such a manner, so that defaulters victimized by natural calamities, may get some relief either by waiving of service charges or reduction of interest, as the case may be;
11. Adaptation of Insurance coverage system for bad debt of credit is necessary;
12. Interest against Group members' contribution has to be introduced;
13. Opening of SHG Group Members' bank account is extremely necessary; and,
14. NGOs activities are required to be strengthened so that Confidence Building Measures are developed among the SHG Group members for successful operations.

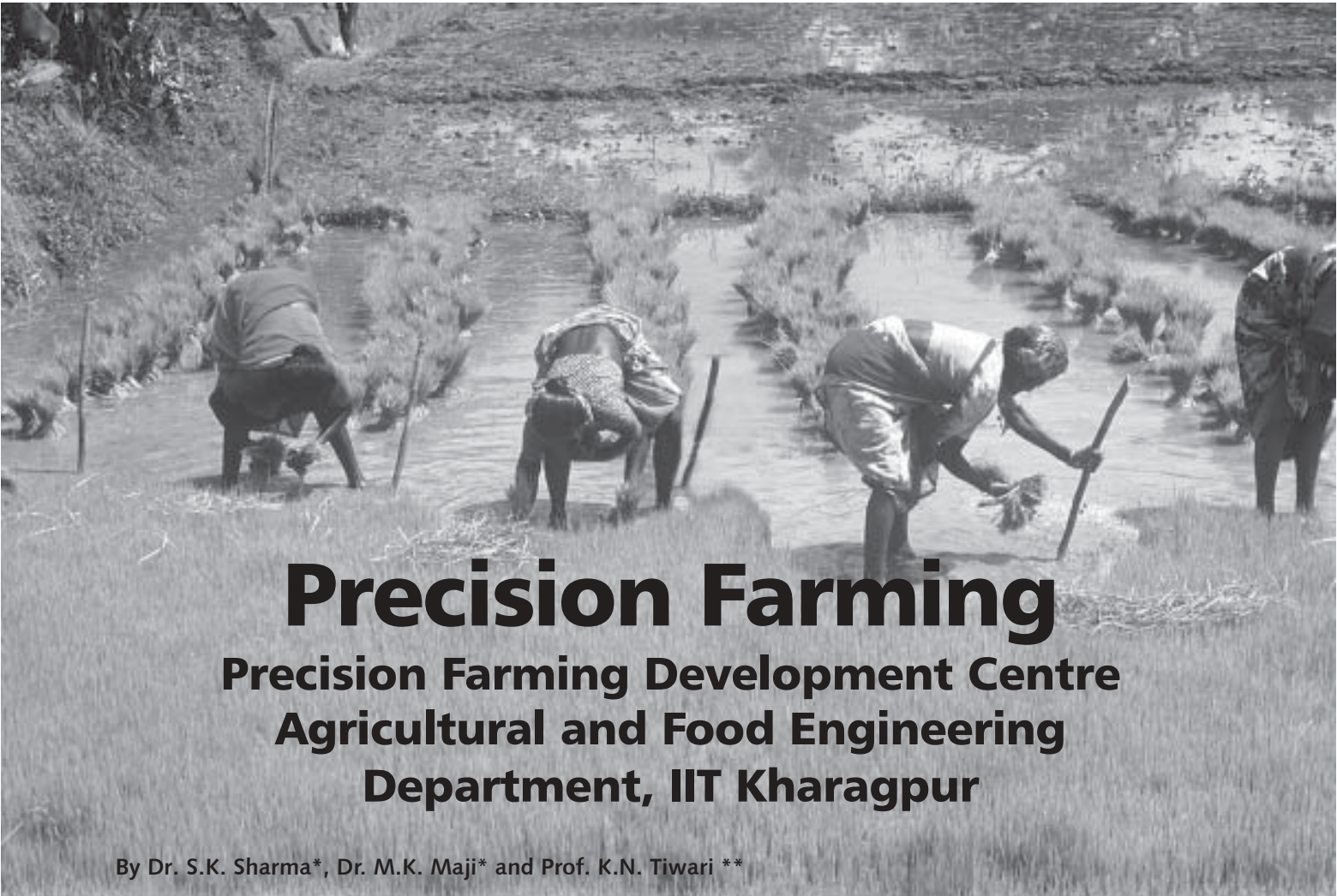


Conclusions

The concept of Micro Finance schemes is to uplift the status of the downtrodden through various avocations by providing financial assistance. It has been visualized to have a very good impact on society, since the banks/other financial institutions could not come up to the desired level. Support of the Local NGOs is very vital, since it is virtually impossible to organize Training Programs at the door-step of the students because of limited manpower. Identification of needy students would become easier for the Institutions with the help of local NGOs/ Club etc. Accordingly, economic development of untapped human resources especially the destitute/downtrodden is considered to be a major achievement by this scheme, and would go a long way for the welfare of society. A modern and economically viable society in different communities should be the vision for the 21st century in the country.

"By three methods we may learn wisdom: First by Reflection – which is noblest; Second by imitation – which is easiest; and Third by experience – which is bitterest"
- Confucius

* Manas Bhattacharjee is Asst Project Officer, AFC Ltd, ERO, Kolkata.



Precision Farming

Precision Farming Development Centre Agricultural and Food Engineering Department, IIT Kharagpur

By Dr. S.K. Sharma*, Dr. M.K. Maji* and Prof. K.N. Tiwari **

Introduction

The green revolution witnessed in the 1960's catapulted the country from a 'begging bowl to the breadbasket'. India has witnessed the growth of food grains production from 51 million tonnes in the fifties to 206 million tonnes at the turn of the century, helping us achieve self-sufficiency and avoid food shortages. However, even at these production levels, the country is much below the world average. It has been estimated that the requirement of food grains in 2020 will be about 320 million tonnes at the current levels of population growth. With the existing technology and productivity levels, it is indeed a very stiff target unless new technologies are imbibed. It is estimated that indiscriminate use of fertilisers and excessive irrigation have resulted in 12 million ha of land becoming water logged and 14 million ha rendered saline. A problem of soil erosion due to water is seen on 141 million ha and due to wind on 11.5 million ha. The limited land resource of about 329 million ha has to support nearly 20 percent of the world's population. India generates just 1 percent of gross world product, emits about 3.6 percent of CO₂ and holds about 2 percent of world forest area. The existing population is likely to touch about 1.2 billion by 2020 with growth rate of 2.2 percent and needs serious thought.

In this context, there is a need to transform our green revolution into an evergreen revolution which will be triggered by farming systems approaches that can help produce more from the available land, water and manpower resources. The precision farming proposes to prescribe tailor made management practices, it holds promise to serve this very purpose.

Precision farming technologies are being adopted in developed nations with rapid increase in their acreage. It has been reported by the USDA that about 34 percent of farmland growing maize was harvested with combine harvesters equipped with yield monitors in 2001

Precision farming (PF) is considered the agricultural system of the 21st century, as it symbolizes a better balance between reliance on traditional knowledge and information – and management – intensive technologies. It is the technique of applying the right amount of input (water, fertilizer, pesticide etc.) at the right location at the right time. The techniques are used:

- to enhance production;
- to decrease input requirement
- to improve quality of the product; and,
- to protect the environment.

Precision farming, sometimes called site-specific farming, is an emerging technology that allows for adjustments of within-field variability in characteristics like soil fertility and weed population. Precision farming has the potential to reduce costs through more efficient and effective application of crop inputs. It can also reduce environmental impact by allowing farmers to apply inputs only where they are needed at the appropriate rate. It involves the

sampling, mapping, analysis, and management of specific areas within fields in recognition of spatial and temporal variability with respect to soil fertility, pest population and crop characteristics.

Status of Precision Farming in Developed Countries

Precision farming technologies are being adopted in developed nations with rapid increase in their acreage. It has been reported by the USDA that about 34 percent of farmland growing maize was harvested with combine harvesters equipped with yield monitors in 2001. For soybean, the extent was 25 percent. In the rest of the world, 800 monitors were used in Australia in their harvest season in 2000 of which 500 were in Western Australia alone. In South Africa, about 15 such monitors were used in the maize growing belt. Efforts are underway for developing monitors for other crops including cotton, sugarcane, potatoes, sugar beets, tomatoes and grapes. Studies in USA, Canada, Europe and Australia have shown that precision farming permits reductions in input



Precision farming, sometimes called site-specific farming, is an emerging technology that allows for adjustments of within-field variability in characteristics like soil fertility and weed population

Table.1. Percentage area in the USA, using Yield Monitor Equipped Combines

Year	Soya bean	Maize	Wheat
1992	0	0	0
1994	2	2	0
1996	8	9	4
1998	16	18	7
2000	21	28	10
2002	37	31	12

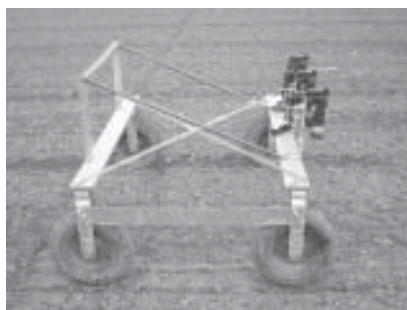
(Source: Nemenyi et al., 2003)

application rates without sacrificing crop yields. The increasing trend in the use of combines equipped with yield monitors in the USA for the years 1992-2002 is shown in table.1.

It is also reported that use of the yield monitors was highest on larger farms in the Corn Belt of USA. USDA researchers showed that 60 percent of US farms using precision agriculture are in the Corn Belt. In a 1999 survey, Ohio researchers found that only 6 percent of all farmers use yield monitors. In general, larger farms are more likely to use yield monitors, but the likelihood of adoption peaks at about 600 hectares. It has also

been estimated that other countries in Europe also use yield monitors with England and Denmark leading the lot with over 400 of them. Germany and Sweden have about 150. In Latin America, the use of yield monitors was highest in Argentina with 560 followed by Brazil with 100.

Adoption of Precision farming technologies in some of the developed countries has resulted in improved cotton yields by 4 percent and increased NPVR (net present value of returns) of 4.5 percent. In the case of maize, yields increased up to 15 percent, the NPVR increased to 60 percent and nitrogen application increased to up to 191 percent as maize responds better to the application of nitrogen. Cultivators of Grain Sorghum benefited due to increase in yields of up to 8 percent and increased NPVR of 7.8 percent. In the cultivation of groundnut, the increase in yield and NPVR ranged between 2.3 and 2.6 percent.



Weed sampling

Elements of Precision Farming

Precision farming relies on the interaction of three broad and fundamental elements to be successful in its implementation. They are categorized in terms of information, technology and management.

Information: In-field variability, spatially or temporally, in soil-related properties, crop characteristics, weed and insect population and harvest data are important databases that need to be developed to realize the potential of precision farming. Of these, entire crop yield monitoring, is the most mature component of precision farming technology and is the logical starting point. Several years of yield data may be required to make a good decision. Highly varying yield within a field indicates that the current management practices may not be providing the best possible growing conditions everywhere in the field. In this case, further adoption of precision farming for other operations may be beneficial.

Technology: The recent development in microprocessors and other electronic technologies for monitoring yields and sensing soil related variables are new tools available to make precision farming a success. When measuring field characteristics such as the harvest data, moisture and nutrients' availability in the soil, satellite-based positioning system, namely, geographical positioning system (GPS) can be used to identify the locations where the data are taken. Some GPS users demand accuracy in identifying field location, and differential global positioning

systems (DGPS) are one of the improved GPS systems that reduce position errors. With this information, the results of soil sampling tests and yield data can be transformed into field maps, achievable through personal computer (PC) and geographic information systems (GIS) software. The same map can be developed for other field characteristics such as weed and/or salinity mapping. Remote sensing techniques can also be utilized to detect soil related variables, pest incidence and water stress. Often, the remote sensing data will be one layer in a GIS to supplement other precision farming data layers.

Management: Precision farming makes farm planning both easier and more complex. The ability to combine the information generated and the existing technology into a comprehensive and operational system is the third key area in precision farming. A farm manager must adopt a new level of management proficiency on the farm. Implicit in this is an increased level of knowledge of the precision farming technologies such as GPS and GIS, better understanding of soil types, micro-climates, aerial photography, economics of farming for accurate assessment of risk, based on different decisions. This precise micro-management of his farming enterprise will enhance the overall cost effectiveness of precision farming in crop production including:

- Land preparation (type and depth of tillage, management of crop residues and soil organic matter, compaction reduction, post harvest residue management);
- Planting (sowing date and rate, plant population and planting depth, varietal selection, crop rotation);
- Input management (rates and method of use of fertilizers, pesticides, soil amendments, and water);
- Crop stress detection and monitoring (insects, diseases, weeds, and vegetation stress due to abiotic factors); and,
- Harvesting (harvest dates, grain moisture content and quality).

When measuring field characteristics such as the harvest data, moisture and nutrients' availability in the soil, satellite-based positioning system, namely, geographical positioning system (GPS) can be used to identify the locations where the data are taken

Basic Steps in Precision Farming

1. Assessing variation
2. Managing variation
3. Evaluation

Assessing Variation:

- Quantifying the variability of processes and determining when and where different combinations are responsible for the spatial and temporal variation in crop yield.



- The major part of precision agriculture lies in assessing the spatial variability.
- Techniques for assessing temporal variability also exist but the simultaneous reporting of a spatial and temporal variation are rare.
- Need both the spatial and temporal statistics.
- Need both the space and time statistics to apply the precision farming techniques

Managing Variation:

- Once variation is adequately assessed, farm managers must match agronomic inputs to known conditions employing management recommendations. Those are site-specific and use accurate application control equipment.
- Can use the technology most effectively, in site-specific variability management. While taking the soil/plant samples, one has to note the sample site coordinates and further one can use the same for management. This results in effective use of inputs and avoids any wastage.

Evaluation:

Economics – Profitability in terms of improvement of environment through reduced agro-chemical use, higher nutrient use efficiency, protection of soil from degradation.

Relevance of Precision Farming Technologies to Indian Conditions

Precision farming technologies have been developed and adopted in developed nations such as USA, Europe, Canada and Australia where socio-economic conditions of farmers are vastly different from those in India. It is argued that over 57 percent of operational holdings in India are less than 1 ha, and farmers in general, practice subsistence farming. Even under these conditions, judicious use of inputs such as seeds, fertilisers and pesticides have to be made for optimising yields and income. In the case of agriculturally progressive states such as Punjab, Haryana, Gujarat and Rajasthan, 20 percent of agricultural lands have operational holdings of 4 ha or more. When contiguous fields with the same

crop are considered, it is possible to obtain fields of over 15 ha extent in which similar crop management are followed. Such fields can be considered for the purpose of initiating the implementation of precision farming. Similar implementation can also be carried out in the state farms.

Precision farming technologies are multi-functional and their adoption should result in favourable changes in various aspects of farming, such as:

- Optimal use of inputs for small holdings – judicious use of inputs such as seeds, fertilizers and pesticides for optimizing yields and income.
- When contiguous fields – same crops are grown in fields of over 15 ha in size.
- Precision farming holds good for food grain crops such as rice, wheat and horticultural crops grown on cooperative farms.

The capabilities of Remote Sensing can also be tapped for precision farming. Multi-spectral images can be used for anomaly detection. These anomalies can be in the form of disease/ pest, weed growth, water stress, etc

- Advent of the Green Revolution has encouraged farmers to use more and more HYV of seeds, fertilizers, and pesticides.
- These are mostly based on regional recommendations rather than specific needs of the field.
- Indiscriminate use of fertilizers and excessive irrigation resulted in 12 million ha of land becoming water logged and 14 million ha rendered saline.
- Nutrient stress management is another area where precision farming can help Indian farmers.

- Detecting nutrient stresses using remote sensing and combining data in a GIS can help in site-specific applications of fertilizers and soil amendments such as lime, manure, compost, gypsum and sulphur.
- This in turn would increase fertilizer use efficiency and reduce nutrient losses.
- Pests and diseases cause huge losses to Indian crops. Remote sensing can help in detecting small problem areas caused by pathogens. The timing of applications of fungicides can be optimized.
- Perennial weeds, which are usually position-specific and grow in concentrated areas, are also a major problem in developing countries. Remote sensing combined with GIS and GPS can help in site-specific weed management.

Remote Sensing and GIS Applications in Precision Farming

Remote sensing and GIS play key roles in implementation of precision farming. Precision farming needs inputs about mean characteristics of small, relatively homogeneous management zones. These inputs can be obtained from soil tests for nutrient availability, yield monitors for crop yield, soil sampling for organic matter content, soil maps for soil physical properties and moisture probes for measuring soil moisture. GIS provides a good framework for storage of these data, modelling of inputs with output, graphical presentation of results, development of user interface and in combination with GPS controlling the navigation on farm. On the basis of GIS, a decision support system can be developed for operationalisation of precision farming at farm level.

The capabilities of Remote Sensing can also be tapped for precision farming. Multi-spectral images can be used for anomaly detection. These anomalies can be in the form of disease/pest, weed growth, water stress, etc. Using the reflectance measurements in the visible part of the spectrum, it is possible to detect diseases and identify weeds from crops. The difference between remotely sensed surface temperature and ground-based measurements of air temperature has been established as a method to

detect water stress in plants. The space-borne observations through remote sensing are useful for weather forecasting, natural resources management and generation of information base relevant to sustainable development of agriculture and precision farming.

Case Study: Crop water stress and irrigation water requirement estimation

A study was carried out at IIT Kharagpur by Gontia and Tiwari (2009) to estimate the crop water stress and irrigation requirement of wheat crop using satellite remote sensing data. They have used ground based spectral reflectance to generate the crop coefficients of wheat and generated the crop evapotranspiration using the ET_0 values estimated from weather parameters. The irrigation water demand and supply were analysed for Tarafeni south main canal (TSMC) command of the Kangsabati project of Midnapur district, West Bengal, India, using satellite-based remote sensing and a geographic information system. The land use/land cover map for the command area was generated using satellite imagery. Crop coefficients (K_c) for pixels representing wheat crop were estimated empirically from remote sensing derived Soil Adjusted Vegetation Index (SAVI). Reference crop evapotranspiration (ET_0) was estimated using FAO Penman-Monteith equation. The K_c map was combined with reference crop evapotranspiration to generate spatially and temporally distributed crop map as shown in Figure 1.



Precision farming matches resource application and agronomic practices with soil attributes and crop requirements as they vary across a field. Though it has been widely practiced for commercial crops in developed countries, it is still at an infant state in most of the developing countries

Conclusions

Precision farming is a scientific and modern approach for sustainable agriculture that has gained momentum in the 21st century. Precision farming matches resource application and agronomic practices with soil attributes and crop requirements as they vary across a field. Though it has been widely practiced for commercial crops in developed countries, it is still at an infant state in most of the developing countries. Remote sensing and GIS provide key tools for implementation of precision farming at a lower cost. The research on precision farming has already been initiated in India in many institutes and the need arises to spread the technology to the field users to harvest its benefits.

References:

- Gontia, N.K. and Tiwari, K. N. (2005). Application of Remote Sensing and GIS in Precision Farming with Specific Reference to Irrigation: An Indian Perspective. In Proc: International Conference on Plasticulture and Precision Farming, Nov 17-21, 2005, p 485-492.
- Gontia, N.K. and Tiwari, K.N. (2009). Estimation of Crop Coefficient and Evapotranspiration of Wheat (*Triticum aestivum*) in an Irrigation Command Using Remote Sensing and GIS. Water Resources Management, DOI 10.1007/s11269-009-9505-3.
- Nemenyi, M., Mesterhazi, P, Pecze, Z. & Stepan, Z. (2003). The role of GIS and GPS in precision farming. *Computers and Electronics in Agriculture*, 40(1-3):45-55.

* Research Associate, ** Professor, Agricultural and Food Engineering Department, Indian Institute of Technology Kharagpur, (W.B.) - 721302

*** Corresponding Author E mail: kamlesh@iitkgp.ac.in, Ph. +91-3222-283150 (O), 283150 (R),

Fax: +91-3222-282244.

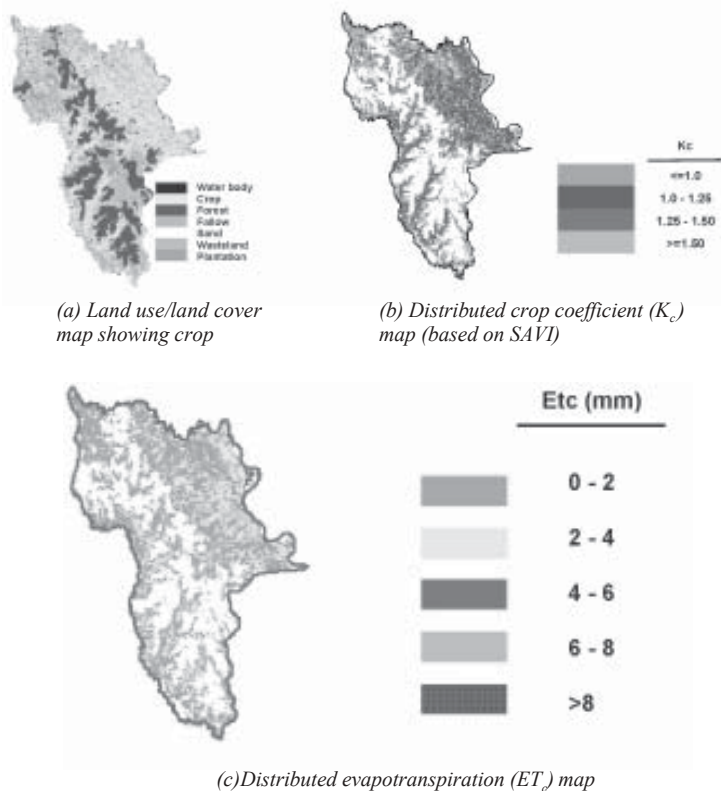


Figure 1. RS generated crop evapotranspiration of Wheat crop in TSMC command (a) Land use/land cover map showing crop (b) Distributed crop coefficient (K_c) map and (c) Distributed evapotranspiration (ET_c) map

Importance of Bio-Diversity to Indian Agriculture

By K. Venkataraman*



Bimtal lake Nainital

Biodiversity is the basis of agriculture and it is the origin of all crops and domesticated livestock, and the variety within them. Its protection is important for the production of food and other agricultural goods and the benefits these provide to humanity, including food security, nutrition and livelihoods. Biodiversity in agricultural and associated landscapes endowed with and sustains ecosystem services important to agriculture. To guarantee future food security and secure livelihoods for rural population of India, we must make certain the conservation of biodiversity.

Biodiversity in India

India is a country of diversity. Not only is it abundantly gifted with geographical, climatic, cultural and social diversity, but it is also profusely endowed with biological diversity. Biogeographically, India is situated at the tri-junction of three realms – Afro-tropical, Indo-Malayan and Paleo-Arctic realms, and therefore, has characteristic elements from each of them. There are many types of climatic and altitudinal conditions varying from the humid tropical to the hot desert, from the cold desert and icy mountains to the warm coasts of Peninsular India. This makes India prosperous and inimitable in biodiversity, comprising of both wild, domesticated/cultivated life forms as well as natural habitats.

India holds a prominent position among the 12 mega biodiversity centres of the world. Out of the 34 global biodiversity hotspots, North-eastern Himalayas and Western Ghats occur in India. Of the total number of estimated species on earth about 8 percent of the species exist in India, though India occupies only 2.4 percent of the world's land area. Amongst the existing biota, already nearly 91,000 species of animals, 45,500 species of plants and 5,650 microbial species have been

Biodiversity is the foundation of the essential goods and ecological services that constitute the source of life for all. Like many tropical countries, India is characterised by a complex mosaic of distinct agro-ecosystems, differentiated by their climatic, soil, geological, vegetation and other natural features

documented in its 10 bio-geographic regions. Indigenous medicine systems utilize nearly 6,500 native plants for both human and animal healthcare. India's diverse preponderance of native tribal and ethnic groups has contributed significantly in the conservation and diversification of biodiversity. Its cultural and ethnic diversity includes over 550 tribal communities of 227 ethnic groups spread over 5,000 forested villages.

India has many endemic plant and animal species. An interesting feature of the Indian flora is that of the 17,672 known species of flowering plants, 32 percent are endemic and located in 26 endemic centres comprising of 141 genera belonging to 47 families. These are concentrated in the floristically rich areas of North-East India, the Western Ghats, North-West Himalayas and the Andaman and Nicobar Islands. So far, 396 known endemic higher vertebrate species are reported. Endemism among mammals (44 species) and birds (55 species) is relatively low. In contrast, endemism in the Indian reptilian and amphibian fauna is high.

Agriculture

Biodiversity is the foundation of the essential goods and ecological services that constitute the source of life for all. Like many tropical countries, India is characterised by a complex mosaic of distinct agro-ecosystems, differentiated by their climatic, soil, geological, vegetation and other natural features. It is within this diversity of habitats that an amazing variety of crops and livestock have been developed over the millennia of Indian farming.

N.I. Vavilov reported that the Indian region is one of the world's eight centres of crop plant origin. According to him 166 crop species and 320 wild relatives of crops have originated in the region. But it is the genetic diversity within each species which is even more astonishing. For example, one species of rice has diversified into at least 50,000 distinct varieties, and one species of mango into over 1,000 varieties ranging from the size of a peanut to a small pumpkin.

Primary Centre of Diversity: Rice, black gram, mothbean, pigeonpea, cucurbits like smoothgourd, ridgegourd and pointedgourd, tree cotton, capsularis jute, jackfruit, banana, mango, jamun, large cardamom, black pepper, minor millets and several medicinal plants.

Secondary Centre of Diversity (introduced crops): African crops - finger millet, sorghum, cowpea, cluster bean, okra, sesame, niger and safflower; tropical American crops - maize, tomato, pumpkin, chayote, chillies and Amaranth.

Regional (Asiatic) Diversity: Maize, barley, buckwheat, prosomillet, foxtail millet, mungbean, chickpea, cucumber, bittergourd, bottlegourd, snakegourd, *Brassica* spp.

Source: Dhillon and Agrawal (2003)

Indian is one of the crop diversity Centres

The last few decades have seen dramatic changes in Indian agriculture. With the advent of the Green Revolution in the mid-1960s, many new high yielding varieties have been promoted over vast areas. This has led to the renaissance of food production (2.8 times the food for 2.2 times the people) and on the whole the local cultivars are no longer used for consumption by the mainstream. The production of Wheat was quite low when India became independent in 1947; only 6.46 million tonnes during 1950-51, which was not sufficient to feed the Indian population. India used to import Wheat from many countries in large quantities for fulfilling the needs of our people. The Government of India appointed a commission under Drs. M.S. Swaminathan, N.E. Borlaug and many others in 1961 and it concluded that production level of Wheat could be increased, using the suitable and superior germ-plasm/varieties available in the country. Presently, among food grains, Wheat (75.81 million tons in 2006-07) stands next to Rice (93.35 million tons in 2006-07), both in areas and production. The share of Wheat in total food grain production is around 35.5 percent and share in area is about 21.8 percent of the total area under food grains cultivation. India is one of the richest countries in the world in terms of possessing tremendous diversity in rice varieties. It was reported that 4,00,000 varieties of rice existed in India during the *vedic* period and it is estimated that, even today 2,00,000 varieties of rice exist in India which is indeed an remarkably high number. The harvesting area of rice in India is the world's largest.

Rice cultivation in the Himalaya



Indian farmers grow and maintain an astonishingly large number of their landraces and traditional cultivars. For instance 1,500 distinct rice varieties have been recorded in Jeypore tract of Koraput district in Orissa. Estimates on the total landraces of rice in India range between 50,000 to 2,00,000. Some other crops with intra-specific varietal diversity in India include sorghum (~5,000), mango (~1,000), black pepper (~1,000) and banana (~600). Such diversity is a result of careful selection and even cross-breeding by Indian farmers over centuries, in addition to inputs from the formal breeding by the public and private sectors. These plant genetic resources restrain momentous genes for resistance to diseases, insect-pests and also for adaptation to abiotic stresses including alleviation of climate change.

It is crucial to note that the gargantuan diversity of crops and livestock accessible to us today is not entirely natural; it is more the outcome of thousands of years of deliberate selection, planned exposure to a range of natural conditions, field-level cross-breeding, and other manipulations which farmers have tried out. Diverse crop varieties and farm animal breeds were modified to various local conditions of growth and survival that were available in the country. More than mere physical adaptation, a host of economic, cultural, religious, and survival factors have played a foremost role in this diversification.

Domesticated Animals

India is equally rich in diversity of animal breeds and genetic resources of other forms of agricultural biodiversity. About 255 breeds of domesticated animals including accredited breeds of cattle (64), buffaloes (23), sheep (62), goat (34), camels (9), horses (7), pigs (8), poultry (28); other species like yak, mithun and ducks also occur here. Of about 27,977 species comprising of fish genetic resources of the world, nearly 11.2 percent (2,500) of species of fish and shell fish are reported to occur in the Indian sub-continent. Sustainable management of farm animal genetic resources is of vital importance to food, nutrition and environment security. Their conservation and astute use is critical for the survival as well as enhanced source of revenue of poor farmers. On the other hand, presently many unique breeds are facing a threat of extinction for want of an appropriate conservation strategy and its effective implementation at the national/state level.

Farm Animal/Poultry Breeds in India

Species	Number of Breeds			
	Local	Regional Trans-boundary	International Trans-boundary	Total
Buffalo	17	4	2	23
Cattle	52	6	6	64
Goat	28	3	3	34
Sheep	58	4	0	62
Yak	5	0	0	5
Pig	7	1	0	8
Horse	6	1	0	7
Ass	3	0	0	3
Dromedary Camel	9	0	0	9
Bactrian Camel	1	0	0	1
Rabbit	3	0	0	3
Chicken	23	1	4	28
Duck	4	0	2	6
Quail	2	0	0	2
TOTAL	218	20	17	255

Source: SOW-AnGR, FAO, 2007 with additions



Mangrove the protector of the land



Management

In addition to the Ministry of Environment and Forests and the Ministry of Agriculture, which are the focal points for the management of biodiversity, a large number of scientists are engaged in inventory, research, and monitoring from various scientific institutes and university departments. Biodiversity being a multi-disciplinary area under discussion, several other Ministries/Departments and affiliated agencies at the central and state levels are also undertaking biodiversity related programmes. At the Central Government level, the Ministries/Departments of Health, Water Resources, Rural Development, Power, Industry, New and Renewable Energy, Urban Development, Science and Technology, and others have important programmes relating to biodiversity.

Collection of data of floral and faunal diversity in the country is carried out by the Botanical Survey of India and the Zoological Survey of India, respectively. These apex organizations, demeanour exploratory studies in different priority

areas, hot spots, and fragile ecosystems in different parts of country. During these scientific studies they collect specimens of different species (floral/faunal) and preserve some of them in the museums/ Botanical Gardens or zoos etc.

The Indian Council of Agricultural Research and the Department of Agricultural Research and Education, cater to the needs of all agro-biodiversity related activities in India through the National Bureau of Plant Genetic Resources, the National Bureau of Fish Genetic Resources, the National Bureau of Animal Genetic Resources, the National Bureau of Agriculturally Important Genetic Resources and the National Bureau of Agricultural Insect Resources.

International and National Regime

India has been party to many international agreements and programmes concerned with various aspects of conservation and sustainable use of biodiversity. Being a signatory to the Convention on Biological Diversity (CBD), the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA) and the Interlaken Declaration as well as the Global Plan of Action on Animal Genetic Resources adopted in September 2007, the National Biodiversity Action Plan (NBAP) has been formulated in view of the prevailing threats to biodiversity viz, habitat fragmentation, degradation and loss, shrinking genetic diversity, invasive alien species, declining forest resource base, climate change and desertification, overexploitation of resources, impact of pollution, and the challenges to ongoing conservation efforts. It has been prepared in pursuance of Article 6a of the CBD and Sections 36 (1) and (3) of the Biological Diversity Act 2002. It proposes to design actions based on the assessment of current and future needs of conservation and sustainable utilization and of physical and fiscal instruments. NBAP is an important tool for translating various concerns, policies and programmes provided by CBD, into actions. Implementation of NBAP is therefore crucial to achieve the objectives of CBD.

A large number of Indian Acts are directly or indirectly relevant to biodiversity. The

Biodiversity Act, 2002, is now the most important act that regulates all aspects related to biodiversity. The other acts that are important for environment and natural biodiversity are Forest Act, 1927, Wildlife (Protection) Act, 1972, Forest (Conservation) Act, 1980, and Environment (Protection) Act, 1986. For agro-biodiversity, the Seeds Act, 1966, Protection of Plant Varieties and Farmers' Rights Act, 2001 and Plant Quarantine (Regulation of Import into India) Order, 2003 are the most important ones. The various central Acts are supported by a number of state laws and statutes pertaining to forests and other natural resources. The policies and strategies directly relevant to biodiversity include National Forest Policy amended in 1988, National Conservation Strategy and Policy Statement for Environment and Sustainable Development, National Agricultural Policy, National Land Use Policy, National Fisheries Policy, National Policy and Action Strategy on Biodiversity, National Wildlife Action Plan, and Environmental Action Plan.

Conservation

In situ conservation and sustainable use of biological resources is customarily deeply embedded in Indian culture. Environmental protection is enshrined in the Indian Constitution in Articles 48a and 51a (g). India's policies and

programmes for conservation and sustainable utilization of biodiversity date back several decades. A large number of such programmes also stem from the national and international legal obligations.

India's strategy for conservation and sustainable utilization of biodiversity focuses on according special status and protection to biodiversity rich areas. Protected areas are the cornerstones of biodiversity conservation in India; approximately 4.74 percent of the total geographical area of the country is already under *in situ* conservation of habitats and ecosystems. Realising the role of forests in controlling soil erosion, moderation of floods, recharging of ground aquifers, as habitat for wildlife, conservation of biodiversity and gene pool etc., programmes were launched as early as the Second Five Year Plan for extensive Watershed Management followed later by establishment of a Protected Areas Network, under the Wildlife (Protection) Act, 1972, comprising of Biosphere Reserves, National Parks and Sanctuaries – both terrestrial and aquatic. At present, this network comprises of 14 Biosphere Reserves, 90 National Parks and 502 Wildlife Sanctuaries. These reserves aim at conserving the biological diversity of plants, animals and micro-organisms in



Pine forest in the Himalaya



Kaziranga National Park

totality as part of the natural ecosystems, so as to ensure self-perpetuation and continuous evolution of the living resources. The aim is not only to protect and preserve the fauna and flora but also to augment this priceless national heritage. Under the World Heritage Convention, five natural sites have been inscribed as areas of 'outstanding universal value' and declared as 'World Heritage Sites'. These sites are Kaziranga National Park, Keoladeo National Park, Manas National Park, Sundarbans National Park, and Nanda Devi National Park. Conservation programmes for species such as tiger, crocodile and elephant, and species-specific sanctuaries for wild and domesticated biodiversity have been established so as to strengthen conservation efforts.

Sacred groves are tracts of virgin forest with rich diversity, which have been protected by the local people for centuries for their cultural and religious beliefs and taboos that the deities reside in them and protect the villagers from different calamities. Sacred groves occur in many parts of India viz., Western Ghats, Central India, North-East India etc. particularly where the indigenous communities live. The sacredness, religious beliefs and taboos play a significant role in promoting sustainable utilization and conservation of flora and fauna of the regions.

To complement *in situ* conservation, adequate attention has also been paid to *ex situ* conservation of biodiversity in India. The strategies include setting up of zoos, botanical gardens, and captive breeding centres, and also promoting gene banking and research activities on *ex situ* conservation of genetic resources. Presently, the central government and state governments together run and manage 33 botanical gardens. Universities have their own botanical gardens. The Central Zoo Authority caters to the *ex situ* conservation of wildlife through ~275 zoos, deer parks, safari parks and aquaria, etc.

There has also been a major emphasis on creation of *ex situ* conservation facilities such as gene banks, especially for agrobiodiversity conservation. The Indian Council of Agricultural Research has established national bureaus for the genetic resource management of agrobiodiversity. Major activities in genetic resource management generally include collection, exchange, quarantine, characterization, evaluation,

distribution, conservation and documentation.

India's population of 1,014,004 people is projected to grow to 1,619,582 by 2050. To meet the increased demand for food, more land has to be improved for agriculture. Irrigation and pasture lands are likely to double in area by 2050, thereby mounting the pressure on biodiversity in natural ecosystems. At the same time, farmers are likely to exaggerate agriculture production. Beside the loss of diversity of farm animals, beneficial insects, and soil biota in agro-ecosystems, agricultural intensification puts wild biodiversity at risk through gene flow from domesticated varieties to wild species, cross-species transmission of potentially virulent pathogens, and adverse effects of modern agriculture practices on non-target species in the natural ecosystems. This will undoubtedly affect a wide range of ecosystem services.

It is believed that science and technology should help us to assess the trade-offs between agricultural productivity, ecosystem services, mitigate the bad effects of climate change and human well-being more effectively than has been the case in the past. India, being rich in biodiversity, desires solutions that culminate the biodiversity externalities. India needs a solution that recognizes the interdependence between human behaviour and ecosystem processes and which delivers a deeper understanding of the value of biodiversity for our life-support services for the future. Since presumption that habitat loss due to the expansion and intensification of agriculture and forestry will be the main threat to biodiversity in natural habitats, is currently under dispute, biodiversity conservation in agricultural landscapes in the form of 'agricultural biodiversity Hotspots' may be the best solution both to the protection of species and to the growth in production of foods, fuels, and fibres. The richness of India's biological resources is an asset that needs to be cherished, conserved and wisely utilized. There is an urgent need to generate awareness about the importance of biodiversity and its direct link with our existence on earth.

* Dr. K. Venkataraman, Scientist F, Marine Biology Regional Centre, venkyzsi56@yahoo.com

L.B. Associates (Pvt) Ltd

Contract Publishers etc.



**We've Produced Publications for Clients
from 90 Countries Worldwide**

www.lbassociates.com

AGRI NEWS

Economic Summit Demands more farm investments

At the recently concluded, India Economic Summit in New Delhi, from 8-10 November, Monsanto India Chairman Sekhar Natarajan said, "Farmers have to be benefited otherwise they will shift to other products." He was referring to his company's experience in India and its farmers. Citing the example of a Monsanto project in Gujarat, where the company is working with tribal farmers in partnership with an NGO and state government, he said, "Within three years the productivity of crops in that area has doubled and income rose by triple." Natarajan also said such initiatives should come from the private sector without waiting for government support.

Kushal Pal Singh, Vice President of the National Institute of Agriculture, said that organised retail is biased towards consumers' interests, as its objective is to provide the 'best product at cheapest price'. "How can farmers get better prices from such retail chains, when they talk about lowest prices," he asked.

Singh observed that India needed agri business that would partner with farmers on a long-term basis. Commenting on prudent use of water, Margaret Catley-Carlson of Sweden's Global Water Partnership (GWP) said, "There is no alternative to water, while other agricultural inputs can be created. So there must be more concern for water."

A few participants said the private sector does not take the risk to enter the agriculture sector due to low returns and over-regulation by the government.

Cane Production may Decline

India's cane output may decline by 9 percent to 249.5 million tons this year after the weakest monsoon since 1972, damaged the crop. The Agriculture ministry said the country would need to import at least 2 million tons this season, in addition to contracted supplies, to meet the demand of 23 million tons.

India recently extended the deadline for duty-free imports of raw sugar by 9 months Jan. 1, 2011, and allowed purchases of white sugar imports at zero duty to 31 March.

A delay in supplies from Maharashtra caused by un-seasonal rains may worsen global shortage as Indonesia, Egypt and Pakistan import sugar. Prices have almost doubled this year in New York because of weather disruptions to crops in Brazil and India, the largest growers.

In Maharashtra, about 60 mills produced 262,000 tons of the sweetener since crushing began on 1 November, which is 19 percent less than the 325,000 tons a year earlier.

Maharashtra is forecast to produce 4.8 million tons of sugar this crop year, compared with 4.6 million tons last year. It may harvest 41 million tons of cane.

About 35 mills in Uttar Pradesh, the nation's biggest cane-grower began crushing from 18 November after mills agreed to pay farmers prices higher than the rates set by the central and state governments, according to Shyamlal Gupta, secretary general of Uttar Pradesh Sugar Mills Association.

New Solutions for Food Preservation Mooted

J William Hudson – president and CEO of the Global Cold Chain Alliance (GCCA) has been conferred with *Amity Golden Award* for his unparalleled commitment, devotion and dynamic leadership towards training, development, and research in the area of cold chain management.

Receiving the Award from Amity University, J William Hudson outlined the ways to preserve the products coming from the farm and commented that the quantity of food that is consumed in America is wasted in India due to the absence of proper storage and transport facilities. He called for low cost solutions in preservation of food products and developing requisite infrastructure and best practices to preserve food.

Honouring Hudson with the award, Dr. Ashok K Chauhan, founder president, Amity announced the launch of certificate/degree programmes in Post Harvest Cold Chain Management in Amity University. Expressing his concern over the grim situation of cold chain management in India, K.S. Bains - IAS (Retd.) and director general, Amity Institute of Organic Agriculture said that India is the second largest producer of food and poultry in the world, therefore more attention needs to be paid towards preserving the products that are wasted during the transportation, handling, retailing etc. of the products from farm to fork.

Agri sector growth to be less than 4 percent

India's farm sector growth will be less than 4 percent this fiscal, on account of floods and deficient monsoon in some parts of the country. This was stated by Planning Commission deputy chairman Mr. Montek Singh Ahluwalia.

"It is extremely unlikely that the agriculture sector will grow more than 4 percent this year. The sector is not growing as it should have been," Montek said at the annual Economic Editors' Conference in New Delhi. "However, this would not pose a problem to food supplies in the country," he added. "We don't need more than 2 percent (growth) of agriculture production," Ahluwalia said, adding that the country would not face any food shortage if the sector expanded by this amount.

Montek further emphasised the importance of using existing technologies and proper farming techniques to increase yields. "Increase in procurement prices and supportive government policies would help the farming sector to perform better in the 11th Plan period that ends 2012," Ahluwalia said.

"The price policy we follow is extremely supportive. We should recognise that farmers must have attractive prices. In the past three-four years, we have increased our procurement also", he noted.

Competition must Benefit Agriculture: Pranab

India's Finance Minister Pranab Mukherjee has said that there is a need to improve competition in the agricultural market to benefit farmers as well as the consumers. Addressing a conference on Competition, Public Policy and Common Man in New Delhi recently, Mukherjee said that the ability to make the desired changes would be a litmus test for the country.

"There is a scope to include competition in the agriculture market. The real litmus test would be to reach out to the common man. This should offer better price mechanisms," Mukherjee said.

Mukherjee reiterated that the Government had no plans to remove fiscal stimulus packages and said stimulus measures ranging from cuts in factory levies to higher Government spending helped cushion the economy against the global financial crisis.

"The resilience was shown by the Indian economy in the face of adversity at a time fiscal and monetary stimulus by the Government and central bank of India. In this case Reserve Bank helped the Indian economy to weather the crisis without such intervention," Mukherjee said.

Punjab Farmers Grow Bananas

Farmers across India's Punjab region are increasingly turning towards bananas in a bid to increase their profit margins. Since it was first introduced across 10 acres in 2006, banana farming has expanded to 300 acres and is expected to grow even further. Says Banana Growers Association President Mewa Singh "I earn a minimum of Rs 1,50,000 (US\$3,278) per acre every year and it can go higher. If the market rates remain as good as they are at the present, I believe we will be able to make an income of over Rs 2,00,000 (US\$4,371) per acre," he said.

Growers in the region are provided with the best varieties from the Punjab Agricultural University, and the type of banana grown in Punjab is very similar to those farmed in Maharashtra and Andhra Pradesh. Almost US\$120 m worth of bananas are consumed each year in Punjab, making the domestic market alone a huge incentive for growers.

Bananas were recently included in India's National Horticulture Mission. It can help the growers to get a government subsidy of up to 50 percent for plants and irrigation enticing the farmers further.

India's Agri Exports to hit US\$20bn

Indian agricultural exports will more than double over the next five years to US\$20 billion. The value of India's agricultural exports is set to hit Rs1 trillion (US\$20.6 bn) in the next five years, according to the estimates by Agricultural and Processed Food Products Export Development Authority (APEDA).

APEDA claims that India's share of the global farm product export market will also grow from 2 to 5 percent. Exports of fresh and processed fruit, vegetables, livestock and cereals rose 24 percent in 2008/09 to Rs 390 billion (US\$8.04 billion).

"It is very important to increase our exports to the developed countries," APEDA Director S Dave said. "Consumption patterns are fast changing in the international market. There is an emergence of specific products like functional foods, convenience foods, dietary products and organic products. India has made considerable progress in ready-to-eat food and organic products but more effort is needed to add value," APEDA chief noted.

Australia pledges US\$70 million for Farm Research in India

Australia will scale up its collaboration with India in science and farm research by pledging US\$70 million in many areas. Australian Prime Minister Kevin Rudd announced that his government would invest US\$50 million for the Australia-India Strategic Research Fund; US\$1 million for an innovative joint solar cooling research project; and US\$20 million for research into dry-land farming in India.

Rudd, in his maiden visit to India announced more funds for joint research projects after holding talks with R.K. Pachauri, Director General of The Energy and Resources Institute (TERI).

The additional US\$50 million for the research fund will flow from the financial year 2009-10 and will complement US\$20 million that the Australian government has invested since 2006 to enable Australian scientists to engage in cutting-edge collaborative research with Indian scientists. The Australian Centre for International Agricultural Research will be supporting the research over five years.

Carrefour engages Apple Growers

Retailer Carrefour is working with Indian apple growers to establish a direct-sourcing supply chain for its new operations in the country. Global retail giant Carrefour has initiated a technical support programme with Indian apple growers in readiness to source direct supplies when it opens its first stores there next year.

The retailer has been selecting growers in the Matiana region of Himachal Pradesh, and will work to improve their farming techniques to deliver a better quality of apple.

“Our technical advice will mainly focus on limiting chemical usage, natural fertilising, harvest-handling and post-harvest storage conditions,” said Yannick Douville of Carrefour WC&C India Private Ltd.

Delhi-based Dev Bhumi is one of the firms appointed by Carrefour to work with farmers to manage storage and logistics. Dev Bhumi has begun operating its distribution centre in Matiana, which features controlled atmosphere storage on two levels.



Uttar Pradesh Potato Acreage to Rise

Potato acreage in Uttar Pradesh is expected to rise, on top of an already record output this year. High prices for Indian potatoes and shortages of rainfall had been moving farmers away from rice production spurring expectations of an acreage rise in Uttar Pradesh next year.

Despite a record potato production of about 10.8 million tonnes in the state, prices stayed high on the back of poor yields in Bihar and West Bengal, hitting Rs 1,400 per 100kg. Combined with the loss of rice paddies from water shortage, the area under potato production in Uttar Pradesh is expected to increase from its current 5,27,000 hectares and prices too may climb as harvesting in Punjab and Uttar Pradesh is affected by hot weather.

AGRI TECHNOLOGY NEWS

Canada's Punjabi GPS System to Boost Farming in India

Agriculture in Punjab will get a major boost with a Canadian company introducing its GPS guidance system in the Punjabi language. The system will offer guidance in farming applications, including spraying, spreading, broad-acre tillage and seeding methods, the Calgary-based Hemisphere GPS company has said. Hemisphere GPS designs and manufactures innovative, cost-effective GPS products for positioning, guidance and machine control applications in agriculture, marine and other markets.

‘The Punjabi Outback S-Lite recognises the Gurmukhi script (in which Punjabi is written) and is targeted at the Punjab state in the northern agriculture region, which is known for its larger farms compared to the rest of India,’ the Canadian company said.

Punjab has 46 million acres in cultivated land and India's largest farming tractor population. The state, which ushered the Green Revolution in India, produces about one percent of the world's rice and two percent of the world's wheat and cotton.

It also has the highest per hectare fertiliser consumption in India, accounting for more than 9 percent of the total fertilizer consumption in the country.

‘The Outback S-Lite (in Punjabi) has both the features and

the price point to compete in India's growing marketplace,’ said Mohamed Abousalem, vice president for marketing, Hemisphere GPS.

“We acknowledge the tremendous opportunity that exists in India with the largest arable land after the US. We will continue to adapt our products to meet the needs of this and other growing markets,” he said.

Apart from the Punjabi language, the Outback S-Lite guidance system also supports 20 other international languages.

Aerobic Rice Technology Making waves in Philippines

In Philippines, Aerobic Rice Technology (ART) is being adapted on a national scale by its farmers. This follows ART rendering promising results in terms of: a) low input requirement; b) crop manageability; c) yield competitiveness; d) profitability; e) early establishment which enhances productivity; f) resistance to pests and diseases; and g) weed competitiveness.

Met Advisories for Farmers

The farmers of Gujarat will soon get tailor-made agro-Met advisories to help plan sowing and harvesting of crops. According to Shailesh Nayak, Secretary, Union Ministry of Earth Sciences, "They will be full-fledged bi-weekly bulletin advisories for horticultural crops, livestock, fisheries, wasteland and forest fires, post-harvest and storage to be initiated for districts in the state," said Nayak. By the end of year 2010, every part of the state will be covered under this project.

"Presently, it is freely available on ministry website but later mobile operators can provide the information at nominal charges. The idea is to make the technology people-oriented and develop it to help the masses," he added.

Addressing a three-day Asia-Pacific conference on luminescence and electron spin resonance dating at Physical Research Laboratory (PRL) in Ahmedabad on 10 November, he said, accuracy of agro-met predication is up to 70-75 percent. The 1,600-km-long Gujarat coastlines have been affected by rapid erosion activities. Nayak said. "South Gujarat region is the worst affected and we are holding talks with PRL scientists to study its impact on the environment. The coastal conditions do have an impact on the people living close by."

According to Nayak, cyclone activity is likely to increase intensity and frequency. "The recent cyclone Phyan which hit India changed its course in its last 24 hours from eastwards to northwards. We erred in predicting the cyclone by 75 km but are equipping ourselves to predict it in a close range of 50 to 60 km," he said.

Post Harvest Loss-Afghanistan shows the way to curb it

A FAO-backed project in Afghanistan funded largely by Germany to provide **metallic hermetically sealed silos** to farmers has helped to cut post-harvest losses quickly to 1-2 percent from 15-20 percent and boosted farmers' incomes.

Wrong harvest timings, bad packing and poor transport and storage facilities cause up to 50 percent post-harvest losses in developing countries, aggravating hunger, the United Nations' food agency has stated.

Food crop losses, ranging from 15 percent to 50 percent of what is produced in developing countries remove supply from the market and drive up food prices, the FAO said stressing the need for training and technology improvements.

The Rome-based Food and Agriculture Organisation (FAO) has estimated that the number of hungry people hit 1.02 billion in 2009 and the world should boost food output by 70 percent to feed a projected 9.1 billion population by 2050. Last year the world's hungry numbered 963 million.

"Investments are needed to train farmers and others involved along the food chain to handle harvested food properly and

Inert Gas Technology Prevents Oxidation

Air Liquide has unveiled a new inert gas technology which prevents the oxidation of wine and thereby maintains the quality and character. Air Liquide food and beverage market manager Lizbe Sorore explains, "By using the innovative Cryogen Injector, which uses liquid nitrogen dispensing technology either as a pre-purge in empty bottles or as a post-purge in filled bottles, winemakers can achieve a significant and consistent reduction in dissolved oxygen (DO) levels of bottled wines".

"The primary aim of the winemaker during the bottling process is to maintain the initial good quality of the wine and ensure that the wine is bottled to specification. It is critical to prevent oxygen pick-up and manage the DO during the bottling process, especially wines under screw cap where the headspace is about 9 ml of air. This could equate to about 2 mg/l DO. This headspace needs to be managed," she says.

Sorore explains that the liquid nitrogen will expand volumetrically at a ratio of about 700 to 1 and displace all residual oxygen in the empty bottles and headspace, preventing undesirable oxidation by lowering the increase in DO levels during shelf life.

"The same technology is also used to increase the internal pressure and ensure rigidity in thin-walled aluminium cans and polyethylene terephthalate (PET) bottles used for noncarbonated beverages and water. This will prevent the 'panelling' effect, allowing for stacking of pallets during warehousing and distribution and enabling the producer to possibly change over to lower-weight PET bottles," she asserts.

improve its quality to make products from the developing world more competitive on the world markets," the FAO said.

FAO has said the world needs to invest US\$83 billion a year in agriculture in developing countries to stamp out hunger by 2050.

Genetically Modified Technology (GMT) to Stay

The Government of India has made clear that India cannot oppose the use of genetically modified technology to increase crop yields. "The GM technology cannot be avoided," Minister of State for Agriculture K V Thomas said. The minister added that India cannot oppose the use of technology if it wants to increase yields and manage the present agricultural crisis.

"The crop shortage of key food grains has led to a rise in prices of some food commodities such as sugar and tur dal this year. In Kerala, tur dal costs Rs 90-100 a kg and sugar has touched Rs 35 a kg this year," he observed.

The minister noted: "The country needs to take scientific and practical steps to improve productivity and bring down cost of production. The GM technology is one way to achieve this".

Insure your crop

Secure your future



First Insurer in India to win 'Innovation of the Year' - 2008 award

It is AIC's introduction of a pilot Weather Based Crop Insurance Scheme (WBCIS) that has won for it this prestigious award. Besides reaffirming its high level of scientific expertise, this award has propelled AIC as a leading player in the global agricultural insurance sector.

Our Vision

- Accelerate the economic momentum of the nation by bringing financial stability to rural India.
- Innovate & develop rural oriented & farmer friendly insurance products for all agricultural & allied risks.
- Cast a protective net over agricultural & allied activities from natural perils & risks

National Agricultural Insurance Scheme (NAIS)

- Yield Guarantee based Crop Insurance Scheme of the Government
- AIC designated by the Government as the 'Implementing Agency' of NAIS
- Currently operating in 25 States & 2 Union Territories, insuring about 35 different crops during Kharif Season and 30 crops during Rabi Season

Year	No. of Farmers Insured	Sum Insured (Rs. in Lakh)	Gross Premium (Rs. in Lakh)	Claims (Rs. in Lakh)	No. of Beneficiary Farmers
2003-04	1,23,92,117	11,16,362	34,739	1,14,974	38,10,394
2004-05	1,62,18,149	16,94,482	53,479	1,19,875	34,47,522
2005-06	1,67,22,357	18,59,076	55,477	1,39,825	36,46,732
2006-07	1,79,12,030	21,30,146	61,017	2,29,001	45,20,954
2007-08	1,84,42,577	24,47,419	68,302	1,71,120	31,49,085
2008-09*	1,91,34,859	26,63,012	80,203	3,19,796	47,66,747

*Provisional

Weather Based Crop Insurance Scheme (WBCIS)

- Introduced by AIC with the approval and support of the Govt as a pilot during 2007-08 Season.
- Provides insurance against potential crop losses due to adverse deviation in rainfall and other weather parameters

AIC's Products :

Weather Index Based Insurance: Varsha Bima; Rainfall Insurance; Mango Insurance; Wheat Insurance (NDVI + Weather); Generic Weather Insurance (Rabi); Coffee Rainfall Insurance; Grape Insurance; Apple Insurance

Traditional Crop Insurance: Potato Insurance; Poppy Insurance; Bio- Fuel Tree/ Plant Insurance; Coconut Insurance; Rubber Plantation Insurance; Pulpwood Insurance

Our Projects on the anvil: Medicinal & Aromatic Plants Insurance; Tea Plantation Insurance; Other Plantation Crops & spices Insurance



Agriculture Insurance Company of India Ltd

Ambadeep (13th Floor), 14, Kasturba Gandhi Marg, New Delhi-110001

Tel:91-11-46869800 Fax: 46869815 Email:aicho@aicofindia.org

Website : www.aicofindia.org

THERE IS MORE TO JAIN IRRIGATION THAN IRRIGATION



Onion & Vegetable Dehydration



Fruit Processing



Tissue Culture



Green House



PVC Pipes



Polyethylene Pipes



B-Sure SWR Pipes & Fittings



Photovoltaic Systems



Solar Water Heaters



PVC & PC Sheet



Jain Irrigation Systems Ltd.

Small Ideas. Big Revolutions™

www.jains.com

