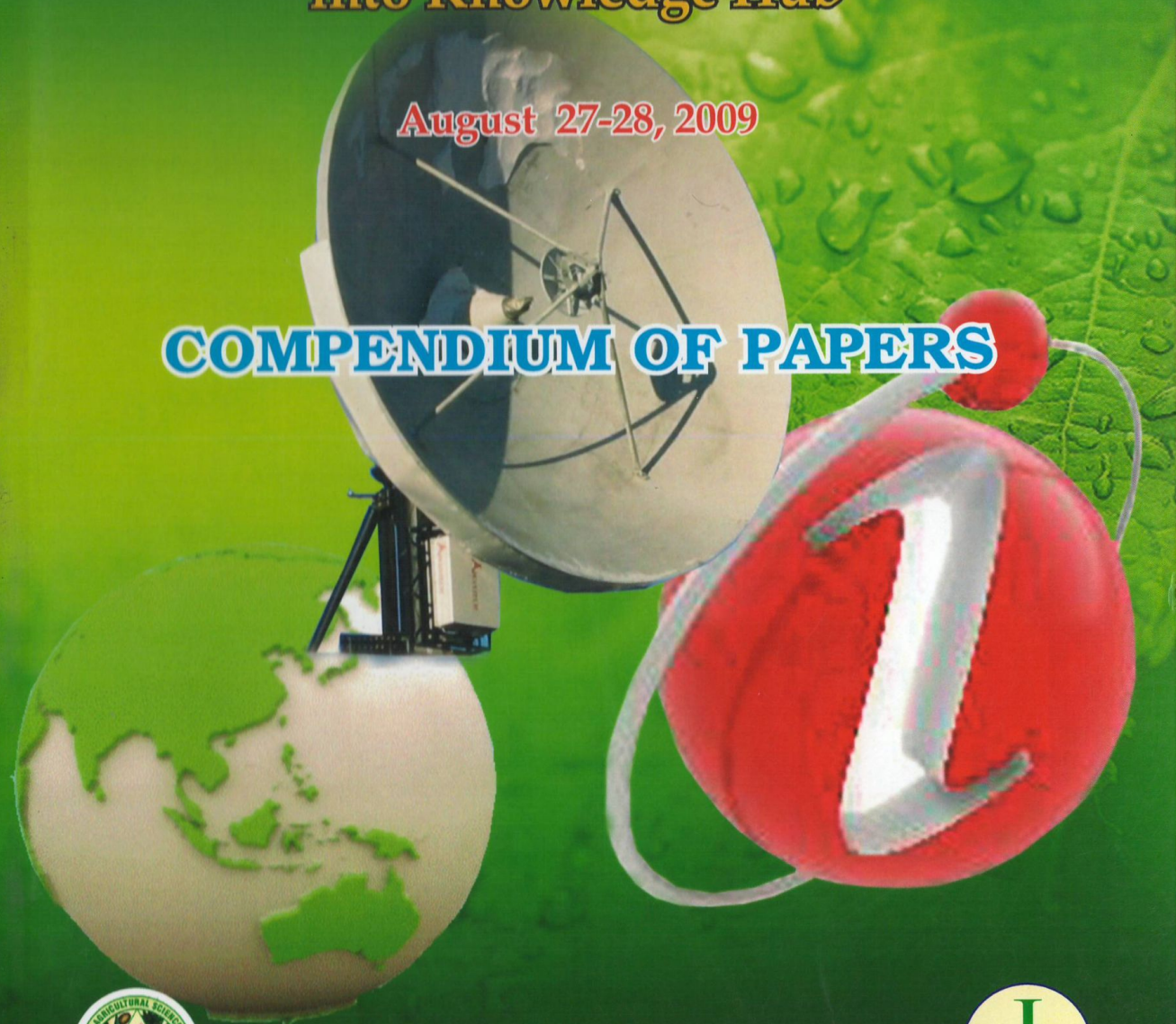
6th National Symposium on Transforming Indian Villages into Knowledge Hub

August 27-28, 2009



COMPENDIUM OF PAPERS

UNIVERSITY OF AGRICULTURAL SCIENCES
BENGALURU
INDIAN AGRICULTURAL UNIVERSITIES ASSOCIATION
NEW DELHI

6th IAUA National Symposium on Transforming Indian Villages into Knowledge Hub

COMPENDIUM OF PAPERS

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Dr. B. N. Manjunatha

2009

University of Agricultural Sciences
Bengaluru

Indian Agricultural Universities Association
New Delhi

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FOREWORD

Information technology has become the key element in economic development. Fortunately, India realized the importance of IT early as compared to many other developing countries. The nationwide network of computer set up by the National Informatics Centre took the Computer to every district in the country, making Government level interaction and communication faster for planners. IT has a prominent role to play in the areas of education, health and agriculture. Primarily the need to enhance efficiency in organizations led to greater demand for accurate and timely information and thereupon use of IT. New areas of computer science and technology viz. online systems, database management systems, management information systems, computer communication networks, office automation, etc. have emerged and have influenced the society, development and social environment.

It is encouraging to note that the IAUA, New Delhi has taken the lead in conducting a National Symposium on "Transforming Indian Villages into Knowledge Hub", to address the issues concerning application of ICT in rural development. The compendium comprising of abstracts and full length papers provided by learned Vice-Chancellors and eminent scientists from different SAUs, ICAR Institutes and ISRO is based on their vast experience, wherein day to day use of IT is used in their work and management of institutions. As such, I am sure that this publication will be useful to academicians, researchers, scholars, policy makers and planners as well as the development support groups and practitioners.

I congratulate the learned contributors and the editors for their painstaking efforts in bringing out such a scholarly and valuable publication.

Date: 24-8-2009

P. G. Chengappa
Vice-Chancellor

PREFACE

In recent years, Information and Communication Technology (ICT) has been quite useful in meeting the information needs of farmers. ICT facilitates faster access to information and innovations among farmers, plays a vital role in providing timely solutions to problems in farming. Pioneering ICT pilot experiments in India have shown that the rural livelihoods are greatly improved by access to information on improved agricultural technology, pest and diseases management, market intelligence and weather forecast, besides wide range of other information namely, health, education, transport, communication and programmes of government. It is possible to address plethora of problems faced in rural areas through the use of modern ICT enabled services. If villages are transformed into knowledge centres, empowered with needed timely information, it is possible to develop the villages on a sustainable basis.

Indian Agricultural Universities Association, New Delhi contemplates to organize Vice-Chancellors meet every year in one of the Member Agricultural Universities of the Country and also deliberates on the topic of current interest. This year (2009) the IAUA has choosen the topic concerning the application of science and technology in rural areas more specifically, Transforming Indian Villages into Knowledge Hub which is very timely and appropriate. A two day symposium is scheduled on August 27-28, 2009 to deliberate in detail the influence of Globalization on Indian agricultural economy, the role of ICTs in knowledge empowerment of rural sector to cope with the current situation and its management. More specifically, the sub themes of the symposium are; Globalization of agricultural economy, Knowledge empowerment of rural people : Issues and Policy Perspectives, Rural Knowledge Management through Stakeholders Partnership and Interventions, Significance of ICT in enhancing rural agricultural knowledge competency, Integration of ITK (Indigenous Technical Knowledge) with scientific knowledge for their adoption and Multi functionality of agriculture and knowledge intervention: The Task Ahead.

The compendium contains various papers and good number of abstracts of papers under each theme. The authors have brought out well thought out ideas and research findings in their papers. The organizers thank the authors for their contribution.

In compiling and editing papers, the help rendered by Dr. M. S. Nataraju, Professor of Agril. Extension and Editor, Communication Centre, Dr. B. N. Manjunatha, Professor of Agril. Extension and Associate Editor, Communication Centre, UAS, Bengaluru is gratefully acknowledged. The Organizers also thank M/s.Raghu Print System, Bengaluru for their timely printing work.

At the end, the Symposium Coordinator would like to thank Dr.P.G.Chengappa, Vice-Chancellor, UAS, Bengaluru and Chairman of Symposium Organizing Committee and Dr.R.P.Singh, Executive Secretary, Indian Agricultural Universities Association, New Delhi for their guidance and encouragement.

24-8-2009

K. Narayana Gowda
Dean (Agri) & Coordinator
6th IAUA National Symposium

Brief Note About IAUA

The Indian Agricultural Universities Association is a Registered Society, established in November 1967 with nine Indian Agricultural Universities as its founder member, viz., PAU, Chandigarh (now Ludhiana); APAU, Hyderabad (now ANGRAU); JNKVV, Jabbalpur; UPAU, Pantnagar (now GBUAT); UAS, Bangalore; KU, Kalyani (now BCKV, Mohanpur); OUAT, Bhubaneshwar; UU (now MPUAT), Udaipur and IARI, New Delhi. The idea to coordinate education, research and extension programmes/activities of all Agricultural Universities in India came to the mind of some well reputed Agricultural Scientists cum Vice-Chancellors like Dr. M. S. Swaminathan, Sri P. N. Thapar when India after her independence was in transition period. Some main objectives of the association are - to serve as inter-university organization, to promote, support and undertake such programmes as may improve norms and standards in agricultural education, research, training and extension in universities, to act as a bureau of information and to facilitate communication, coordination, mutual consultation and collaboration amongst universities.

To achieve the objectives, IAUA undertake, organize and facilitate annual conventions, symposia, brainstorming sessions and its regional meetings etc. The papers are invited from National and International Scientists on various subjects and also invite them to its events for participation. It also works in Collaboration with other national and international sister organizations at NASC. Presently almost all the Agricultural Universities in India numbering 47, are its member. All the Universities and National Institutes (Deemed Universities) in India which provide an integrated programme of teaching, research and extension education in agricultural sciences are qualified to become its 'Regular Member'. Institutions or Agencies which are genuinely interested in and capable of contributing to the promotion of the objectives of the Association are qualified to become its 'Affiliate Member'.

Vice-Chancellors of member Universities or institutions constitute Association's General Body. The General Body meets once a year to decide activities and also to elect Executive Committee of the Association for the ensuing calendar year. Most working is governed and guided by the Execitive Committee which meets quarterly (4 times) a year. The decisions on policy matters are discussed and ratified by the General Body in its Annual meeting usually held in December each year. The main source of revenue is annual subscription from member universities.

The IAUA brings out quarterly Newsletter publishing significant contributions made by the member universities. The publications are also organized of each event during the year along with recommendations through the host university.

IAUA website (iauaindia.org) was launched during August, 2002 and depicts all the information till date about Annual Conventions, National Symposiums, Regional meetings and Brainstorming Sessions along with recommendations, brief about each member university with main building photograph and the past President of IAUA with their brief bio-data and photograph of each. The Association is manned by Executive Secretary. The present contact person for any information is Dr. R. P. Singh, Executive Secretary, IG2, CGIAR Block, NASC Complex, DP Shastri Marg, Pusa Campus, New Delhi-110012 (India). Tele Fax - 911125842422, e-mail - esiaua@yahoo.co.in and drsingh@rediffmail.com

R. P. Singh
Executive Secretary

CONTENTS

TECHNICAL SESSION-I

Globalization of Agricultural Economy

Sixth National Symposium on Transforming Indian Villages into Knowledge Hub

Prof. Anwar Alam
Vice-Chancellor, SKUAST-K, Srinagar

India is an agricultural country, 80% of the people live in the rural areas where village is a primary unit for economic activities, social life and mutual protection. It has been so far thousands of years. Inspite of scientific, technological, industrial and trade developments more than two-third people depend upon agriculture. Production, Productivity, quality of their produce and profitability governs their quality of life, shelter, clothing, education and healthcare. Farmers are the primary risk takers of agriculture, a biological industry, prone to vagaries of nature droughts, floods. With rising population, globalization of economy agricultural economy being no exception, rising standards and cost of living has posed new sets of challenges. Cost of agricultural inputs are steadily rising, necessity of maintaining access to food for the masses compels containment of prices of food and feed commodities thereby reducing the profitability.

There has been phenomenal growth in agricultural sciences and technology which increase production, productivity, input use efficiency thus reduced unit cost of production and increased profitability. However, majority of the farmers are not aware of these knowledge, skills and inputs and machinery, opportunities of marketing and trade. Often farmers are obliged to dispose off their produce and by-products at throw away prices. In some parts of the country farmers do not harvest their produce due to slump in the price in their neighborhood, so low that even cost of harvesting, packaging and transport can not be realized. Agricultural produce are perishable commodities in absence of proper post-harvest technology and value addition opportunities, at times, severe qualitative and quantitative losses occur. In absence of proper post-harvest processing infrastructure farmers sell their produce to traders and millers which returns to them as primary processed food and feed ingredient at much higher price, a drain on the rural economy.

With time we are in knowledge driven economy where application of latest knowledge, skills and technology enables efficiency and economy in production, processing and marketing. Though there is extension machinery in the States as well as Centre, however, it is shrinking as it is costly and has limited reach. Luckily India has well developed Information and Communication Technology (ICT) networks. It enables reaches to unreached. Even rural people can have access to information and knowledge of their interest. Innovative approaches have been tried to provide information and knowledge to the rural people both in public and private sector. Dr. M.S. Swaminathan and his foundation have demonstrated village as knowledge Centres using local youth and low cost ICT network. Websites and portals are there that contain

latest information relating to agriculture production, marketing and processing. There are websites that provide latest market prices of major commodities in selected Mandis. Since village is a primary unit it is only logical that villages have knowledge base relevant to them - their land, water, crop, and livestock, energy and power, demand and supply of essential commodities and enterprises dependent on their produce and by-products, markets for their goods in domestic and international markets. ICT and essential data bases need to be developed, continuously updated and access created to ordinary farmers at costs that is affordable.

Globalization of Agriculture – The Role of Higher Agricultural Education

Dr. P. G. Chengappa
Vice-Chancellor, University of Agricultural Sciences, Bangalore-560 065

Agriculture Universities form a link between knowledge generation and transfer of knowledge as they prepare the future decision-makers and teachers, who contribute to the societal development. Globalization has spurred technological, economic, social and cultural change through mobility of capital, technology, information and human resource. This has shifted the demand for acquiring, processing, disseminating and applying knowledge. Universities, as key centers of research and learning, play a vital role here. Thus in addition to fundamental research, universities also need to undertake innovative, action-oriented research and the support of NAIP to NARS in this regard is laudable. In addition to traditional teaching functions, SAUs can consider their role in retraining school teachers and local professionals to contribute to learning for sustainable development. Universities are to contribute to innovation, reflection on values and ethics, and transformation to a sustainable society. Provision of knowledge as a "public good" is the role of higher education, and access to verifiable knowledge is the key for sustainable development. In the process, orientation towards innovation and learning, creativity and the willingness to take risks are crucial.

Thus the Tasks for SAUs in perspective are:

- Strengthening the relevance of teaching and research for societal processes leading to more sustainable and discouraging unsustainable patterns of life,
- Bridging the gap between science and education, and traditional knowledge and education,
- Interactions with local communities and businesses,
- Introducing decentralized and flexible management concepts.

Higher Education and transfer of knowledge

The complexity of societal problems demand a multidisciplinary treatment. The challenge for SAUs then is to create learning environments to prepare learners for this purpose. Our learning environments should improve access to scientific knowledge of good quality, enable students to be competent to work in multi-disciplinary and multi-cultural teams, and bring global dimension to individual learning environments.

Through education, outreach and service to community and region, SAUs are the bridge between knowledge generation and application and need to be innovative, development and welfare oriented. Learning environments in higher education should enable

- Learners to appreciate their physical and social environment;
- Develop positive attitude towards cultural, environmental diversity, and life-support ecological processes; and
- Use their knowledge, skill and attitude for the well-being of society.

Higher education in agriculture is crucial as it constitutes the learning environment for all educational professionals. Here, the opportunities offered by new media and information and communication technology (ICT) certainly deserve attention.

Historical context

Agricultural Colleges in India were modeled on the basis of the Land Grant Colleges of the United States. It was the Morrill Act of 1862 also called the Land Grant Act, which was passed by the US Congress during its serious social crisis, which lead to an educational reform by creating agricultural college in each State, to serve the previously unserved — the "sons and daughters of farmers and mechanics". In the US AGRICULTURAL COLLEGE wields enormous power and prestige. It stands above the State Departments of Agriculture and above most other publicly - supported agricultural activities.

The greatest of the Acharyas of Agriculture, Professor Theodore Schultz, passed out from Land Grant College, worked in University of Chicago and received the Nobel Prize in Economics for his work on Human Capital Formation. In 1961, at the 100th year celebrations of the American Association of Land-Grant Colleges in Kansas City, Dr. Schultz, said that there is neglected opportunity in the Land Grant College System. He said, this neglected opportunity" is not in plants and animals, not in soils and yields, not in the growth regulators or genetic improvements or in the fundamentals of science for new and better techniques of production, but in the "education of farm people .....which lags behind most other groups in the nation. They are the least benefited from science and technology, even much of what has occurred in agriculture".

Professor Schultz said we need to develop and mobilize intellectual resources to serve farmers and their children. Professor Shultz concluded that the neglected opportunity for agricultural colleges and the central purpose of the Morrill Act is "still open to them. Even after four decades after the remarks of Professor Schultz, the opportunity has not been seized in the US. The situation in India is no different. Thus, our agricultural education through SAUs and our Agricultural Extension machinery through Departments of Agriculture are still neglected and they deserve the greatest of the attention

Contribution of SAUs

Agricultural Universities have played a pivotal role in attaining quantum jump in level of food grains production and other farm commodities which was instrumental

to attain self-sufficiency in food. The crop varieties and other technologies generated by SAUs have been responsible for sustaining agricultural and livestock productivity and ensure food security to the country

Agricultural universities have experienced quantitative expansion during last four and half decades since the establishment of first agricultural university viz., G.B.Pant University. Presently there are 40 SAUs, five DUS, one CAU with an intake of 15, 000 graduates, 7, 000 M.Sc and 1700 Ph.Ds. At any point, there are over 75,000 students studying in SAUs.

Future break through in agricultural production can be achieved by improving human resource through imparting necessary skills to absorb frontier technologies. Therefore, the quality of agricultural education is fundamental for future development and modernization of Indian Agriculture.

Restructuring of Educational programmes

Since the last few decades, the nature of the employment landscape has changed from low key on farm jobs to very high technology input ventures. It is the responsibility of the University to ensure that the students graduating from its colleges are sufficiently trained and have a greater degree of employability.

An analysis conducted at the University shows that nearly 70 per cent of the graduates pursue higher studies. This seems to reinforce the general perception that employability of graduates after their basic degree from the University is rather very low. Several reasons are in order. First, it appears that at the undergraduate level the education is not comprehensive enough for the students to be capable of going into the mainstream of agricultural related employment opportunities. Second, the practical training or internship programme is modest making the candidate ill equipped to deal with real-life employment challenges. Third, the training of the candidates during their undergraduate period is out of tune with the existing realities of employment. All these could collectively add to the low preference for candidates for employment opportunities soon after their graduation. Self-assessment of the University profile in the employment markets seems to drive home a strong lesson – and that is to enhance the employability of the University graduates through active reforms in both the curricula as well as the training methods. The University needs to provide exposure in emerging areas and in related subjects, reduce redundancy, impart high quality technological training.

Globalization of Agricultural Education

Globalization of Agricultural Education has posed two important challenges to SAUs. First, the outgoing graduates should be made to face the changes and challenges

successfully. Second, SAUs should be made to compete globally to attract talents and students and at the same time remain relevant to take care of the needs of geographical region where it is located. This would call for redefining goals of agricultural education.

In the light of the market demand for various programmes, the University should calibrate its technical programme and accordingly need to drop programmes not in demand while emphasizing programmes that are in demand. This would to a large extent solve the issue of employability. In this context and based on the recent market demands, the University launched academic programmes (courses) on Agri-business management, Natural resource management, Agricultural Biotechnology and Food Science Technology. However, such a mass restructuring of the curricula should keep in mind emerging areas in science and should provide adequate scientific base to pursue higher studies in agricultural education.

Agricultural sector is experiencing a paradigm shift in the recent past. There has been a shift from subsistence to commercial agriculture, Horticulture and livestock production. Shift is more demand driven as well as caters to the needs of the both local and export markets. There has been shift in thinking from exploitative agriculture to sustainable agriculture to achieve evergreen revolution with bio-safety measures. In this regard farming system research and modern extension approaches are gaining importance. Thus, restructuring of curricula is essential for **keeping up with the Joneses**. Agriculture education should be knowledge intensive; skill oriented building self-competence, self-confidence and self–reliance to encourage agricultural graduates to set up agri-business ventures / services aligned to rural environs.

Hands on training

Emphasis on hands on training, income generating activities and exposure to professional management are crucial. Building entrepreneurship through commercial courses for self employment and management concepts for career planning are crucial to run enterprises such as Soil Testing laboratories, Crop Clinics, Warehousing, Agro-Service Centers, Farm Equipment's Service Centers, Agro-Processing Plants and consultancies inter alia in natural resource management, agribusiness.

Students should be equipped with frontier knowledge and skills in Biotechnology, ICT, GIS, and Remote sensing Technology of applications in agriculture. They should also be sensitized to the issues related to (i) Climatic changes (ii) Natural resource management (iii) Environmental Protection and Bio-safety (iv) Water quality deterioration (v) loss of bio-diversity (vi) GATT (vii) WTO & IPR issues (viii) Patent laws (ix) Post harvest processing and value addition (x) Contract farming (xi) International trade in agriculture (xii) Quality standards for agricultural Based products which are globally acceptable.

Village Resource Centres (VRCs) – A Step towards Reaching the Unreached

Sri Hegde, V.S., Sri Ganesha Raj, K., Sri Paul, M.A., Sri Sethuraman, K. and Sri Rayappa, H.

Indian Space Research Organisation HQ (ISRO HQ), Bangalore

Abstract

The Village Resource Centre (VRC) programme was initiated by ISRO during the year 2004, to facilitate overall development at village/ community level, by delivering the variety of space technology enabled products and services directly to the grassroots. The first set of VRCs were set up in Tamil Nadu in association with MS Swaminathan Research Foundation, Chennai. Year by year the more and more VRCs have been set up and at present there are 473 VRCs spread over 22 States/Union Territories. The programme is being implemented in association with selected NGOs, Trusts, Universities/institutions and Government agencies and as of now there are 45 partner agencies involved in the programme. Major attraction of VRC programme is the knowledge connectivity, which is enabled through the two way audio video linkage to various expert centres. The expert centres provide services in the areas of agriculture, animal husbandry, skill development, floriculture, fisheries, water resources; tele health care; woman's empowerment; supplementary education; computer literacy; micro credit; micro finance etc. So far more than 6000 programmes have been conducted and around 4,00,000 people have availed the services. The above services are provided at VRCs either through online or offline mode. Expanding the network requires additional satellite bandwidth, infrastructure, HUB, servers etc.; ISRO is working in this direction. It is also proposed to set up an exclusive Content Server for storing and retrieving Programmes across the network.

Introduction

Indian Space Programme started in early 60s has become largely self-reliant with capability to design and build satellites for providing space services and to launch those using indigenously designed and developed launch vehicles. Over the years, India has achieved a notable progress in the design, development and operation of space systems, as well as, using them for vital services like telecommunications, television & radio broadcasting, meteorology, disaster warning, natural resources mapping, monitoring and management.

Space based services, emanating from Satellite Communication (SatCom) and Earth Observation (EO) satellites, holds considerable value to transform village community. Primary issues related to eradication of illiteracy, better health care, training on better jobs, enhancing agricultural productivity and ensuring proper drinking water management etc., can be facilitated by digital connectivity and remote sensing. Tele-education, for example, enables non-formal education, strengthens supplementary teaching mechanisms, and facilitates interactive training and skill development processes to the rural community. Similarly, tele-medicine facilitates specialist doctor-to-doctor consultations; doctor to patient consultations, besides strengthening medical extension and health care related training in the rural areas.

EO enables community centric spatial information in terms of geo-referenced land record, natural resources, suitable sites for potable/ drinking water as well as recharge, wastelands for reclamation through rural employment creation, watershed attributes, environment and infrastructure related information. Synthesizing spatial information with other collateral and weather information, EO also facilitates locale specific community advisory services. Disaster management support, community based vulnerability and risk related information, early warning and extreme weather information dissemination mechanisms provide reliable disaster management support at the village level.

To reach the benefits of Space Technology to the rural, distant and remote places, ISRO launched Village Resource Centre (VRC) programme in association with NGOs, Trusts, State Govt. Dept. as well as with academic/research institutions. The VRC programme aims to promote a single window delivery of need-based services in the areas of education, health, nutrition, agriculture, water, weather, environment and alternate livelihoods to the rural population.

First cluster of VRCs were set up in Tamil Nadu in association with M S Swaminathan Research Foundation, Chennai (MSSRF) in 2004. Prime Minister of India inaugurated these VRCs. From this modest beginning, at present, there are 473 VRCs spread across 22 States and Union Territories. At present there are 45 partners/ associating agencies involved in the programme from NGOs, Trusts, Government, Academic institutions. Each and every partner involved in the programme have got their own specializations and experience in the field of rural development.

Space Technology Enabled Village Resource Centres (VRCs)

ISRO has piloted several socially relevant space application projects on mission mode basis. With the appropriate technological and institutional base, ISRO has taken up newer social missions, wherein space applications could be integrated with other IT and e-governance related services and brought closer to the community. The effort has now focused on to effectively disseminate the portfolio of services emanating from the space systems - as discussed above, as well as from other Information Technology (IT) tools, directly down the line to the rural communities, through the Village Resource Centres. Some of the other ICT initiatives taken up by the Government in India are setting up Village Information Kiosks like 'Akshya' in Kerala, 'e Seva' in Andhra Pradesh, 'Gyandoot' in Madhya Pradesh etc. Some of the other initiatives by private and NGOs are 'E choupal', 'Village Knowledge Centre'(VKC), 'Drishtee', Common Service Centres (CSCs) of IT Department, Govt. of India etc. These Kiosk systems are being used for a variety of applications like information directories, customer self service terminals, internet access terminals etc. Experiences from these projects suggest that

the information needs of the community should be thoroughly assessed before the launch of the project and knowledge connectivity is the basic requirement. ISRO's initiative on Space enabled Village Resource Centre (VRC) is an effort in that direction.

The VRCs, aimed at serving essentially as Community Resource Centre and addressing the dynamic and critical needs of rural communities. The VRCs are linked to various expert centres in different States to provide information support to the Village Resource Centres in local language. VRCs can directly interact with the experts through two way audio video interactivity. The expert centres provide services in the areas of agriculture, animal husbandry, skill development, floriculture, fisheries, water resources; tele health care; woman's empowerment; supplementary education; computer literacy; micro credit; micro finance etc.

The VRC communication network is Very Small Aperture Terminal (VSAT)-based and which has two way audio and video connectivity. It enables each expert node to multicast the advisory, and enables each of the participating VRCs to raise questions. Expert node software enables a video return link for each VRC in such a way that all participating nodes can listen to the expert and also the questioner, along with viewing them. The VRCs / expert centre / specialty hospital are equipped with a VSAT antenna of 1.8 m in diameter, with 2 W BUC and a satellite modem. As baseline start-up configuration comprises of 1 multimedia PC, 2 speakers, 1 amplifier, 1 cordless microphone, and 1 HandyCam with stand. This configuration is able to cater to 30-40 people as regards listening and conversation, and viewing tele-consultations and advisories on the PC screen. Each VRC is capable of transmitting 384 Kbps of multimedia traffic.

The major objectives of VRCs are to provide services in the following areas:

Tele education: Skill development, vocational training/capacity building, supplementary teaching, non-formal , adult education, computer training/education.

Tele health care: VRCs provide positive, preventive and curative health care services. Facilities are provided for Telemedicine consultations with specialist doctors. Awareness creation on malaria, dengue, chickungunya, AIDS, women and child health could be carried out. Discussions on traditional medicines/herbal medicines also organized. To bring the services of large/speciality hospitals and expert doctors closer, the VRCs provide connectivity to these hospitals. VRCs are also connected to the selected nearest district/speciality hospitals.

Land & Water Resources Advisories: VRCs provide spatial information on various themes such as land use/land cover, soil, groundwater prospects, and enable the farmers to get query based decision support. A simple software package - GRAMINS

is provided for accessing and querying the natural resource information and related advisories, which enables people to get online decision support.

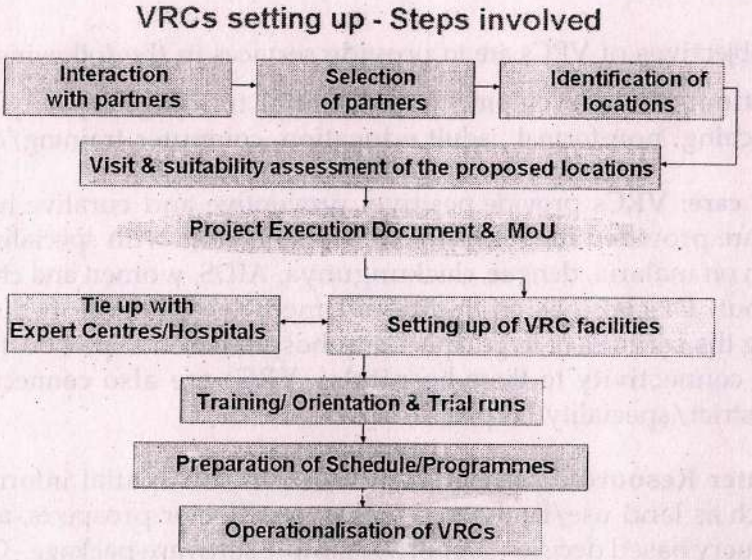
Interactive Farmers' Advisory Services/Tele agriculture: VRCs enable online interactions between the local farmers and agriculture scientists working at Scientific Institutions. The advisory covers a wide range of subjects starting from alternate cropping systems, optimization of agricultural inputs – seeds, water, fertilizer, insecticides, pesticides and producer oriented marketing opportunities. Community centred advisories on soil and water conservation, on adopting water efficient cropping patterns, on practices related to rainwater harvesting/ground water recharge, on participatory watershed management, information on market/price, pests & diseases etc. also been made available.

Weather Advisories: Short, medium and long-term weather forecasts and agromet advisories from available sources (mainly from Agricultural Universities) are provided through VRCs.

Other services: Services such as governmental schemes on agriculture, poverty alleviation, rural employment, animal husbandry and livestock related services, services related to Self Help Group (SHGs) etc, are also been made available at VRCs.

Mode of Operation and Responsibilities

Identification of partner agencies is the first and foremost thing involved in setting up the VRCs. State level interaction meets were held to explain about the VRC



programme and the role and responsibilities of the partner agencies. Further, members from VRC team visited the interested partner agencies to assess the infrastructure facility availability, various programmes carried out and to understand their capability in community mobilization/organization, etc. After that a MoU is signed with the partner agency and a project execution document is prepared jointly with each partner agency.

Towards setting up a VRC, ISRO provides the communication and telemedicine equipments, satellite connectivity, and available/ customised databases of relevance to management of land and water resources. The partner agency provides the civil and other infrastructure to house the VRCs, manpower to run the VRCs, and also maintain the equipment and the facility after the warranty period. The responsibility of content generation and community mobilization is also the prime responsibility of the partner agency.

Rapid Rural Appraisal (RRA) and/or Participatory Rural Appraisals (PRA) have been conducted to assess the livelihood pattern, natural resources stock, and information needs for development by the partner agency. People-centered multi stakeholder participatory methods have been adopted in situational analysis, planning, implementation, monitoring and evaluation of the project. VRC is envisaged to follow an equal opportunities policy that will enable socially and economically disadvantaged sections like women, landless agricultural labour households, etc to get services. Gender mainstreaming is being ensured throughout the project cycle, by implementing the project activities through gender-sensitive approaches. Local Self Help Groups (SHGs) have been involved in VRC activities.

The various other local institutions such as traditional panchayats (grassroots level local institutions), local bodies, youth clubs, farmers associations, and womens' associations are involved in defining the framework for implementation in some of the VRC areas. Concerned Line Departments at the block level are also have got involved appropriately in some areas.

At present, about 45 partner agencies were involved in setting up VRCs. The VRC partners include MS Swaminathan Research Foundation (MSSRF), Chennai; Mysore Resettlement And Development Agency (MYRADA), Bangalore; Karuna Trust, BR Hills, Karnataka; Self Employed Women's Association (SEWA), Ahmedabad; Kutch Nava Nirman Abhiyan, Kutch; Development Alternatives (DA), New Delhi; Himalayan Institute Hospital Trust (HIHT), Dehradun; Development of Humane Action Foundation (DHAN), Madurai; School of Desert Sciences (SDS), Jodhpur. Tarun Bharat Sangh, Jaipur; National Centre for Human Settlement and Environment (NCHSE),

Bhopal; Himachal Pradesh Voluntary Health Association (HPVHA), Shimla; Byraju Foundation, Hyderabad; Gram Vikas, Berhampur; Peoples Rural Education Movement (PREM), Berhampur; Centre for Youth and Social Development (CYSD), Bhubaneswar; Agragamee, Bhubaneswar; Ramakrishna Mission, Kolkata; Assam Branch of Indian Tea Association (ABITA), Guwahati etc. Universities like University of Agricultural Sciences (UAS), Bangalore; Sathyabama University, Chennai; Amrita Viswa Vidyapeetham, Coimbatore; YS Parmar University of Horticulture and Forestry, Solan and State Govt. Departments like Kerala State Planning Board; Nagaland State Council for Science & Technology; Sikkim Department of Science & Technology (DST) and Rural Management & Development (RM &DD) are also partners in VRC programme.

The VRCs are operated and managed by these partner agencies. In certain cases the VRCs are run by Community Based Organisations (CBOs), and they meet the expenses with limited support from the partner agency. Some other cases the expenses are borne by partner agencies from their own resources and by charging nominal fee for certain services.

Activities at a Glance and Experiences Gained

The VRCs address several critical gaps in existing rural tele-centres. The lessons with regards to the services delivered from rural tele-centres demonstrate that interactivity, i.e. live video-conferencing, has had a greater impact on social and human capital, in terms of exchange of knowledge, skill development, information democracy, and field-level advisories, etc. The Knowledge Connectivity to Experts at Agricultural Universities, Vocational Training Universities and Research Institutes who provide immediate solutions/response to villagers questions/concerns is the unique feature of VRCs.

As envisaged variety of activities have been offered by VRCs. These activities can be broadly grouped into (i) Agriculture/Horticulture/Floriculture (ii) Education (iii) Computer Learning (iv) Skill development/ vocational training/ entrepreneurship dev. (v) Health Care (vi) Water Resources/Ground Water (vii) Soil (viii) Child & Women Related (ix) Traditional Health/Ayurveda (x) Live Stock (xi) Fisheries (xii) Insurance (xiii) Micro finance (xiv) Career development (xv) Alternate Livelihood practices (xvi) Weather infn. etc. So far more than 6000 programmes have been conducted and around 400,000 people have availed the services. The above services are provided at VRCs either online mode i.e. programmes conducted using satellite based (two way video audio) connectivity with expert centres like Agricultural Universities, hospitals etc or offline mode – VRC centric activities like health camps, skill development, computer training, micro finance, marketing of products of SHGs, land & water resources management etc. Diversified activities and good participation are observed from the clusters in Karnataka, Tamil Nadu, Gujarat and Orissa.

MS Swaminathan Research Foundation (MSSRF) VRC network, Chennai; Pondicherry Multipurpose Social Service Society (PMSSS), Puducherry; MYRADA in Karnataka, Ramakrishna Mission in West Bengal etc. have carried out a good number of offline activities

Successful conduct of Skill development training through VRCs has proved the utilization of ICT in rural areas. One year duration courses on lab technician, nursing assistant, electrician, and automobile course conducted by Sathyabama University cluster in Tamil Nadu and house wiring course and disaster risk reduction course organized by SEWA/Abhiyan network in Gujarat are excellent examples of the same.

Amongst the various programmes conducted in Karnataka network, the unique programmes organized for children like "Learn with fun" i.e. Mathematics coaching class; spoken English classes, Summer camps on painting and crafts; kids fun time etc. were attended by more than 15000 students. Considering the demand from the children, the "Learn with fun" programme was separately held for 1st to 5th standard students in the morning on all week days and it shows the interest and success of the programme. The innovative "Learn with fun" programme of MYRADA VRC network has got the **"Manthan – Asia Award"** for the year 2008 for the ICT application in education.

Agriculture, animal husbandry and livelihood related programmes has attracted a large number people in the VRC clusters namely, Kerala State Planning Board, Kerala; University of Agriculture Sciences, Bangalore; SEWA/ Abhiyan network in Gujarat; NCHSE network in Madhya Pradesh , Assam Branch of Indian Tea Association, Assam and VRC network in Orissa. There are 17 agriculture Universities /Research Centres in VRC network as of now (ICRISAT, Hyderabad, AP; ANGR Agri. Uni., AP ;Assam Agri. Uni., Assam; ABITA Gramin Krishi Unnayan Prakalpa, Assam; Rajendra Agri. Uni., Bihar; Anand Agri. Uni., Gujarat; Krishi Gram Vikas Kendra, Rukka, Jharkhand; Uni.of Agri. Sciences, Bangalore; Coffee Research Station, Chundale, Kerala; Krishi Vigyan Kendra, Andoor, Kerala; Kerala Agri. Uni., Mannuthy, Kerala; Indian Institute Spices Research (IISR), Kerala; OUAT, Bhubaneshwar, Orissa; Acharya Narendra Dev Uni.of Agri. and Technology, Faizabad, UP ; G.B. Pant University of Agri. and Technology, Uttarakhand; CAZRI, Jodhpur, Rajasthan; YS Parmar Uni for H&F.Solan,HP) across the country linked to the VRC network providing excellent services to the farmers. Some of the Agri. Uni. like UAS, Bangalore; AAU, Gujarat; ANDUAT, UP; AAU, Assam are also providing agromet advisory services to the VRCs.

VRCs have enabled rural population to have access to quality health care. Apollo Hospital Ahmedabad provides teledermatology, tele-ophthalmology and tele pulmonolgy consultations to Gujarat VRCs. Health awareness programmes are also conducted by Apollo Hospitals. Tele-ophthalmology consultations provided by Tarabai

Desai Eye Hospital & Research Centre, Jodhpur is unique one with follow up free operations. MSSRF VRCs in association with Sankara Nethralaya also provide ophthalmology consultations. Tele health care programmes provided by Himalayan Institute Hospital Trust, Dehradun; Global Hospital, Mount Abu, Eras Medical College, Lucknow, and many others are the classic examples of usage of modern technology for the benefit of rural poor.

Vocational training, supplementary teaching on regular curriculum of school and colleges, Computer training etc. are conducted by Ramakrishna Mission, West Bengal; AMRITA Vishwa Vidyapeetham, Coimbatore and Indian Institute of Information Technology, Allahabad. Short term courses conducted by NCHSE in Madhya Pradesh on Remote Sensing and GIS to the planners, govt. officials and NGO representatives using the VRC network was well appreciated by many.

Convergence of VRC activities with other rural development initiatives, supported by other funding agencies like UNICEF, Azim Premji Foundation etc. are seen in School of Desert Sciences network in Rajasthan and MSSRF network in Tamil Nadu. This has helped in organizing a lot of activities towards improving health and sanitation system, health insurance, tele-education, capacity building etc.

VRC network has also witnessed a few National Virtual Congresses, wherein, many intellectuals, policy/decision makers, academicians, Govt. Officials and General public discussed various issues face to face from various corners of the country. National Virtual Congress on "Celebrating Women's Contributions to Safeguarding and Strengthening Ecological Security" organized as part of the First Indian Youth Science Congress; 'National Virtual Congress of Mahila Kisans' organized during 95th Indian Science Congress; Discussion on traditional herbal medicines etc. are some of them.

Some initial results/pointers, gathered through the activities of VRCs have been examined. Some of the interesting outcomes include farmers' motivation towards scientific advisories and consultations, school children getting enthused - resulting into improved performance, implementation of education and healthcare programmes of the Government, improved interest in legal guidance, Children benefiting from career guidance; treatment of patients for dermatology, ophthalmology and other problems and people getting cured of their problems after tele consultations at VRCs. People who attended skill development courses (which includes theory classes through VRC network and practical at nearby place) getting jobs or taking up own job; livestock advisories resulting into saving of cattle, poultry etc; agro advisories helping farmers in getting better production, adoption of new crops etc; use of natural resources data base at VRCs for wasteland reclamation, watershed development, extension of crops etc. However exact quantification of the benefits accrued has to be made.

At the same time, it is observed that some VRC clusters only are carrying out diverse programs/services and others are focusing on two to three services, while some does not carry out regular programmes. Use of Natural Resources data is also minimal. In many VRCs quality/adequate power (electricity) is not available. Manpower is also a matter of concern in some VRCs. Some Clusters are having sustainability plans while others yet to work on that. Efforts are made to address these concerns.

Future Plans

- Expanding the network requires additional satellite bandwidth, infrastructure, servers etc; ISRO is working in this direction. It is also proposed to set up an exclusive Content Server for storing and retrieving Programmes across the network.

- VRC programme will also become an integral part of the initiative ' Rashtreeya Gramin Gyan Abhiyan' (National Rural Knowledge Movement) to provide connectivity to all the villages in India, in which, it is planned to provide satellite based VRC connectivity to almost 4000 blocks (sub District level) by the end of 11th Five year plan. Further, the last mile approach to the panchayaths and villages will be achieved by other ICT means like wireless, community radio, cell phones etc. This is planned with the participation from, government, civil society organisations, bilateral and multilateral donors, private and academic sectors.

TECHNICAL SESSION-II

Knowledge Empowerment of Rural People: Issues and Policy Perspectives

Knowledge Empowerment for Rural People: Issues & Policy Perspectives

Prof. M.C. Varshneya

Vice Chancellor, Anand Agricultural University, Anand, Gujarat

Empowerment means developing the capacity of rural poor so they become competent decision-makers with the confidence to act on their choices.

Value-added information is knowledge. For example, information on world commodity prices, weather and input cost are not of much use to a rural woman unless it is provided at the local level that impacts her life. In other words, knowledge is generic information converted into a location-specific one. That is what adds value for the local people.

Knowledge revolution can lead to the enhancement of human productivity and creativity in every area of human endeavour. Knowledge is a key to economic, social and political development. Rural areas do not only require knowledge for agricultural production. They also need to know about markets, prices, alternate sources of income, organisation, and political rights. Rural areas are structurally disadvantaged in accessing knowledge. To empower them, they must be provided with knowledge efficiently.

Equipment like computers and innovations like the internet are important for facilitating the rural knowledge revolution. The government has included knowledge connectivity as an important component of Bharat Nirman. Since information, to be of value to rural women and men, should be location and time specific, the knowledge centre has to stress the need for converting generic into location specific information and for training local women and men in adding value to information. Value-added information is appropriately extended to as knowledge and 'Rural Knowledge Centres' to generate opportunities for educated youth in villages to find a career in knowledge management and dissemination. We should train at least a million rural knowledge managers during this decade.

Key challenges are low connectivity particularly in rural areas, low literacy, lack of skills competence to use the web and web based models to provide relevant information.

Therefore, Connectivity and content should receive concurrent attention. Constraints should be removed on the basis of a location-specific analysis. For example, wired and wireless technologies could be used where people are economically not technology or connections. Similarly, solar power can be harvested where the supply of power is irregular. The approach should be based on the principle that there is an implementable solution for every problem.

Knowledge Empowerment for Rural People: Issues & Policy Perspectives

Prof. M. C. Varshneya
Vice-Chancellor, Anand Agricultural University, Anand , Gujarath

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Obvious challenges are low connectivity particularly in rural areas, low literacy rate, lack of media competence to use the web and web function models to provide and target information.

Therefore, Connectivity and content should receive concurrent attention, Constraints must be removed on the basis of a malady-remedy analysis; for example, wired and wireless technologies could be used where telephone connections are not adequate or satisfactory. Similarly, solar power can be harnessed where the regular supply of power is irregular. The approach should be based on the principle that there is an implementable solution for every problem.

The information provided should be demand driven and should be relevant to day-to-day life and the work of rural women and men. Also, semi-literate women should be accorded priority in training to operate the centre, since this is an effective method of enhancing the self-esteem and social prestige of women living in poverty.

The local population should have a sense of ownership of the knowledge centre. It should be client managed and controlled, so that the information provided is demand and user driven. The local population should be willing to make contributions towards the expenses of the knowledge centre, so that the long-term economic sustainability of the programme is ensured. Contributions in cash or kind generate a sense of ownership and pride.

A national grid of virtual Universities/colleges devoted to harnessing in an integrated manner the internet, cable TV, community radio and the vernacular press for reaching every woman and man in our villages can play a critical role in triggering a knowledge revolution in rural India.

India is a land of small holdings. A small farm is ideal for sustainable intensification through eco-agriculture. A small farmer however suffers from many handicaps including access to technology, credit and remunerative markets. It is only by helping such farmers to overcome their handicaps that small farms can become instruments for an ever-green revolution, characterised by enhancement of productivity in perpetuity and without associated ecological harm.

The smaller the farm, the greater is the need for marketable surplus to derive some cash income. Our farm families can face the challenges of the new global trade regime only by achieving revolutionary progress in the areas of productivity, quality and diversity.

The benefits of the digital revolution will reach every country and every part of each country by the year 2015. It is plan to establish 100,000 ICT-based community service centres by the Department of Information Technology, Government of India. These community service centres will provide reliable broad-based connectivity to remote villages. We have found a methodology to make the achievement of such aims economically viable. For example, many of the STD-ISD/PCO centres in villages can be made knowledge centres; the panchayati raj institutions can be made use of.

Setting up village resource centres at the block level by the Indian Space Research Organisation (ISRO) in collaboration with appropriate public and civil society institutions to provide a wide range of services including tale-conferencing facilities.

What is important is to ensure that all such initiatives designed to help rural and tribal families are pro-poor, pro-women, and pro-livelihood in both design and implementation.

The relevance and timeliness of the content will determine the interest of rural families in ICT centres. The content should be demand driven and area, culture, and time specific.

Without proper infrastructure facilities like power, place of the centre, connectivity and computer related materials and human support the programme will not success. So before start the ICT education programme should make sure all these facilities.

Education and motivation of rural people about usages and benefits of ICT programme is an important aspect. Here, the role of Extension worker is vital. So first should provide clear knowledge to workers of the rural areas on the ICTs.

There are three main ingredients for success: First, the information or content that is provided must make a difference to the lives of the people in the village. It must be a powerful tool of information empowerment and education. Second, required infrastructure, this is obviously the government's responsibility and over 80 per cent of the country already has broadband, cable connections and so on. The last-mile connectivity can now be focussed on. Third, we must bring together all the on-going efforts for synergies. A common goal for all is crucial for the success of the Mission.

In Gujarat, Government has established knowledge centres at Panchayats of all the villages under its Ie-gram Vishwagram Yojana' wherein computer set-up with tutor has been developed. The internet connection has also been provided through GSWAN. Further, Government has also developed e-krishi kiran programme by involving the scientists of agricultural universities. The e-krishi kiran programme generates and provides the fertilizer recommendations on the basis of soil analysis and the nutrient requirements of the crop for each field. This will increase the efficiency of the fertilizer and also saves consumption of the fertilizer. Moreover, farmers can excess individual soil health card, village soil health card, crop-wise fertilizer recommendations, ready racknor for calculating the quality of fertilizer, alternative crop planning and its economic, package of practices for existing crops and recommended alternative crops etc. according to their local agro-climatic condition. To make it all easy, Government of Gujarat has also made the computer education compulsory at the primary school, which will increase the skill of computer use in a couple of years among the rural people. The subsidy schemes are also launched for poor / student for the purchase of computer. Thus, many folds efforts are done for the knowledge empowerment of rural people.

Transforming Our Villages into Knowledge Hub- Role of Fisheries and Aquaculture

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India is the second largest fish producer in the world and due to enormous aquatic resources, both biotic and abiotic, fisheries and aquaculture sector in India is poised to play a pivotal role in the economic welfare of the country, especially in the context of food and nutritional security and sustainable rural livelihood development. However, like any agriculture production, sustainable fisheries and aquaculture development is information-dependent and knowledge-intensive. All aspects of fisheries rely on continuous flow of dynamic information related to meteorological, geographical, technological practices and innovations, environment, market and management. Unlike other agriculture and animal husbandry-related professions, fishery involves inherent risk associated with deep-sea as well as inland fishing which also require equipping with adequate sea safety and professional hazard management information and skill. Besides, it is the extremely poor, disadvantaged, highly unorganized communities – the fishing communities who live in far flung, difficult to reach terrain and most vulnerable to natural disasters like cyclone, flood and drought. It is also realized that the looming danger of climate change and consequent sea level rise is going to affect the fishing communities especially those living in developing world, and they are most vulnerable because they lack adaptive capacity. Health care-related information and facility is another serious concern in the fishing community. On the other hand Asia being the origin and current hub of fisheries and aquaculture, the region has vast localized indigenous knowledge reserve being practiced in isolated pockets by local communities. Such knowledge resources are yet to be shared and benefited by majority of fishers and farmers. Therefore, easy access to information as well as sharing of information and knowledge coupled with rapid communication would be of immense help not only for sustainable resource use and livelihood development but also to save the lives of millions of fisher folks. Further, unlike other sub-sectors of agriculture, there is a lack of efficient extension mechanisms in the field of fisheries and aquaculture. Aquaculture is rapidly growing from subsistence level to intensive and commercial scale and as such it has to depend on quick and updated information delivery on indigenous practices to contemporary farm management, disease control measures, usage of various chemicals and nutritional supplements, hatchery management and seed production, environmental well-being to conservation of aquatic biodiversity, etc.

It is lately but increasingly being realized that for sustainable development of agriculture and its subsidiary-based rural livelihoods it is important that we need to

follow a holistic approach to development which may harness the potential of complementarities between various farming components being practiced at farm household / watershed / ecosystem levels. Again, in the current era of global market regime there are a number of external factors which influence even local level practices and production. In the globalized context, information and knowledge on market drivers, regulations and guidelines of international instruments which deal with the global trade of aquatic organisms are paramount. Information and knowledge on intellectual property is another vital area. Although globalization put forth various regulatory burden and constraints to fisheries and aquaculture development in developing countries, success of fisheries and aquaculture in today's world relies on translating those challenges into opportunities. Information and knowledge on productivity enhancement and quality improvement, employment availability and market-driven entrepreneurship development opportunities are some of the key areas. Apart from these, access to various generic or routine information- and knowledge-base and its retrieval, access to connectivity and networking will play crucial role in village community empowerment where community would be benefited not only from the national information resources but from regional as well as global resources. However, for the Indian rural population, accessibility of information and knowledge alone will be meaningless, unless it is supported by the creation of functional literacy to the rural folks. This should be supplemented by creation and consolidation of knowledge-base and capacity building. This capacity would be useful not only as a tool of implementation but should be looking at capturing and translating the international knowledge into locally useful knowledge, as many of the technologies or information is time- and location- specific. Value addition of information would be the key in this context. To realize this, it is essential to create knowledge hub in our fishing and aquaculture villages to make available and disseminate basic and applied knowledge which are locally relevant. The knowledge hub can also participate in knowledge creation and act as reservoirs of expertise. Transforming our villages into knowledge hub is essential to mainstream and empower the rural community which is an integral component to achieve an inclusive growth and development for our country. However, this is also to be kept in mind that the users will not keep themselves confined to information related to fisheries and aquaculture alone. In the globalised world they are also likely to see their livelihood options beyond agriculture and its subsidiaries. When they will see that there is no parity between agriculture, industries and service sector they will also tend to move to sectors where they are likely to be more secured, comfortable and draw more benefit.

Knowledge Empowerment for Rural People : Issues and Policy Perspectives

Dr. P. Murugesa Boopathi
Vice Chancellor, Tamil Nadu Agricultural University, Coimbatore

Agriculture is becoming more and more knowledge intensive and market driven. In knowledge driven empowerment, there is a need for providing extension services and educating the farmers keeping in view their diverse needs not only on production procedures but also on the whole range of agribusiness, research institutions, programmes and schemes of the development departments, open markets both at domestic and global scale.

The major issues in rural knowledge empowerment are :

- Creating an awareness on the need for knowledge based decision making
- Affordable timely access to the modern ICT tools
- Private sector participation and investment
- Networking of knowledge platforms for effective delivery systems
- Providing end to end solutions through multiple e-ways
- Government support in the form of extended soft loans for massive infrastructure building in collaboration with the local partners

TNAU has made great strides in empowering the rural masses, through the following initiatives.

Krishi Vigyan Kendras : There are 30 KVKs spanning all the districts of Tamil Nadu. They impart knowledge to the farmers by means of field level demonstrations, On Farm trials, Exhibitions, Kisan Melas, Trainings on ICT, Exposure Visits, etc.

e-Velanmai : A pilot research scheme is operated where the farmers could get the advisory services immediately through the use of information technology. The Public model of e-velanmai was implemented in 75 farms, 25 each in Palar, Aliyar and Varahanadhi sub basins. The paid model has been implemented at different sub basins in the State since 2008. The farmers get technical assistance as well as they get trained in use of ICT tools.

Market Intelligence Cell : The Domestic and Export Market Intelligence (DEMIC) cell provides forecasts of prices on different commodities even before sowing is taken up and also prior to harvest. The information is also used by the farmers,

policy makers also traders. DEMIC has so far made 60 price forecasts of different commodities and the results have been published in seven English dailies and six Tamil dailies for 13 important commodities like maize, cotton, turmeric, groundnut, gingelly, tomato, chillies, vegetables etc. The price forecast and price information published by DEMIC have been surfed by 44607 stakeholders through DEMIC website (www. tnagmark .tn.nic.in). Efforts are being made to provide price forecast through mobile phones to stakeholders.

Dynamic Market information Service for Agri-Horti produces : The project collects market price of 152 commodities (both whole sale and retail) from 13 markets of South India and publishes in the website (www.tnau.ac.in and www.indg.in) by 1.00 pm daily. The project also disseminates this data to registered farmers over the mobile. This helps the farmers in deciding the market place for their produce.

TNAU Agri Tech Portal : This is a technology portal on farming, to integrate Agriculture, Horticulture, Sericulture, Seed, Marketing, Fisheries, Forestry and Animal Husbandry. It is a dynamic and multimedia based portal for the benefit of field extension officials and farmers both in Tamil and English, covering around 75000 web pages. The launch is scheduled in August 2009. The process of connecting TNAU centres (34 research stations, 14 KVKs, 8 academic campuses and 4 Plant Clinic Centres) is in progress.

Expert System : The project aims at development of expert systems for crop and animal enterprises facilitating instant decision-making process of the farmers through ICT enabled mechanism. Five important crops have been identified; they are Paddy, Ragi, Sugarcane, Coconut and Precision Farming Technology for Banana. The animal enterprises include management of important diseases and nutritional disorder of Dairy cow, Sheep, Goat and Poultry birds. The expert system will also be synergized with the existing KVK e-linkage system for its implementation.

Agriclinics and agribusiness centres : The University implements the GOI sponsored which focuses on training the unemployed agriculture graduates to offer private extension consultancy services hither to dominated by local traders and agents. . Tamil Nadu Agricultural University has so far trained 102 Agrl.Graduates out of whom 42 have started Agriclinics and Agribusiness centres and other related ventures.

Community radio: The TNAU, Community Radio Station which has the coverage of 15 to 20 km, has the feature of 'e' component in it and hence the broadcast programme is integrated into the e – Extension network. So far 120 programmes have been prepared on various aspects of farming, programmes implemented and success stories.

Weather Advisory services : Short term weather forecasting messages are directly disseminated to the farmers through various media. This helps the farmers in deciding the farming operations promptly and precisely. Automatic Weather Station (AWS) is provided for all the 385 blocks of Tamil Nadu under Weather Forecast Insurance Scheme. In the First phase, AWS has already been installed in 224 blocks.

Open and Distance Learning : The Centre presently offers three P.G. Courses, 3 P.G. Diploma Courses, 21 Certificate courses in Tamil and 9 Certificate courses for urban dwellers in English. Farmers can enrol for various certificate programmes in tamil.

Policy Perspectives

- Regional priorities in agriculture and allied sectors are to be identified in participation with the local rural people and these has to be given due importance in implementation.
- Promotion of commodity groups for strengthening the technology transfer efforts as well as market led production.
- Effective utilization of services of organised local groups like Self Help Groups for knowledge delivery through series of purposive trainings.
- Promotion of private sector investment and participation in knowledge dissemination through ICT tools. Projects should be on a public private partnership module so that high end technologies reach the last mile in a sustained basis.
- Strengthening researchers-extension workers-farmers interface for effective dissemination of technologies.
- Efforts are to be made to provide information on various development programmes of the Government related to agriculture and allied sector as to access and realise the benefits of the programmes. Use of mobile services for such efforts would make the reach faster and fruitful.

The State Agricultural University located all over the country develop many crop production and post harvest oriented technologies. The rich knowledge developed has to be transferred to the farmers who are the end users. Development of such a knowledgeable and resourceful rural population is imperative to overcome the agricultural stagnation that the country faces today. Unless knowledge awareness is created among rural population the entire research and education infrastructure as well as human resource so far developed will be ineffective.

TECHNICAL SESSION-III

Rural Knowledge Management through Stakeholders Partnership and Interventions

Importance of Public – Private Partnership in Rural Knowledge Management: Some Ideas

Prof. C. S. Chakrabarti
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Agriculture is the backbone of Indian society. Although from the point of GDP Agriculture is behind Services and Industries but from the point of involvement of man power this is the largest sector. About 70 crores of Indian populations at present are directly or indirectly engaged in agriculture.

At this moment Indian agriculture is in crisis for a number of reasons. Productivity has gone down for many crops. To revamp agriculture a total farming integrating crops and non crops (Livestock, Fisheries, Animal Husbandry) in any suitable combination is essential.

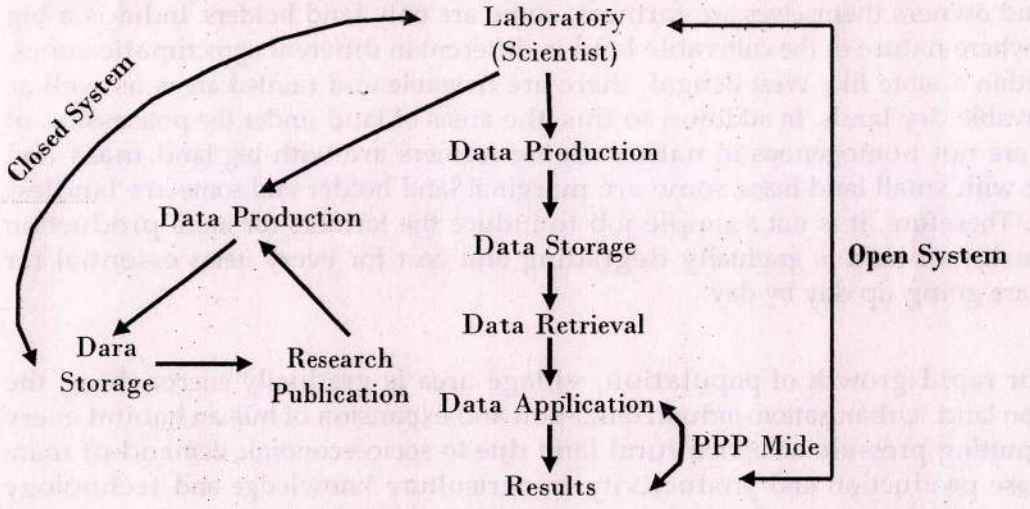
Throughout India most of the agricultural lands are with private owners. Many of the land owners themselves are farmers, some are only land holders. India is a big country where nature of the cultivable land is different in different agrocrimatic zones. Even, within a state like West Bengal, there are irrigable and rainfed areas as well as non cultivable dry lands. In addition to this, the areas of land under the possession of farmers are not homogenous in nature. Some farmers are with big land mass and some are with small land mass, some are marginal land holder and some are landless labourer. Therefore, it is not a simple job to induce the farmers for more production where quality of land is gradually degrading and cost for every items essential for farming are going up day by day.

For rapid growth of population, village area is gradually encroaching the cultivation land. Urbanisation, industrialization and expansion of human habitat every thing is putting pressure on agricultural land due to socio-economic demand of man. To increase production and productivity in agriculture knowledge and technology evolved in the laboratories should be transferred to the field and laboratory should design their research works as per need of the farmer. The common slogan from lab to land be made a practical one by implementing this properly.

In this process of transfer of technology telecommunication, teleconferencing may be very useful mechanisms. By this mechanism the villages may be converted into knowledge hubs.

To achieve such goal the recommendation of Knowledge Commission regarding knowledge network may be taken into consideration.

- To utilize the potential of institutions engaged in generation and dissemination of knowledge in various areas, it is important to connect them through a high-speed broad band network.
- The primary objective is to interconnect all our knowledge institutions in various fields, at various locations throughout the country, through an electronic digital broadband network with adequate capabilities and access speed to encourage sharing of resources and collaborative research.
- The purpose of such a knowledge network goes to the very heart of the country's quest to build quality institutions with requisite research facilities and to create a pool of highly trained persons.
- The Knowledge Network should be owned by the SPV consisting of major stakeholders. Government ownership is not desirable, despite the fact that substantial funding will be from the Government.



A Scheme for Networking and Management

Knowledge Commission about Agriculture

Enhance and regulate the role of private players in agricultural extension delivery

The existing multi-agency and multi-media extension strategies need to be coordinated, with some integration and interaction on content between various

extension providers such as farm, schools, information kiosks, web-based providers, kisan call centre, agri-clinics, mass media etc.

Create a web-enabled knowledge bank on all aspects of agriculture.

Such a knowledge bank should strive to include all traditional knowledge that is credible prima facie or validated, all modern knowledge generated by research over the years with location specific features highlighted and appropriate information on post harvest and value addition aspects.

Knowledge Commission on Enhancing Quality of life.

Knowledge Commission recommend that every block in the country should have at least one Panchayat Gyan Kendra (PGK). The PGK can become a resource centre to demonstrate best practices, evolve local solutions and save as a training institution.

Proper maintenance of such a system is very difficult in our country because large portions of the agrarian society are illiterate or poorly illiterate. Therefore a proper management system or a backup system should be developed for proper maintenance of the system.

Experiences of Stake Holders Participation in Knowledge Management

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Abstract

The traditional three factors of production –Land, Labour and Capital have become easier to handle in 21st century but the fourth factor is increasingly becoming a hurdle or bottleneck for growth, this is "Knowledge". It is at the heart of much of today's global economy and managing knowledge has become vital for success.

The paper attempts to share the experiences of Agri Business and Export Knowledge Centre, (ABEKC) in knowledge management in the area of production and marketing involving farmers, government agencies and scientific community. The ABEKC within a short period of time has been able to initiate a large number of diversified activities through participatory mode. Farmers were following pre-harvest contract method in most of the fruit crops for disposing off their produce resulting in low returns for the efforts made. In this regard the centre sensitized the Mango growers in Dharwad district and as a result "Sufal Mango Growers Association" was established and registered on 28/4/2007. The farmers are now procuring inputs collectively, sharing knowledge about production practices besides marketing strategies. Meetings are held on the farm along with scientists. Knowledge is also passed on to the farmers through monthly bulletins, mass media and handouts. This information flow has increased the yields of mango considerably. Apart from this, the system also helped the farmers to sell their mango fruits directly to the consumers in the vicinity of Hubli-Dharwad cities at a lower cost in cardboard boxes by eliminating the intermediaries.

Sufal Pomegranate association in Bagalkot was also initiated under the guidance of the centre. The centre has made concerted efforts in organizing awareness seminars on production technology and succeeded in inviting exporters from Mumbai and Pune for procurement of fruits from Bagalkot area. The competition among the export firms coupled with good quality fruits meeting the export standards led to substantial increase in the price level and thus enhanced the income of the farmers. The ABEKC has acted as a liaison agent in planning for the creation of "Cold Chain Facility" in collaboration with VITC, Bangalore , KAPPEC , Bangalore ,Sufal Mango Growers Association and Sufal Pomegranate Association, Bagalkot at Dharwad and Bagalkot districts for the benefit of farming community. The Centre has taken a lead and organized seminars, group meetings and field meetings in collaboration with APEDA, KAPPEC, Visveswaraya Industrial Trade Centre (VITC), Dept. of Horticulture etc. Knowledge was also shared through articles published through magazines and news papers in local language for the benefit of farming community. Even the latest information is also made available through the website in the form of message and farmers corner. The All India Radio (AIR) and FM Radio of the University are also utilized to reach the farmers in remote rural areas. The website (www.uasd.edu) provides information about the centre and other information like commodity profiles, news, seminar, etc. Provision is also made for buyer-seller meet through internet for trading activities of agricultural commodities directly. Forecasts relating to crop scenario on production and marketing are also furnished in the website. It is a welcome feature that some farmers sent their enquiry through mails.

Background

At various stages of civilization over the past five thousand years, successions of factors have formed bottlenecks on the efficiency of human beings, threatening to

repress the growth of civilization. Up to the end of 1800s, limits on amount of available arable land caused problems as populations were growing and there were more mouths to feed. Then as large-scale manufacturing came into existence, urban labours became the most valuable asset. Following technological breakthroughs, machinery came into picture of production and it began to improve the automation and industry had no longer to depend on labors to that extent. But due to investment in machinery, capital became all-important. Controlling flow of capital was foremost problem for the industrialists at that time and suddenly capital became the bottleneck to efficiency.

The traditional three factors of production – Land, Labour and Capital – have become easier to handle in 21st century, a fourth factor is increasingly and fast becoming a hurdle or bottleneck for companies to grow. This is "Knowledge", which is at the heart of much of today's global economy and managing knowledge has become vital for companies success. Knowledge can be defined as a fluid mix of experience, values, contextual information and expert insight that provides a framework for evaluating and incorporating new experiences and information. Knowledge is information in action. Knowledge is what people in an organization know about their customers, products, processes, mistakes, and successes. Unlike the conventional Material assets, which decrease as they are used, Knowledge asset increases with use; Ideas breed new ideas, and shared knowledge stays with the giver while it enriches the receiver.

Types of Knowledge

a) **Explicit knowledge:** It is the visible knowledge available in the form of letters, reports, memos, literatures, etc. Explicit knowledge can be embedded in objects, rules, systems, methods etc.

b) **Tacit knowledge:** It is highly invisible and confined in the mind of a person. It is hard to formalize and therefore, difficult to communicate to others. A master craftsman after years of experience develops a wealth of expertise 'at his fingertips'. But he is often unable to articulate the scientific or technical principle behind what he knows. Transformation of knowledge from tacit to explicit form increases its usability and visibility. Capturing the experts Tacit Knowledge that resides within him in the form of Knowledge Management is a process that, continuously and systematically, transfers knowledge from individuals and teams, who generate them, to the brain of the organization for the benefit of the entire organization. It is the systematic, explicit, and deliberate building, renewal, and application of knowledge to maximize an enterprise's knowledge-related effectiveness and returns from its knowledge assets.

The value of knowledge assets

– Knowledge assets are often described as the intellectual capital of an organization

- The value of intellectual capital is often intangible
- A popular measure is the difference between the cost of capital assets and the cost of replacing them

What is knowledge management?

We define knowledge management as a business activity with two primary aspects:

- Treating the knowledge component of business activities as an explicit concern of business reflected in strategy, policy, and practice at all levels of the organization.
- Making a direct connection between an organization's intellectual assets - both explicit (recorded) and tacit (personal know- how) - and positive business results.

In practice, knowledge management often encompasses identifying and mapping intellectual assets within the organization, generating new knowledge for competitive advantage within the organization, making vast amounts of corporate information accessible, sharing of best practices, and technology that enables all of the above - including groupware and intranets. That covers a lot of ground. And it should, because applying knowledge to work is integral to most business activities.

Knowledge management is hard to define precisely and simply. (The definition also leapfrogs the task of defining "knowledge" itself. We'll get to that later.) That's not surprising. How would a nurse or doctor define "health care" succinctly? How would a CEO describe "management"? How would a CFO describe "compensation"? Each of those domains is complex, with many sub- areas of specialization. Nevertheless, we know "health care" and "management" when we see them, and we understand the major goals and activities of those domains.

The value of Knowledge Management

It is important to manage knowledge assets because –

- Organizations compete increasingly on the base of knowledge (the only sustainable competitive advantage, according to some)
- Most of our work is information based (and often immersed in a computing environment)
- Our products, services, and environment are more complex than ever before
- Workforces are increasingly unstable leading to escalating demands for knowledge replacement/acquisition

Why we need knowledge management now

Why do we need to manage knowledge? Ann Macintosh of the Artificial Intelligence Applications Institute (University of Edinburgh) has written a "Position Paper on Knowledge Asset Management" that identifies some of the specific business factors, including:

- Marketplaces are increasingly competitive and the rate of innovation is rising.
- Reductions in staffing create a need to replace informal knowledge with formal methods.
- Competitive pressures reduce the size of the work force that holds valuable business knowledge.
- The amount of time available to experience and acquire knowledge has diminished.
- Early retirements and increasing mobility of the work force lead to loss of knowledge.
- There is a need to manage increasing complexity as small operating companies are trans-national sourcing operations.
- Changes in strategic direction may result in the loss of knowledge in a specific area.
- To these paraphrases of Ms. Macintosh's observations we would add:
- Most of our work is information based.
- Organizations compete on the basis of knowledge.
- Products and services are increasingly complex, endowing them with a significant information component.
- The need for life-long learning is an inescapable reality.

In brief, knowledge and information have become the medium in which business problems occur. As a result, managing knowledge represents the primary opportunity for achieving substantial savings, significant improvements in human performance, and competitive advantage.

Roadblocks to adoption of knowledge management solutions

There have been many roadblocks to adoption of formal knowledge management activities. In general, managing knowledge has been perceived as an unmanageable kind of problem - an implicitly human, individual activity - that was intractable with traditional management methods and technology. We tend to treat the activities of knowledge work as necessary, but ill-defined, costs of human resources, and we treat the explicit manifestations of knowledge work as forms of publishing - as byproducts

of "real" work. As a result, the metrics associated with knowledge resources - and our ability to manage those resources in meaningful ways - have not become part of business infrastructure. But it isn't necessary to throw up one's hands in despair. We do know a lot about how people learn. We know more and more about how organizations develop and use knowledge.

The body of literature about managing intellectual capital is growing. We have new insights and solutions from a variety of domains and disciplines that can be applied to making knowledge work manageable and measurable. And computer technology - itself a cause of the problem - can provide new tools to make it all work.

Limitations of mechanical KM

- Reliance on technology produces consensual knowledge (over-reliance on best practices for instance) and may stifle innovation
- The notion that 'right information' is predictable and flows from historical data may be flawed
- Making information available in not enough; getting people to use it is more critical

Experiences of the Agribusiness and Export Knowledge Centre , UAS, Dharwad in knowledge management

The centre within a short period of time has been able to initiate a large number of diversified activities keeping in view the objectives set for the centre. Following are some of the important interventions in the area of production and marketing through knowledge sharing.

1. Formation of consultative/core committee

A consultative committee /core committee was formed within the University representing senior officers, scientists from various disciplines of Horticulture, Plant Pathology, Entomology etc through planning a roadmap, synthesizing data collected from multiple sources, presenting findings in consultative workshops and steering committee meetings and drafting the policy and the perspective plan.

2. Organization of producer associations

The centre took a survey of the area under the jurisdiction of the university comprising of twelve districts of Northern Karnataka and the crops grown which have the potential for exports. To begin with, a few location specific areas and commodities were concentrated in view of the fact that the technical man power has been limited. Following are the producers associations organised

A. Sufal Mango Growers Association, Hubli

In Northern Karnataka, the important districts growing fruit crops are Bijapur (19,007 ha), Belgaum (9,134 ha), Haveri (6,496 ha), Bagalkot (5,147 ha) and Dharwad (4,927 ha). The important fruit crops like Grape, Mango and Pomegranate are extensively grown in Bijapur & Bagalkot districts. Mango is being cultivated in Haveri, Dharwad & Belgaum districts on large areas. Under the present situation, the cultivation of these fruit crops in all these districts is gaining lot of importance. As a result of this, area under these fruit crops has been increasing. On the other hand these fruits are being highly perishable in nature with lower shelf life period; farmers are experiencing greater problems in marketing of these fruits. Presently for all fruit crops farmers are following pre-harvest contract method for disposing off their produce. Under this process of marketing, farmers are not realizing better returns to the efforts made. In addition to this, currently no alternative marketing practices are available to take up the sale of these fruits. In this regard a beginning was made by the Agri Business & Export Knowledge Centre, UAS, Dharwad to sensitize Mango growers in Dharwad district. As a result of this "Sufal Mango Growers Association" was established and registered on 28/4/2007. With a series of discussions relating to the purpose of the association, critical interventions were designed and executed. The members of the association sold their fresh Mango fruits to the processing unit namely Exel Fruit, Hubli & Co-operative Mango Processing Unit, Varana, Maharashtra. By selling through this method, farmers have eliminated pre-harvest contractors and wholesalers. With this method, on an average, farmers realized Rs.18,000 to 20,000 thousand per tonne of mangoes. While, before this intervention farmers were obtaining on an average Rs.10,000 to 12,000 per tonne of mango from contractors and wholesalers. Hence, direct marketing channel had helped the mango association members to improve their income level to the extent of additional benefit of Rs.6, 000 to 8,000 per tonne. Small farmers (less than 50 mango plants) and large farmers (more than 200 mango plants) were accepted as the members of the association which speaks of social inclusion. Moreover, there were some women members who were actively involved in the interactions with regard to knowledge management.

B. Successful Intervention in pomegranate marketing

Another successful venture of the Centre has been in marketing of pomegranate in Bagalkot area which is a predominantly pomegranate growing area. A growers association in the name of Sufal was organized at Bagalkot. Hitherto, there were few buyers who used to procure fruits at lower prices. The Agri Business & Export Knowledge Centre has made concerted efforts and succeeded in inviting exporters from Mumbai and Pune for procurement of fruits from this area. The competition among the export firms coupled with good quality fruits meeting the export standards led to increase in the price level from Rs.45 per kg of fruits to Rs.65 per kg thus enhanced

the income of the farmers. The efforts of the Agri Business & Export Knowledge Centre has been greatly appreciated and applauded by the farmers. The president of the pomegranate growers association put this fact on record through his appreciation letter written to the University.

2. Direct selling to consumers

Apart from this, the system also helped the farmers to sell directly their mango fruits to the consumers in the vicinity of Hubli-Dharwad cities in packed cardboard boxes of two dozens for sale directly to consumers at a lower cost. The mango boxes of two dozen were sold for Rs.300 to 450 through the Agri Business & Export Knowledge Centre as well as directly from the farmer's residence and farms. This direct selling of mangoes has been experimented on a pilot basis and has worked successfully. Further, the packing boxes were manufactured by a near by industrial unit at a reasonable price resulting into forward market linkage in mango marketing. Thus it paved the way for income generation on one hand and employment generation on the other hand.

Two sale outlets in Dharwad and Hubli cities were opened besides selling through the Agri Business & Export Knowledge Centre, University of Agricultural Sciences, Dharwad as a pilot effort to popularize this method without expecting any margin of profit for the service rendered. This mechanism helped the consumers by getting them good quality mangoes and they made repeated purchases which reflected indirectly the satisfaction of consumers.

3. Rejuvenation of sick industry

A sick pulp making industry at Anawatti, Shimoga district was also reviewed by providing share capital by the farmers of the area who are growing mango and pineapple. A linkage with a MOU has been established between the INFAM and KAMPCO, to have a joint management of the factory which has been in operation for the last few decades and established a good credibility and market but suffering from capital requirement. Due to the joint efforts of the ABEKC and INFAM, farmers contributed capital and loan to review the working of the factory to its fullest capacity and will be managed jointly by the farmers and a few directors of the factory. The selfless efforts by the Agri Business & Export Knowledge Centre and NGO have been greatly appreciated by the farmers and others in the area.

4. Organic Certification

During the interactions of stakeholders with the ABEKC scientists, the farmers showed keen interest in organic certification of their farms realizing the importance of the organic concept in the present situation. Hence, the Centre suggested them to go for group certification instead of individual certification to minimize the cost of

certification since it may not be affordable to the farmers for individual certification. In this regard, around 30 farmers belonging to Sufal Mango Growers Association were provided with organic certification from National Organic Certification Association (NOCA), Pune and the Certificates were distributed to the farmers at Agri Business and Export Knowledge Centre on 16-04-2009. The Centre is also making efforts to get the farms certified as 'EURAP GAP' at lower costs through group certification mode which is helpful to farmers and certification agencies. This would enhance the export potential of crops and attract the exporters.

5. Transfer of Technology

Every month the meetings are held in the fields of farmers. During the interactions, there is lot of technologies being transferred in either side. The information regarding what to produce, how to produce, where to sell, prevailing price, value addition etc are being discussed for the benefit of the stakeholders. Knowledge is also passed on to the farmers through monthly bulletins, mass media and handouts. This information flow has increased the yields of mango considerably. A farmer whose mango orchard yielding 0.5 tonnes per hectare in the past is yielding about 2.00 tonnes per hectare of mangoes due to active participation in the interactions carried out and the light of information gained in the influence of knowledge dissemination.

6. Inter-institutional linkages

The Centre has been making all out efforts to establish a close network of various institutions both government and non-government so as to have mutual benefits in the promotion of production and marketing of agricultural commodities. The Agri Business & Export Knowledge Centre has been acting as a liaison agent among the various institutions. The Agri Business & Export Knowledge Centre has taken a lead and organized seminars, group meetings and field meetings in collaboration with APEDA, KAPPEC, Karnataka State Tur Development Board, Visveswaraya Industrial Trade Centre, Department of Agriculture, Department of Horticulture, Karnataka Chamber of Commerce and Industry , Certification agencies etc. in different areas of the northern part of Karnataka. Through these initiatives the various development departments were able to channalize their innovative schemes and funds for the welfare of target areas and groups in the field of agriculture and agro-based industries. Many of the development institutions have come forward to extend financial and technical support for development activities in production, marketing and value addition fronts.

7. Awareness through mass media

The Centre is propagating the benefits of good quality products and marketing opportunities including export through commodity wise profiles in Kannada language and distributing them free of cost to the farmers. Articles are also published through

magazines and news papers for the benefit of farming community. Even the latest information is also made available through the website in the form of message and farmers corner. The All India Radio (AIR) and FM Radio of the University are also utilized to reach the farmers in remote rural areas.

8. Creation of Web site (www.uasd.edu)

The website provides information about the centre and other information like commodity profiles, news, seminar, etc. Provision is also made for buyer-seller meet through internet for trading activities of agricultural commodities directly. Forecasts relating to crop scenario on production and marketing are also furnished in the website. It is welcome feature that some farmers sent their enquiry through mails.

9. Infrastructure creation

ABEKC has acted as a liaison agent in planning for the creation of "Cold Chain Facility" in collaboration with VITC, KAPPEC and Sufal Mango Growers Association at APMC ,Hubli for the benefit of farming community. Creation of a "Pack house" in Bagalkot for the pomegranate farmers to avail remunerative prices for their produce has been planned. The total capital outlay has been estimated at Rs.22 Crores and already the sanction has been issued by the funding agency.

10. Conclusion

The ABEKC, Farmer's Associations and Government organizations have joined hands to share the knowledge and capital to mange the upcoming activities in Northern Karnataka especially in the area of transfer of technology, infrastructure creation and marketing. The knowledge sharing has been yielding positive impacts on the farming community of this area. The efforts of the ABEKC have been recognized by the farmers, public, government and non-government organisations reflected through their appreciations and awards.

Transforming Indian Villages into Knowlede Hub

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The salvation of India lies in the cottage—M. K. Gandhi

As we know that our country is consisted of about 5,67,338 villages out which there are about only 2/3 of village panchayats existing which clearly indicates the population is scattered in nature. The population of India has already crossed 1.02 billion last year. This alarmingly increasing population is putting great pressure on the food grain production of the country.

Our country achieved marvelous success in food grain production in recent year started with a bare 51 million tonnes in 1951-52 and reached 208 million tonnes in 2002. It is estimated that India would need to produce an additional 50 million tonnes of food grain by 2010 AD to feed its anticipated population in that year. This is a major challenge not only for policy makers but more directly to Agricultural scientists and Extension workers also. On analyzing the crop production data of previous years, it can be easily to be understood that average yield of almost all the crops are far below as compared to the actual yield potential. The main reason behind this is the low adoption of new technology by the farmers.

Keeping the above fact in mind, it is a top priority to transfer available technology to the farmers. Transfer of technology is a crucial prerequisite for widespread and sustainable agricultural development. It is high time to make villages as knowledge hub for transfer of technological know how for stake holders and the peasantry.

Transfer of technology

Transfer of technology is the spreading of technology from one place to another and transfer of agricultural technology is the dissemination of agricultural technology from research station to farmers' field.

Technology may be defined as a whole mass of knowledge and experience relating to a product or process.

Classification of Technology

(1) **Biological Technology-** includes cropping systems; rainfed farming systems, intercropping practices and mixed farming.

(2) **Chemical Technology-** includes chemical fertilizers, herbicides, fungicides, hormones and growth regulators.

(3) **Mechanical technology-**includes tractor and tractor drawn implements, improved drills, power sprayers, dusters, machines and threshers.

(4) **Emerging Technology-**includes IPM, INM, scientific water technology, integrated post harvest technology, energy efficient farm machinery and equipments, soil health care on system basis and other plant and animal based technologies.

Another type of Classification of Agricultural Technology

(1) In The Physical Sense Agril. Technology Is Generally Of Three Types

1. Out put increasing technology -e.g. improved seed
2. Factor saving technology -e.g. improved machine
3. Factor using technology -e.g. improved fertilizer formula

(2) In The Financial Sense Agri. Technology Is Of Four Types

1. High cost
2. Medium cost
3. Low cost
4. No cost

The effectiveness of Transfer of Technology(TOT) is greatly influenced by the extent of functional linkages between and among four systems, namely Research system, Extension system, Client system and Support system.

- **Research System-** It takes care of the production technology. Its output becomes the input of technology utilization system. A process of feedback should operate at all levels. Structurally this system consists of Agricultural Universities, Research Institutes, Centers of ICAR and other organizations, which create new knowledge and innovations through applied research.
- **Extension System-** It comprises change agents, extension personnel belonging to Government and Non Governmental agencies which act as link between research and client system. The extension system establishes direct contact with farmers in person, in-group or through indirect media like newspapers, magazines, leaflets, radio, television, etc.
- **Client System -**It is the technology utilization system consists of ultimate users of technology. This term refers to farmers of all categories.
- **Support System-**It provides required input and manages agricultural output. It consists of Government as well as private agencies, dealing with credit and input supplies such as cooperatives, banks, agro industries etc. and those agencies dealing with processing and marketing and private agencies.

Characteristics of good Technology

An innovation is an idea, practice or object perceived as new by individual. The speed of transfer of new technology or the adoption of new idea is deperding partly on the characteristics and nature of the technology. Certain farm practices have natural characteristics, which speed their rate of adoption; other types may have retarding factors.

1. **Cost:** New technologies that are high in cost generally tend to adopt more slowly. The farmers may adopt less costly idea as it involves less risk.
2. **Complexity**: The new idea that are relatively simple to understand and use will generally be accepted more quickly than more complex e.g., seed treatment, mushroom cultivation.
3. **Visibility**: New technology will generally be adopted more quickly, if it is visible. e.g., effect of nitrogen fertilizer.
4. **Compatibility**: New technology will be adopted more quickly, if it is friendly with farmer's attitude, ability, interest and past experience.
5. **Utility**: If a new practice is viewed as major improvement over existing method it is likely to adopt rapidly.
6. **Group Action**: Some technologies require group adoption other may be accepted on an entirely individual basis e.g., control of locust.
7. **Profitability**: Some ideas or technologies are more profitable which tend to fast adoption.
8. **Special Advantageous**: Some ideas have special advantage e.g., early variety- in rain fed condition early variety of crop will be adopted very fast.
9. **Availability**: Easily available technology will be adopted very fast. e.g., seed as compare to tissue culture seedling.

Strategies to Transform Indian Villages into Knowledge Hub

Though there is an incensement in per capita availability of food grain in India, there is no surety of filling the number of empty stomachs multiplied in the new millennium. Unless we concentrate our efforts in this area, the shortage of the food is likely to be one of the greatest problems in the years to come. To achieve best result from the agriculture, Indian farmers will have to make best use of available modern high production oriented agricultural technologies. It is said that out of available technologies with research system, only thirty per cent have been transferred or reached

up to the client system. Therefore some suggestions have been made here in existing system of TOT to accelerate rate of adoption of agricultural technology. It has been told by **Bill Gates** that **"Knowledge is power"** likewise in case of agriculture everyday the innovation is taking place at the globe so the village will have to cope up with these innovations to reap the rich harvest in their own enterprise.

Following are the steps to be considered for making villages into knowledge hub.

1. Satellite *Krushi Gosthi* should be made available at village level

Satellite Krushi Gosthi is an interactive live telecast programme with one-way video and two-way audio linkages. It enables the farmers sitting in the receiving station of a remote area of the state to clarify their doubts and to interact with the scientists sitting in the central studio at Gandhinagar or state capital. The limiting factor of existing system is that very few numbers of receiving centers are established all over state. To establish receiving center, facilities like television, dish antennae and telephone connection are needed. Thus, in rural areas also it is possible to start such kind of receiving centers with the help of cooperative societies or gram Panchayats or farmer's organisations. So it is suggested that such kind of reception centers should be established not only in the villages of our country.

Advantages

1. It is a new approach in agricultural communication. So it creates a center of attention and provides new experience to the farmers to collect the information.
2. It makes possible the two-way communication between the farmers and scientists sitting in two different places.
3. If system is made available at village level it helps to save the time and money of the farmers to meet the specialist for the solution of a particular problem.
4. It helps the farmers in the remote areas to get specialist's advice on various field problems

2. Need to bring improvement in agriculture related programmes of mass media

Television channels like Door Darshan (DD), Etv, other TV channels are telecasting agriculture related programmes everyday but due to unavailability of TV sets with farmers, non-suitability of timings and unavailability of location specific or region specific programmes, farming community is not getting real advantage out of these programmes. As a result of this, some changes are required in the present system.

Suggestions

1. Government, cooperative societies or various organizations like NGOs working in the village area should take initiatives to provide TV sets and VCRs in each village to watch and record programme related to concerned crop or specific operation of the area.
2. Agriculture related programmes should be telecasted at the most convenient time of farmers and the frequency of the programme should be at least twice in a day.
3. Development of video library regarding the crops and practices concerning area would be very helpful to the farmers.
4. Some times, one-way video and two way audio live programmes should be organized like Satellite Krushi Gosthi to establish direct contact of farmers with scientists. Because of availability of telephone facility with many farmers of village area, they can ask direct questions to the person or agricultural scientists delivering programme on television. Now a days such kind of TV programmes are being telecasted frequently on sports and election .For radio also such kind of two-way programmes should be organized.
5. More programmes on successful farmers should be made for TV, radio and print media.
6. All the newspapers should publish special weekly addition on agriculture.
7. Villagers are also viewing different channels in their TV through cable. If information regarding agricultural practices is given on a strips through cables, people can get interesting information on agriculture while watching entertaining programmes.
8. FM radio (Like Radio Mirchi) for agriculture purpose to be established through which agricultural information can be given with various kinds of entertainment programmes for twenty-four hours. Such type of special TV channel on agriculture can be also started.
9. Well-trained Agricultural Graduates should be given responsibility of production of agricultural programmes for various mass media.

3. Adopt Simplicity in naming the technology

Usually the agricultural chemicals like pesticides; fungicides and herbicides are bearing very complex and lengthy names. These names are very difficult to understand and remember for farmers. So it would be better to give simple and common names to these chemicals, so that the farmers can easily remember them. These simple and familiar

names may also encourage the sales. Similarly most of the varieties available from various universities and research stations are bearing difficult technical names. If these varieties were provided familiar names like names of mountains, rivers, etc. it would help the farmers to easily recall and use.

4. Practicability of new technology to adopt

The recommendations for nutrients are made in terms of amount of Nitrogen, Phosphorus or Potassium per hector of land for different crops but there is no specific chemical fertilizer available through which all the nutrients can be made available as per the recommended dose to particular crop. It is very difficult for a farmer to make out the nutrient content of fertilizer and calculate the requirement for his own land. Availability of specific fertilizer for a specific crop as per the recommendation of various nutrients per hectare basis helps farmers to adopt fertilizers easily on their fields. Fertilizer can also be made available in form of capsule or pouch for a particular tree or per specific crop and area basis. It makes the field application easier. Such types of capsules or pouches of chemicals or pesticides as per the recommendations can also be made available for the control of various pest, insects or weeds.

5. Improve peoples' participation in various extension programmes

From finding out specific problems, its solution, planning, implementation to evaluation of the programme, peoples' participation must be encouraged to carry out extension programmes successfully. Implementation of the programme must be from bottom to top level.

6. Linkages of SAUs with other agricultural developmental agencies

There should be a good linkage between agricultural universities and various government, non-government, cooperatives and input supply organizations. These agencies have very good contact with the farming community. Many farmers adopt various fertilizers, pesticides and fungicides on the basis of guidance given by these agencies. So it is desirable to provide periodical training to the persons of the various input supply agencies. In most of the input supply agencies, inexperienced persons are dealing with chemicals and recommending various remedial measures also. So the license of the pesticides, fungicides dealership should be given to agricultural graduates only. It helps the farmers to receive better service and advice.

7. Combination and modification of extension methods

Now a days many modern types of equipments like computer and interactive television programmes are being used for dissemination of agricultural technologies.

But most of the old aged farmers like traditional methods like puppet show, street plays, folksongs etc., while younger generations like modern devices such as Television, Computers etc. The combination of these two methods helps to attract a wide range of audience from older to younger people. For example telecasting of drama, puppet show and folksongs etc, related to technology dissemination attracts both elder and younger farmers.

8. Availability of rural agricultural libraries

Many magazines and journals are available in urban areas, but agricultural publications are rarely available in rural areas. So, the establishment of rural libraries for agricultural publications is obligatory for the literate farmers in rural area. In addition to this, audiovisual materials like Audio / videocassettes and CDs should be made available on new technology to the farmers on rental basis through rural agricultural library.

9. Internet facilities at village level

The farmers from villages can have a direct access to modern technologies if every village is connected with Internet facilities. The farmers from villages can have a direct contact to modern technological advancements through such facility and can share their knowledge with the farmers of other villages and countries. This will have positive impact on faster dissemination of agricultural technologies. Young educated farmers can be trained and their services can be utilized for this purpose. In Orissa, the KVK has started Information Centre where Internet and other required facilities have been installed carefully. Many villages of Gujarat have already connected with e-Gram and taluka with e-Dhara.

10. Use of local resources available

Old farmers are rich sources of indigenous technologies. But in modern days and age, farmers have not aware regarding the importance of the technology. So extension worker should accumulate such knowledge from the old aged farmers, transfer it to the younger farmers and motivate them to use locally available indigenous technologies like botanical pesticides, insecticides, fertilizers, etc. Extension functionaries for young farmers should also arrange field visits of the fields of those farmers who have successfully adopted modern or indigenous technologies.

11. Establishment of farm clinics and service centers in villages

Service centers help the farmers to get good services and quality inputs from their villages. Now a days most of the agricultural inputs are available in town areas only. Farm clinic helps farmers to solve their field problems at low cost. Agricultural

graduate can be deputed and given responsibility to run such clinic and service centers as suggested earlier.

12. New role of voluntary organizations

These organizations should give up their traditional outlook and should play the role of marketer and service providers to maintain machineries like pumps, power tillers, sprayers and low cost farm implements. Instead of doing only extension work they should do something to solve the problem of marketing of agricultural products. They can also help farmers to educate and adopt value addition process in agricultural products for getting higher prices.

13. Encouragement to private extension service

Private extension service provides job opportunities to unemployed agricultural graduates. For them it is one of the best fields to start self-employment ventures. To encourage such service, Government should provide some financial help to agricultural graduates at the initial stage so that unemployed agricultural graduate can be motivated towards such kind of activities.

14. Appointment of Agricultural graduate in each village

In the present system of TOT through T and V system, the technology dissemination activities of each village are assigned to Agricultural Diploma holder village level workers. To a certain extent the extension worker can assist farmers in resolving problems but in case of critical problems such as devastating diseases, pest attack etc. they might not be able to solve such kind of problems due to the lack of strong theoretical background and practical exposure. It may affect the credibility of whole system to the farmers. So it would be better to appoint Agricultural Graduates as Agricultural Officers at the village level or the Panchayat level. They can easily solve most of the field problems with the help of their strong theoretical and practical exposure and experience. Such concept has been successfully adopted in the state like Kerala.

Advantages

1. Agricultural graduates are able to solve most of the field problems and they can also provide proper guidance to the farmers in each and every crop production activities. This helps to improve the credibility of the whole system.

2. Agricultural graduates are well trained for the effective interaction with farming community. So they can easily make good contacts and string relationship with farmers.

3. Agricultural graduates are able to formulate various projects or programme specific for a particular area with farmers' participation.

4. Agricultural graduates will be able to conduct various classes and training programmes for the farmers to help them to solve various field problems on their own.

5. This helps a lot to create new job opportunities for Agricultural graduates.

15. Establishment of Indigenous Technical Knowledge (ITKs) Centers

The traditional knowledge of the farmers should be documented and tested the rationality of each practices followed by them in agriculture and allied fields with the help of agricultural scientists. If there is rationality for the benifit of the farmer it should be recommended for the farmers.The NGO like SRISTI ,Ahmedabad has documented such practices since two decades in the field of agriculture and allied fields.

16. Traditional mass media should be used for knowledge dissemination

Traditional media like Bhavai, drama, street play etc should be used as the farmers' illiteracy rate may be high and they may not be in position to perceive the message conveyed through the sophisticated media.

17. Participation of farmers in Krushi Mahotsava, Farmer's day, Scientist's day, Frontline Demonstration, Crop Fortnight Celebration etc. for awareness and adoption of innovation at grass root level.

Agricultural Knowledge Management Strategies through Partnership among Stakeholders: Experiences of IARI

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In the past the public sector has remained as the major player in development and transfer of farm technologies. However, we all know that generation, processing and utilization of agricultural knowledge is not only limited to public sector, but a number of actors such as farmers, extension personnel, private sectors, NGOs etc., are involved in it. The eighth Millennium Development Goal, "to develop a global partnership for development" highlights the importance of involvement of all the actors in partnership mode to strengthen the agricultural knowledge system. Partnership among scientists, extension personnel, farmers, private firms, and NGOs will help in tapping the power of diverse actors which will result in finding solutions to complex agricultural problems faced by us.

This paper discusses some of the experiences of Indian Agricultural Research Institute in agricultural knowledge generation and transfer.

Partnership in Technology Generation: Efforts in partnership with private sectors for variety development have been made very recently. The IARI in collaboration with Sipani Farms, Mandsaur(Madhya Pradesh) is trying to develop improved pigeon pea with shorter height , determinant type, shorter duration and higher yield.. The contribution of Sipani Farm will be provision of germplasm.

Partnership in Technology Assessment and Refinement: Partnership with farmers in technology assessment and refinement is an important component in overall technology generation and dissemination. A Centre for Agricultural Technology Assessment and Transfer was established during 1996 for this purpose. Experiences show that participatory technology assessment through farmers' organizations is effective in identifying location specific technologies for the farmers which could increase farmers' income.

Commercialization of products and processes: Commercialization of products and processes through public-private partnership has been one of the main strategies of sharing knowledge for agricultural development at IARI. Several products and processes in agro-chemicals developed for pest control have been licensed to private firms and industries. Some of the recent products which have been commercialized are as follows:

1) Pusa Hydrogel: This is an environment friendly technology and the hydrogel polymers applied in the root zones enhance the water holding capacity of soil

and reduce the water losses. 'Hydrogel technology' developed by the Division of Agricultural Chemicals holds a great promise in rainfed agriculture and those areas which face water scarcity.

2) Pusa Nema Gel: Pusa Nema gel is a bio-pesticide which contains an indigenous insect killer nematode *Steinernema thermophilum* which was isolated at IARI. This nematode species is heat tolerant and can kill a broad range of soil and foliar insect pest such as diamond back moth, gram pod borer, rice borer, white fly, cabbage butterfly, cotton boll, worm termites etc.

3) *Reduced Azadirachtin* : This is a neem biopesticide.

Partnership in Technology Dissemination

Partnership with farmers: Initiatives in Participatory Seed Production: Several varieties of crops and hybrids have been developed by National Agricultural Research System. However, their diffusion and adoption among farmers have been very low due to poor multiplication of seeds by government agencies. In order to solve this problem IARI has experiments successfully with the following three models of public –private partnership in seed production (Patil and Dadlani, 2009): **Model 1**: Seed production through progressive farmers to meet the demands of seeds amongst the farmers in the village. **Model 2**: Seed production through progressive farmers with buy-back arrangement at IARI. **Model 3**: Seed production by farmers facilitating establishment of farmers' seed companies.

Partnership with Farmers' Organizations: Partnership with farmers' organisations in villages of states like Delhi, UP and Rajasthan have been established to promote community based extension to transfer the technology developed by IARI as well as empowering them to solve their problems related to availability of inputs like seeds fertilizers etc. The experiences show that mobilizing farmers through farmers organizations like Rural Social Center (Cooperatives) have helped the farmers to increase farm productivity and income. In the state of Rajasthan, these farmers' cooperatives have helped the farmers in adoption of bio-gas technology.

Partnership with SAUs/ICAR Institutes: In order to speed up the diffusion of IARI varieties and technologies the IARI has developed a National Extension Programme which is based on partnership mode between IARI and SAUs/ICAR Institutes. Under this programme collaboration has been made with the following agricultural universities and ICAR institutes: Marathwada Agricultural university, Parbhani; Mahatma Phule Krishi Vidyapeeth, Rahuri; Banaras Hindu University, Varanasi; Indian Institute of Vegetable Research, Varanasi; Birsa Agricultural University, Ranchi; MPUAT, Udaipur; National Centre for Rapeseed and Mustard,

Bharatpur; Navsari Agricultural University, Navsari; University of Agricultural Sciences Dharwad.

Partnership with NGOs: Partnership with NGOs has been established for promotion and diffusion of IARI varieties.

Private-Public Partnership for diffusion of improved crop varieties: The IARI has adopted a partnership mode the private sector in seed production of improved crop varieties especially in the case of rice hybrid PRH – 10. The IARI has signed a MOU with about 15 private organizations for production of hybrid PRH – 10.

Conclusion

The experiences of IARI in agriculture knowledge management through partnership amongst stakeholders have revealed that knowledge management requires an effective linkage and communication among different partners under win-win situation for all the partners involved. The knowledge developed has to be not only relevant but also useful but also cost-effective. The agricultural research organizations are knowledge intensive organizations and hence there is a need for the scientists to use their creativity to acquire new knowledge in collaboration with other stake holders. The success of present agricultural research organssations will depend upon to what extent they learn from different stake holders and suitably modify their programmes. Thus, in the coming years the agricultural research and extension agencies have to be learning organizations. Giving a fillip to partnership demands mutuality in process arrangements.

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TECHNICAL SESSION-IV

Significance of ICT in Enhancing Rural Agricultural Knowledge Competency

TECHNICAL SESSION-IV

Significance of ICT in Enhancing Rural Agricultural Knowledge Competency

Enhancing Rural Agricultural Knowledge Competency Through Information and Communication Technology (ICT)

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Prologue

The prime objective of agricultural extension programmes has been the enhancement of Rural Knowledge competency of farmers and rural peasants for facilitating their farm economic activities resulting in their better livelihood security. And in the 21st century, in the context of globalization where while world has been transformed in to a boundary less Knowledge Society, the enhancement of Rural Knowledge Competency would very much depend on use of Information and Communication Technology (ICT). ICT has a large potential to make extension programmes more effective and to decrease their costs at the same time.

There is no doubt that agricultural extension is an instrument of change. It enables farmers to seek and adopt desirable changes in farming. Its focus is on technology improvements, leading to human resource development. In every culture, agriculture normally keeps changing, either slowly or rapidly. The role of agricultural extension is to make this process more purposeful. As the economy expands and technology advances, agricultural extension does not remain a matter of choice, but becomes a socio-economic necessity *(Dwarakinath, 2006)*.

Further, experience over several decades has shown that no single approach to agricultural practices produces the optimum output from land everywhere. Plot-to-plot variation in soil composition, micronutrients, moisture availability exists and scientific inputs vary depending on the specific crop and the stage of crop growth. Post-harvest techniques, which add value to the produce, are not common for all crops. Therefore continuous interaction between the farmers and the agricultural scientists is essential to determine relevant and appropriate action. Such interaction is only possible if farmers have access to the scientists and agronomists.

Furthermore, in a scenario of multiple and integrated markets with frequent price fluctuations, the farmer must know where and when to sell in order to maximize profits. To mitigate the unpredictability involved in agriculture arising from market changes as well as inclement weather, water scarcity, crop disease, pest attacks and so on, a farmer requires an appropriate form of crop insurance. He can also want to reduce market risks by trading in derivative instruments such as Options and Futures. Clearly there is a need for the farmer to be connected at every stage to a suitable knowledge and information base, and a source of appropriate training and advice. The role of Information and Communication Technologies (ICT) therefore becomes paramount *(Ramachander and Jhunjhunwala)*.

The Importance of ICT in Agricultural Extension

Information and Communication Technologies (ICT) have an important role to play in agriculture. A definition from the Overseas Development Institute (ODI) report on ICTs and Rural Development is as foliows; "ICT are those technologies that can be used to interlink information technology devices such as personal computers (PCs) with communication technologies such as telephones and their telecommunication networks. The PC and laptop with e-mail and Internet provides the best example". The report goes on to say that the range of technologies that can be included within ICT is increasing all the time and that several other devices such as digital cameras, digital video cameras and players, personal digital assistants, slide projectors and mobile telephones are also becoming compatible with these technologies. Therefor "an expanding assembly of technologies that can be used to collect, store and share information between people using multiple devices and multiple media" can now be categorized as ICT. While the term ICT is of fairly recent origin, there have been other forms of communication used in the past, such as radio, television and printed documents, which have now been termed "traditional ICT". Their main distinction form "modern ICT" is the fact that they permitted only a one-way system of information dissemination, while the latter allows for a dialogue. This difference has vast implications for the use and relevance of these technologies. In this section we explore the role that ICT can play in strengthening agricultural extension, and its particular importance in today's world.

Challenges for Extension and its Managers

In the emerging global scenario, the task to extension has now become to be more challenging which demands a ***system of market-led extension*** and technology transfer with specific focus on diversification, post harvest management, export orientation, market intelligence and consumer orientation. However, the most important challenge for the future extension system and its managers would be the ***Management of Knowledge***. In the coming years, the success of a farmer is going to be primarily dependant upon his level of knowledge. Agricultural extension programmes need to be oriented towards enhancing the decision making abilities of rural people, especially farmers, by expanding their exposure to effective organization and management skills in a ***knowledge-intensive manner*** and not just new agricultural production technologies alone.

> **Key tasks ahead therefore are :**

- Reorienting the standard of farmers' socio-economic level
- Reorienting the extension system to effectively address post WTO compulsion

- Production and market oriented communication
- Strengthening of market information sources including price, storage and transportation
- Linking with weather forecast information
- Concentrating on quality and value added production procedure
- Dissemination of post harvest technology
- Educating the farmers about sorting, grading and other market procedures

Knowledge Connectivity through ICT : A Means for Rural Economic Growth

Today, India is both a developed as well as a developing nation at the same time. Extremely advanced forms of agriculture and industry co-exist with other forms of yester years. Bridging this gap is the ultimate development challenge of 21st century. To accelerate the march towards rural rejuvenation, a wholesome and forward looking scheme needs to be devised. In order to achieve our national goal to be a ***Knowledge Society***, we can therefore launch a learning revolution in rural India through the establishment of ***Village Knowledge Hubs*** involving the integrated use of both the conventional as well as upcoming electronic media like Intra and Internet, Information Kiosk, Cable T. V., Radio (including HAM, Community Radio), Mobile Telephones, Vernacular Press and other Print Media. And perhaps that will facilitate better ICT use in enhancing farmers' knowledge in their farming endeavour *(Samanta, 2009)*.

Farmers' Knowledge Society – Why?

For :

- Knowledge empowerment and global access
- Social Mobilization of the Community
- Empowering rural people in decision making
- Increased Food Security through knowledge based agriculture
- Increased on-farm and non-farm employment
- Increased capital flow and higher economic security

ICT in Developing Village Knowledge Hubs

ICTs provide us a new opportunity to build up a confident, skilled and participatory knowledge community that includes women also. Introduction of ICT, as has already made inroads into our agricultural scenario, would be immensely helpful to collect, store and share information between people through using multiple devices and multiple media so as to bridge the perceived knowledge gaps at the rural nexus. A range of information inputs and services can be made available through effective use of ICTs.

> **Agro-Advisory Services**
- Disease forecast service
- Online advisory and consultancy
- Computer to Mobile/SMS Broadcast Service
- *Krishi Gyan*

> **Agri-Business Management**
- Input Sector
- Farm Production Sector
- Processing Sector
- Marketing and Distribution Sector

> **Weather-based Pest and Disease Forecasting**
- Pest and Disease Database history
- Short and Medium Range Decision Support on Plant Protection
- Annual Crop Planning

> **Weather Information for decision support on Crop Management**
- Weekly report on crop-weather conditions
- Agro-climatic Zones
- Climate outlook Soil, Water, Radiation
- Distribution of plants
- Production potential
- Seasonality and weather aberrations

> **Method of Soil Fertility Evaluation**
- Physical Indices
- Chemical Indices
- Biological Indices

Epilogue

The country has made commendable stride in the ICT based knowledge initiative. The learning experiences from multimedia community centres or telecentres through pilot projects have ushered a major paradigm shift away from individual connectivity. What we are to do now is to groove out of the pilot syndrome and develop a national network of village knowledge hubs to foster India achieving its cherished

goal to be a knowledge society. And the role extension system here is crucial. Building mass awareness, developing local level linkages, facilitating usable and demand driven content development, capacity building of the stakeholders for managing the village knowledge hubs and empowering the rural managers for rendering sustainable and scalable services are the tasks ahead for extension managers.

ICT becomes extremely important here as it provides a means for the farmer to gain new knowledge and interact with participants in this market. Eventually, however, the farmer will benefit only if his knowledge system is able to incorporate the new inputs he gains. The Internet kiosk in the village could play an extremely important role in bridging this gap.

The kiosk should become a village knowledge center, through which a farmer can access all kinds of information and interact with experts, financial institutions and the market. A "farmers' club" can be set up in every village kiosk that meets at least once a week. The farmers could exchange information and knowledge amongst each other and use the Internet (through the kiosk operator) to access information and interact with farmers in other villages, thereby enriching their knowledge base. Further, farmers could also have access to experts in research institutes, ask questions and discuss their particular problems. Such interaction would enable farmers to cope better with new technology and use it appropriately in the context of their particular plot. The Internet kiosk would also enable them to better understand the global market and trends in commodity pricing.

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ICT for Empowerment of Knowledge to Rural Livestock Holders

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The greatest challenge of today is the improvement in the quality of human life particularly of the rural people through eradication of poverty and hunger and overall achieving rural-urban balance. Livestock being the pivotal sector of rural economy in India, the empowerment of the farmers in taking initiatives and decisions will help in shaping the future of the farmers' economy. The challenge of eradicating poverty, hunger and malnutrition is essentially a problem of low income rather than a problem of low production and productivity only. The majority of world's one billion poor live in the rural areas of the developing countries, who are mostly small-scale Livestock holders. At present, there are 2.4 billion people working in agriculture animal avocation representing 45% of the world population. Farmers as producers of food must have an enabling environment for access to know-how and do-how for realizing the full potential of modern technology.

As Livestock rearing including fisheries apart from Agriculture is the main source of earnings for the majority of the people and the use of Information Communication Technology (ICT) systems in these sectors are very much essential to reap its unutilized potentials and thereby improving the socio economic conditions of the rural people. Proper initiatives need to be taken to utilize ICT systems in Livestock based industries, Animal Science research and dissemination of Livestock technology, Livestock business development to the farmers and preparation and maintenance of domestic animal database.

Societies and governments must explore the possibilities of application of ICT to Livestock development through effective rural – to – rural and rural – to – urban linkages. A pluralistic system needs to be envisioned with many players for promoting effective use of ICT for the benefit of the Livestock farmers including Government, Corporate, Private, NGO and other Farmers' organization in various forms.

What is ICT

ICTs are those technologies that can be used to interlink information technology devices such as personal computers with communication technologies such as telephones and their telecommunication networks. ICTs, therefore, are an expanding assembly of technologies that can be used to collect, store and share information between people using multiple devices and multiple media. The most common perception of ICT is that of computer and the Internet, including common technologies of radio, television, telephone and fax system, video program, teleconferencing, video

conferencing, wireless and satellite technologies being used in ICT activities. The range of technologies is increasing all the time and there is a convergence between the new technologies like digital camera, mobile phones and conventional media. Thus most devices can now be linked to others to share and exchange information and allow it to be used in such a way that the devices can also be categorized as ICT.

Web

The web is the largest and richest Livestock information system in the world. Its massive holdings, covering all aspects of world animal resources, natural resources and food systems, enable farmers to locate needed information to improve productivity, plan for weather contingencies, access research, forecast, disease problems, take precautionary measures, visualize precision data, manage finances, buy inputs and sell outputs and monitor prices of Livestock products in local as well as world markets. The Web is surely the most promising way of extension services to reach more farmers with better services (Schmitz, 2001). The Distance Education for agricultural and rural development has been described as 'The Third Wave' by Cook (1998). For the first time it is possible for many to communicate with many as easily as one person can address one other or a group (Rowntree, 1995).

Extension through ICT

While the existing extension systems is unable to provide adequate information effectively and extensively to the Livestock farmers, the ICT provides the flexibility in providing information on various mode of Livestock farming practices including the Breeds, verities, productive and reproductive data; accessibility to the information without disrupting the routine engagement in their farm activities and all other information related to technology advances and global competitiveness. Information and communication technology has been proved to be an effective alternative and comfortable in providing needed information of varying nature appropriate to the different farming environment systems/ location specific situations.

Farmers and those who serve them must balance three formidable objectives of productivity, profitability and sustainability. There is a need to increase productivity to meet the growing demand of food for their own household; responding to the demand of fast changing market opportunities for quality and value added products for increasing profits; and managing natural resources including water, soils and organic by-products in a more sustainable manner.

Various telecasting organization like Zee TV and also Self-Employed Women's Association. (SEWA) rely on Very Small Aperture Terminals (V-SATs), which are connected to their own communication satellites. These systems are a good solution for isolated areas, particularly where terrestrial connections would be costly. The

choice of Optcal-Fibre Cable routes were not used by most of the ICT projects. But Reliance India has planned to lay 25,000 km of fiber optic cable and also develop more than 1.5 millions IT kiosks in rural areas along the way to facilitate high volume data /voice communication.

Category of ICT Projects in Vogue

The first category of ICT projects (mostly Govt. controlled or sponsored) provide the rural people with all information and services concerning Government programmes and schemes including land records, health services and public utility services.

Info-village of Pondicherry developed community ownership and collective action with a "pro-poor", "pro-nature" and "pro-women" approach to development. The network provides public services in local language in a multimedia fashion. It also provides relevant information regarding fish density in ocean to fishermen community.

In an experiment in electronic knowledge delivery to the poor, ten village near Pondicherry in southern India have been connected by a hybrid wired and wireless network consisting of PCs, telephones, VHF duplex radio devices and e mail connectivity through dial-up telephone lines – that facilitates both voice and data transfer, and have enable the villagers to get information that they need and can use to improve their lot.

Most of the operators and volunteers providing primary information are women, thus giving them status and influence. All centers evolved themselves to meet the information demands made by the community.

Information provided in the village knowledge centers is local specific and relates to prices of livestock inputs and outputs, market (potential for export), entitlement (the multitude of schemes of the central and state governments, banks), veterinary care, cattle diseases, transport (road conditions, cancellation of bus trips), weather, etc.

The Ministry of Information Technology has prepared a plan to cover over 600,000 public call office (PCOs) into public 'tele-info-centres (PTICs) offering services like Internet browsing, fax e-mail and DTP.

The second category of ICT project largely addresses to trading and e commerce. eChaupal project started in 2000 with 23 tele-centers in Hoshangabad district of Madhya Pradesh and till now set up 4,100 kiosks serving 21,000 villages and 2.4 millions farmers in 6 states of India with more than Rs.7.5 billion annual turnover.

ITC is setting up e-Chaupals across the agricultural belt in India to "offer the farmers of India all the information, products and services they need to enhance farm productivity, improve farm-gate price realization and cut transaction costs. Farmers can access latest local and global information on weather, scientific farming practices as well as market prices at the village itself through this web portal-all. Chaupal also facilitates supply of high quality inputs as well as purchase of commodities at their doorstep."

The third category of ICT projects provide number of offline, static content including packages of practices, recommendations, locally relevant technologies, government schemes etc. in local languages. Besides, experiences of successful ICT applications in animal avocation in rural India and provision of numerous web-based links to these sites will be available to farmers through these projects. These projects have strong inter-institutional linkages to develop content and providing online and offline services.

The fourth category of ICT projects primarily address to issue of capacity building and empowerment of farmers, farm women, rural artisans and also large number of extension personnel and use of ICT for education and alleviation of poverty from rural sector.

Tarahaat, named after the all-purpose haat (meaning a village bazaar), comprises "a commercially viable model for bringing relevant information, products and services via the Internet to the unserved rural market of India." It is to set up a partnership between Development Alternatives (DA), and NGO focused on promoting sustainable development in India and its rural marketing arm, Technology and Action for Rural Advancement (TARA). It won the Stockholm Challenge Award in the Global Village category in 2001.

Information Technology Initiatives in TANUVAS

It is often expressed by the scientists of extension centres that they have difficulty in reaching large number of people owing to limited man power, transport facility, high cost and lack of time. TANUVAS is also in constant search for newer, faster, and economic methods of technology transfer system.

Village Information Centres

The flow of information in the recent years is so high. To meet the urgent need of finding out effective means of transfer of technology, the Directorate of Extension Education has established three village information centres with ICT tools (Computer and its accessories) at Chitheri (Vellore District), Kuzhumani (Tiruchirapalli District) Puthuthamaraipatti (Madurai District) for Animal Husbandry activities. In Fisheries

development, similar ICT info-village has been established at Sethukuvaithan, Vellapatti and Konbuthurai coastal villages.

Six women Self Help Groups are also identified at Cuddalore, Kancheepuram and Chennai Districts. Computer and other accessories with inbuilt CD writer, UPS, Modem Web camera, Speaker, Hand phone and 3 in 1 CD player are installed in all information centers. Telephone connectivity is also provided to all sites. They are provided with Audio & Video lessons (on CDs) containing Animal Husbandry practices, Dairy and Fisheries product preparation, Value added products, general knowledge, tutorials and Tamil typing Software. A separate web portal in Tamil vernacular was hosted, www.tanuvas.org/rural containing details on district profile, Animal Husbandry, Agriculture, Horticulture, Fisheries Education, Home Science, Health, Transport, Sports, Entertainment, Job opportunities, products marketing and financial institutions.

Contents Developed

Tamil Nadu Veterinary and Animal Sciences University has also created its own portal *www.tanuvas.ac.in* with appropriate contents for the demand and needs of local population. This web content is having information about dairy, sheep, goat farming, piggery, rabbit, poultry farming and other animal husbandry farming practices, home science, agriculture, horticulture and fisheries including information on health, weather, education, market information and exclusive frequently asked questions (FAQ) for the benefit of rural folks.

Web portal Developed

An exclusive website, *www.animalsciencesacademy.tn.nic.in* has been launched for the web based / CD Rom correspondence courses on livestock and poultry including Animal Welfare.

Touch Screen Information Kiosks

Sixteen Touch Screen Information Kiosks have been established so far in strategies locations. Software on Dairy farming, Goat farming, Poultry farming, Japanese quail farming and marketing avenues have been developed and installed in the touch screen information kiosks for use of Stake-holders. A total of 2570 farmers have benefited during the year 2007-08 alone through this information kiosks.

On-line Veterinary Services

Implementing Electronic Extension Services for the farmers of Tamilnadu in collaboration with M/s. n-Logue Communication (P) Ltd. (Voice mail facilities) are created at five District centres of TANUVAS.

Distance Education Programme in Veterinary & Animal Sciences

It is well known that 65 per cent population is dependent on Agriculture and allied enterprise of which 50 per cent are youth who need agriculture and Animal Husbandry education to make their business profitable and livelihood sustainable in India. Distance Education is right option in this regard (Central Advisory Board on Education Committee Report, 1994). The following certificate courses are being offered to interested stakeholders.

- Dairy farming
- Goat farming
- Animal welfare (print and online web based)
- Livestock and Poultry Farm Manager

In addition, "Management of Infertility in Bovines", "Recent trends in disease and diagnosis and treatment of ruminants" are other courses offered for the Veterinary graduates.

Web Bbased and CD-Rom Based Courses

Web based course on *"Animal Welfare"* for the farmers and CD Rom based course on *"Optimizing cattle feeding based on locally available fodder resources"* were launched during 2005.

The details of the above courses can be downloaded from www.animalsciencesacademy.tn.nic.in an exclusive website launched for the Tech Mode correspondence courses.

Technologies Released and Documented

43 technologies were released by TANUVAS and these technologies were documented as a booklet / CD ROM and released as "Technology Released by TANUVAS" during 2008. Further this University has documented Success Stories of different Livestock, Poultry and Fisheries farmers and the first copy of the Success Stories document was released.

Video Conferencing

This University has launched an ambitious project on "Tele-Conferencing" by linking all institutions under its ambit. Though the initial motive will be academic and research oriented, the network will be expanded to cover the stakeholders and address their problems directly by the experts from the Institutions.

Optimistic Future

India has twin advantage of being a global IT Superpower and also being blessed with rich bio-diversity especially the animal wealth. The Government of India consider

IT as an agent of transformation of every fact of human life which will bring about a knowledge based society in the twenty-first century. It plans to accelerate the drive for setting up a world class Information Infrastructure with an extensive spread of Fibre Optic Network, Satcom Networks and Wireless Networks for seamlessly interconnecting the Local Informatics Infrastructure (LII), National Information Infrastructure (NII) and the Global Informatics Infrastructure (GII) to ensure a fast nation-wide onset of the Internet, Extranets and Intranets.

The Government plan to take all the necessary steps to boost IT for agricultural, livestock avocation and integrated rural development. Towards this end, a number of demonstration projects need to be devised in each State taking into account the specific strengths and needs at the local level. A unique 'WIRED VILLAGES' pilot project has been launched under the aegis of National Information Technology Task Force on Information Technology at the Warananagar Cooperative Complex in Kolhapur District in Maharashtra. Efforts need to made to quickly replicate such projects in other states.

Conclusion

Livestock and allied activities in India is no less than any primary sector and more significantly it is the basis of rural India. The most critical factor in breaking the cycle of poverty and increasing the income is through the empowerment that comes from access to information and knowledge by the organizations engaged in the improvement of Livestock sector. They have advocated the formation of information system and use of technology as a means of increasing the competence of marketing systems and encouraging the orderly structure of animal agriculture

Briefly speaking, in theory, such a service can:

a. facilitate better quality production, better quantity, better post production management;
b. add to improving the bargaining position of farmers ensuring them justified price;
c. inspire competition among traders;
d. encourage the adaptation of supply to demand; and
e. assist in more effective Livestock policy formulation,

The provision of the requisite information to all the concerned users, by the usage of appropriate technology, will facilitate the proper growth of the Livestock sector largely. This will directly influence the Livestock farmers resulting in the growth of rural India. Developing an efficient, relevant and sustainable information system based on right technology is not at all an easy job. Apparently, the problems are many, but it needs to be tackled as the benefits accrued will unquestionably outweigh all those efforts, considering the plus factors for Livestock and other stakeholders.

Use of ICTs for Hi-Tech / Specialised Group Entrepreneurs

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Abstract

The advent of ICT era is resulting in a sea change in the social and economic fabrics of our society. It is also revolutionizing the way in which our technological advances are being put to use in each and every sphere and is rapidly becoming a two-way process between the technologist and the end user. However, at the same time, the rural India is yet to reap the benefits of access to information and improved communication to transform their agriculturally based livelihoods and to realize higher profitability in their profession. This inturn, also, impacts the way our natural resources are being put to use and the protection offered to our fragile eco-systems including the germplasm. There are number of issues involved in providing ICTs to the village units that will serve multiple benefits including agriculture. The biggest bottleneck is creating and maintenance of multi-mode information databases assuming that we can afford to have communication infrastructure in an affordable manner in very near future, if not today. Till such time, the uses of ICTs for agricultural purposes are taking shape and functionality in cultivating high-end crops or in Hi-Tech entrepreneurships as the return from such activities are high. This in turn, can be expected to be a pre-cursor for further developments in uses of ICT for common agricultural purposes.

The use of ICT tools in specialized tasks involving agricultural components requires both precise information regarding the enterprise and the collective requisition from the participants in enterprise. It usually can be accomplished if the monitory viability of creation, sustenance and the continual requirements are possible. Creation of such packages also needs dedicated skill oriented manpower and infrastructure along with the specialists in the field of enterprise. Grape cultivation, dairies, tea & coffee plantations, spices etc., are some of the high-end enterprises for which these ICTs can be put to use at first instance. Encouraging private-public partnership with the manufacturers of the inputs used in these enterprises would help to popularise these initiatives.

How to Reach the Unreached With Required Effectiveness – SATCOM Experience

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The greatest challenge faced by Indian planners is how to reach the rural people effectively to take advantage of the benefits of planned development programme. Although several transfer of technology programs have been launched from time to time earliest being the Community Development Programme (1952), in almost all the development programmes the technologies and benefits meant for them have not reached the end users in full form. Further, inordinate delay in communication through different hierarchical system in each department as well as general slow process among many bureaucratic systems resulted in either partial or less realization of the usefulness of development programme among stake holders. Yet another issue of concern in the recent years is drying up of public extension system particularly at the grass root level and unwillingness of many personnel to work in the rural areas especially in remote areas.

Radio and Television to some extent have enabled in disseminating farm technologies to rural poor but Radio has the inborn limitation that it is one way audio while television audio-visual media, with no immediate feed back. Even the print media had the limitation of reaching illiterates and less affordable audience with hardly feed back. A constant and direct feedback is essential for the users, since the receptivity and use of information will be much higher when felt needs are addressed immediately. If Indian villages have suffered over the years, it is partly due to lack of timely and dependable information support system. The necessity of the powerful information support system has become all the more important now than ever before in view of the WTO regime. The farmers of India need to be provided with latest farm technology at a shortest span of time from dependable source to run the farming on a profitable venture in the present day competitive world. Under the above circumstances, Satellite Communication (SATCOM) has become handy to address the aforesaid issues in view of information reaching directly from the Experts (EC) to the grass root people through its Village Resource Centres' (VRC) at quickest possible time with an opportunity to directly interact and avail solutions with the source by the receivers.

According to Dr. Vikram Sarabhai, founder of the Indian Space Program, *"There are some who question the relevance of space activities in a developing nation. To us, there is no ambiguity of purpose. We do not have the fantasy of competing with the economically advanced nations in the exploration of the moon or the manned space flight. But we are*

convinced that if we are to play a meaningful role nationally, and in the community of nations, we must be second to none in the application of advanced technologies to the real problems of the man and society".

The Rural Bioresource Complex (RBRC) project funded by Department of Biotechnology under the Ministry of Science and Technology, Government of India, is implemented by the University of Agricultural Sciences, Bangalore since April 2005. The Project is covering 8340 families in one Hobli located in Bangalore Rural District of Karnataka, with the overall mandate of enhancing income and standard of living. One of the objectives of the project is to provide information support system to rural farmers in order to empower them. Accordingly the project has established an Expert Centre at University main campus and a **Village Resource Centre** at the project level to fulfill its mandates.

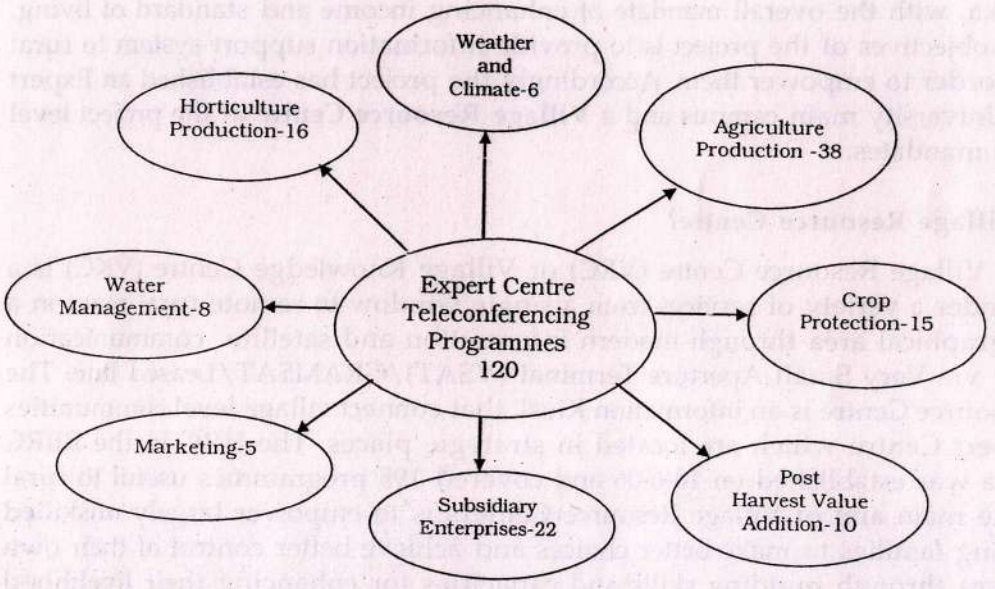
What is Village Resource Centre?

The Village Resource Centre (VRC) or Village Knowledge Centre (VKC) is a place to render a variety of services from a single window to remote rural mass in a given geographical area through modern information and satellite communication technology viz Very Small Aperture Terminal (VSAT)/GRAMSAT/Leased line. The Village Resource Centre is an information Kiosk that connect village level communities to the Expert Centre which are located in strategic places. The VRC in the RBRC Project area was established on 10-6-06 and covered 195 programmes useful to rural people. The main aim of Village Resource Centers is to empower largely unskilled rural farming families to make better choices and achieve better control of their own development through building skills and capacities for enhancing their livelihood opportunities. The programme is focused on reaching the benefits of satellite based information technology directly to the communities at the grassroot level as a single-window delivery system on agriculture, health, education and variety of livelihood needs of rural mass. Therefore this information support system will provide the services of **Experts** directly to the end users which take care off the distortion of the messages, inadequacy of grass root level extension workers, credible information, timeliness of information and above all online feedback.

What is Expert Centre?

The Expert will directly provide information to large number of rural people simultaneously through VRCs. Generally, the ECs are located in strategic places where large numbers of experts are easily accessible. One such centre is located at the University of Agricultural Sciences, GKVK, Bangalore, which has started functioning from 26th April 2007(fig-1) and had conducted 120 Expert Programmes till date covering crop production and protection aspects, Harvest and Post Harvest Technology, Value

addition, Weather forecast information, Allied Subsidiary Enterprises and marketing which were found very much useful by farmers at the receiving end. The programme is covered on every Monday as per the time slot provided by ISRO between 11.00 AM and 1.30 PM. Currently the Expert Centre programme of UAS, GKVK are received by 51 VRCs across the state out of which 17 KVKs of UAS (B). Two more Expert Centres are established in Karnataka, one of them by Mysore Resettlement and Development Agency (MYRADA), Bangalore and other by KARUNA Trust, Mysore.



Details of Expert Centre Programme conducted

Overall objective of this information support system is to leverage technologies to reach the rural communities. The VRCs have wireless or satellite connectivity with the nodal Knowledge Centers or Expert Centres. The farmers/receivers participating in the programme can directly interact with the experts through two way audio video conference and get more details as well as solutions to questions.

A Case Study

During 2005-06 the southern part of Karnataka has received the highest rainfall, which was a record rainfall in the last five decades. The intensity of rain was more during the late Kharif coinciding with the harvest of the field crops particularly Ragi and Maize, which are the major cereal crops of the area. RBRC Project operates in 75 villages covering 8340 families located in Tubagere Hobli of Bangalore Rural District

Fig-1: Experts interacting with the Farmers at VRC

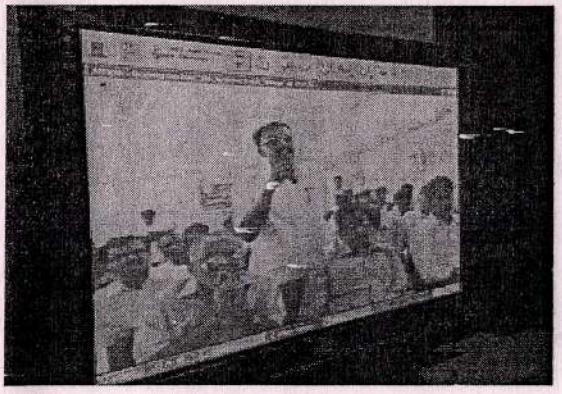


Fig :2, Dr. A.P.J.Abdul kalamji Former President of India interacting with the VRC participants from Expert-Centre, GKVK during visit to Expert-Centre on 1-11-2008.

in Karnataka. One junior scientist cover at the rate of 800-1000 families in the project area. The junior scientists provide timely information on various agro technologies including weather forecast. Timely weather forecast information helped many farmers in the project area to take crucial decisions such as whether to take up harvesting or postpone the harvest, heap the produce in case of onset of heavy rains.

Although precise quantification of economic benefits was not possible the data generated through Participatory Rural Appraisal reveal that majority of farmers were able to save the loss and obtained good grains due to the timely advice on the weather forecast. In fact the farmers of neighboring Hobli were envy to this and telling to us in

some occasions what sin we have committed in not getting such vital information and we have lost heavily harvested ragi crop due to lack of timely information. Even the leftover grains are of poor quality and unfit for human consumption. The information on weather forecast is also helping many farmers in the project area to schedule the plant protection measures particularly for high value crops like potato, tomato and grapes including minimizing expenditure on social functions.

A Study on performance analysis of Village Resource Centers (VRCs) on farming activities of Karnataka by Shamna.A 2009 has clearly indicated almost equal number of respondents rated the performance of VRCs on forming activities as medium (37.0%) and high (34.5%) and little more than one fourth of the respondents (27.5%) scored the performance of VRCs on farming activities as low.

The major advantages of the VRCs as mentioned by the users were; VRC programmes helped to increase the knowledge on various farming activities, learning through VRCs are equivalent to face to interaction, important programmes could be repeated on requests VRC programme helped to improve farming and substantial saving in expenditure due to saving in travel.

Benefits of SATCOM

1) Information to large number of people can be reached by a single expert simultaneously who are geographically dispersed
2) Learning becomes effective as there is face to face interaction between the expert and the receivers.
3) Provide information on latest cultivation practices of different crops, alternate crops and enterprises including Integrated Nutrient and Pest Management at an opportune time.
4) Provide information on forecast such as rainfall, temperature, Relative Humidity, wind velocity, wind direction, cyclone, earthquake etc for quick decisions and actions.
5) Information on marketing opportunities, warehouse facility, value addition, processing for taking right decisions.
6) Availability of various subsidies, services from government, corporate bodies and NGO's for utilizing such benefits.
7) Information on provisions of crop, health and market insurance
8) Enhancing the knowledge base on water, plant and other natural resources of the area including Indigenous Technology Knowledge for taking rational decisions.

9) Source of availability of various inputs, nursery seedlings, rates, quality, quantity including availability of transport facility and fares.

10) Information on health related knowledge, including facility of super specialty hospitals.

11) Information on remedies for simple ailments, village stories with moral values, village history, village folk songs, village culture and traditions.

12) On line degree programmes can also be taken up.

13) Provide information on employment opportunities and legal aspects.

14) Receivers can also obtain appropriate solutions from Expert Centers by holding live specimens/Samples at VRCs

15) Local extension personnel can also be empowered regularly.

16) Saving on expenditure due to savings in travel, logistics and replication of teaching infrastructure.

17) System is scale neutral and can reach all types of people irrespective of their social or economic backgrounds.

18) In the context of cost benefit ratio this method is less costly and more effective in reaching large number of users.

Conclusion

The Indian farmers have suffered over the years partly due to lack of timely dependable comprehensive information support for taking rational decisions. In this context, Expert Centres and VRCs have great role to play in providing timely reliable information at a reasonable cost to the farmers in particular and rural people in general for their development. Therefore it is appropriate to establish one VRC in each Hobli in the initial stage and thereafter for all the panchayats in the country in due course. One expert Centre need to be established for a given agro climatic region to provide more specific and need based information to user groups. It is a great opportunity to extension professionals to update their knowledge and make use of this system for reaching the farming community at a faster rate. Similarly it is an opportunity for the extension researchers to explore how to enhance the system in terms of reaching every clientele with required effectiveness as well as to analyse cost feasibility over other methods. Considering the overall scope for providing a variety of information at a shortest span of time, effectiveness and cost feasibility, it is for the policy makers to make use of potentiality of the SATCOM application for improving the living standard of rural people.

TECHNICAL SESSION-V

Integration of ITK (Indigenous Technical Knowledge) with Scientific Knowledge for their Adoption

Re-Esteeming the Need of Village Knowledge Hub for Knowledge Intensive Rural Development

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Abstract

In the changing global scenario, the knowledge intensive development plays a pivotal role in characterizing the sustainable development of the rural people. As an aftermath of the emergence of 'knowledge driven economy' *vis a vis* 'knowledge driven society', the need of the hour is to orient the rural people in updating their skill and knowledge for making their identity in this competitive world by utilizing the most modern technology, Information Communication Technology (ICT). To use the ICT in fullest extent for sustainable development of the rural areas, it has been proposed to introduce e-village initiative by using state-of-the-art high-tech Information and Communication Technology by setting up Village Knowledge Hub (VKH). In such a knowledge intensive environment, the present conceptual paper has been developed to delineate the concept and modalities of Village Knowledge Hub with the help of exploratory or formulative type of research design. The details of the Village Knowledge Hub is explained in the present paper with some illustrations like Information village at Pondichery by Indian Space Research Organisation-MS Swaminathan Research Foundation, Warna wired village at Maharastra, Technology and Action for Rural Advancement (TARA) haat, a venture of Development Alternatives enterprise at Punjab, Haryana, MP and UP and E-Choupal by ITC. Ultimately, to act upon the principle of 'Think globally and act locally', Village Knowledge hub which can create a new saga in e-learning solutions to make the knowledge village a knowledge-disseminating hub of the World, is required to be established to face the challenges of 'the knowledge intensive and knowledge driven society'.

Key words : Village knowledge hub, Knowledge village, Village knowledge centre, E-village, Information communication technology, Sustainable rural development, E-books, Tele-medicine, Tele-education.

Introduction

At the advent of rainbow revolution era, the knowledge intensive development plays a pivotal role in delineating the sustainable development of rural people and acts as a prime mover of rural India. India has long been the pre-eminent knowledge-disseminating hub of the World. The Indus Valley civilization, one of the oldest in the world, dates back at least 5,000 years. From the Vedic age downwards the central conception of education of the Indians has been that it is a source of illumination giving us a correct lead in the various spheres of life. Knowledge according to some thinker is the third eye of man, which gives him insight into all affairs and teaches him how to act.

Today, economy is said to be 'knowledge driven economy'. This emergence of 'knowledge driven economy' and 'knowledge driven society' in this millennium market place has placed greater demand for a broader base of population to have broader

knowledge and current information in the concerned field. This is very much true in the agricultural field. A sample survey has revealed that 40% of Indian farmers desire to leave the vocation of agriculture which they found non-remunerative. One of the main reasons of this is the lack of proper information at the appropriate time. This changing scenario demands people to adapt new ways to update their skills and knowledge for making their identity in this competitive world by using most modern technology, Information and Communication Technology (ICT).

Advance in Information and Communication Technology (ICT) and especially in Multimedia, Networking and Software Engineering have promoted the enormous amount of learning resources and Learning Management System (LMS). During the last year thousands of electronic texts, images, movies and Java application based learning resources have been developed for learning purposes in Internet environments.

Information and Communication Technology (ICT) is now the key enabler and a vital component of the new knowledge based economy because it has revolutionized the process of dissemination of knowledge and information. It is a major factor in economic growth and increasing productivity. India is increasingly integrating ICT into its national development plans and adopting strategies for its widespread promotion in all the spheres of economic activities. There is a need to ensure that the benefit of the ICT percolates to all the different socio-economic strata and to the grass roots of the rural India. The requirement of transforming a nation, into a knowledge vibrant e-learning environment is vital.

The rural areas in India cannot be compared with its urban areas, where needs and service requirements are at a very different level. With poor existing infrastructure in the rural areas, delivery of services of essential requirements becomes in itself formidable task in its 6,40,000 villages spread out in every type of agro-climatic zones.

Fitting into this overall knowledge village concept, it has been proposed to introduce e-village initiative to reach the un-reached, un-served and underserved areas more effectively by using state-of-the-art high-tech Information and Communication Technology by setting up Village Knowledge Hub (VKH). Knowledge Village should be powered by innovations. Efficient utilization of the existing knowledge can create comprehensive wealth and also improve the quality of our society i.e. life - in the form of better health, education, infrastructure and other social indicators and should offer a huge opportunity to collaborate with the Scientists, Academic Research scholars, Universities & Organizations, to create a modern, vibrant Knowledge disseminating hub of the World. It should bring about a fusion of Knowledge with Information Technology, Information Technology Enabled Services and Space Missions Services for disseminating knowledge to people in all walks of life through Satellites and Virtual

Classrooms. In such an innovative communication climate, the present conceptual paper has envisaged the concepts of village knowledge hub in a nutshell.

Methodology

The exploratory or formulative research study was carried out to prepare the entire content of the paper. The major emphasis was given on the discovery of ideas, insights and theoretical construct. The survey of concerning literature was the main base to formulate the theoretical construct.

Content

The Village Knowledge Hub (VKH) will be a place to render distant services from a single window point to rural masses especially in remote areas of the country through modern Information and Communication Technology. The knowledge hub will be connected to a central studio using technologies *viz.* WiMax/VSAT/leased line. There will be live interactive sessions in real time by the central speaker with audience at remote villages or content already prepared on any subject that the rural communities might need or desire, will be disseminated. The purpose of setting up of a VKH is to bring access to a range of services, content and information to people living in remote villages or areas which do not provide such access otherwise.

The village knowledge hub connectivity through tele-communication with satellite, high bandwidth fiber optic cables, wireless reaching the rural areas from cities and through internet kiosks enables the rural areas to acquaint with the urban facilities of the nation. The Knowledge connectivity (e-village) provides education, skill trainings for farmers, artisans and craftsmen and entrepreneurship programmes. A proper network linked to the regional headquarters through the broadband fibre and wireless connectivity, makes the people of the remote areas of the nation to have a vision of the nation, and of the vital presence of their contribution of the nation's welfare. Broadcasting facilities through satellite radios should provide adequate updates of men and materials of the nation. Mobile learning and connectivity enhances the alert information during disasters. A proper disaster management system including scholars, scientists, and technician body should be created for handling disaster situations of the future. The disaster management task is to track the disasters, predict the calamities, handle the disasters with adequate technologies and enable a reliable security for the citizens of the nation. Disaster zones should be located and a team should be implanted for proper study.

The remote areas of a nation should be networked to Knowledge Village hub through the broadband fibres and wireless connectivities. Mobile cell phone with Global Positioning Systems (GPS) facility may be provided for emergency communication.

This will also provide the population data, local meteorological and local sea state data through subject matter specialists from the village knowledge hubs obtained from near by meteorological station, disaster management stations, knowledge village (e-village) and the other service providers. The knowledge village should support with cost effective safe techniques, training, application of technology, improving the productivity, proper mobilization of natural resources, cost effective marketing strategies, product branding, marketing for realizing the value added price, application of technology for improving the productivity, storage and preservation systems. The knowledge village hub should create an e-village forum. The purpose of the forums will be to provide the citizens of the nation with a public discussion arena. If they want to raise an issue or concern they have the right to represent it for the well being of the nation irrespective of caste or creed.

E-learning is the presentation of a learning, training, educational program or knowledge dissemination by electronic means. The interactive e-learning basically focuses on increasing the quality, value and reach of education. Typically used to describe media such as CD /DVD-ROM, internet, intranet, wireless and mobile learning, knowledge management can also be included as a form of e-learning. Any learning can utilize a network (Local Area Network, Wide Area Network or Internet) for delivery, interaction, or facilitation. Using satellite based, internet based, and interactive multimedia (CD/DVD/WEB/KIOSK) technology to deliver knowledge to people begins a new leap in interactive e-learning system. But the prevailing trend in e-learning is merely Web Based Training (WBT) Computer Based Training (CBT), conversion of data (bilingual text) from hard copy to digital formats, online power-point slides, streaming audio/video lectures etc.

Objective

The village knowledge hub will be meant for extending the benefits of the Information Communication Technology directly to the farming communities at the grass root level for promoting single window delivery of need-based services relating to the life cycle needs of rural population, viz. rain water harvesting, natural resource management, nutritional information including primary processing of fruits and vegetables, rural sanitation, preventive and curative aspects of health and hygiene, skill development and linkage with market requirements and demands, capacity building among village based organisations and people or on any issue that the rural communities would desire.

Expected Outcome

- Dissemination of knowledge and services to the under-served, un-served and un-reached areas

- Better skilled and oriented cadres and individuals
- Training of trainers
- Capacity enhanced at the grass root level
- Modern human resource practices for efficient service delivery
- Improved organisation and better decision making ability in the community
- Improved capacity within communities to manage VKH systems
- Networking of governmental, non-governmental institutions, Panchayat Raj Institutions, Self Help Groups
- Knowledge connectivity
- Better opportunity of employment
- Availability of online market rates and better marketing of rural produce.

Advantages in a Nutshell

- Interactive communication
- Reduce dependence on the functionaries
- Reduce dependence on the middle men
- Easier accessibility to information
- Early warning of natural disasters
- Provision of need based information for the stakeholders
- Continuous availability of the information

Approaches

"Establishment of a Village Library and then gradually convert in to Village Knowledge Hub".

1. To establish a village knowledge hub, a village should be surveyed properly by interacting with people and local governing body.
2. After conducting extensive surveys and finding the needs of people, a suitable place in the village should be located to provide the services.
3. After finding a suitable place in the village, it is established.

Deliverables

1. ***Daily News*** : Important headlines will be gathered from different newspapers by the volunteers and they will write them on black board at the entrance of VKH. They will also subscribe to newspapers.

2. ***Employment News*** : The volunteer will collect information from different news papers and tell them to villagers.

3. ***Education News*** : This will include list of educational institutions offering various courses, model question papers for entrance examinations and information on application of Diploma courses. The VKH will also look up results for students in villages.

4. ***Agriculture*** : The volunteers will call the near hub and get the prices of fruits, vegetables from a general/retail and farmers market societies and the information is pasted on the black board everyday. Information about inputs, such as bio-fertilizer and bio-pesticide stocks at the government godown will also be provided.

5. ***Government schemes*** : A preliminary database of schemes, subsidies and programs for groups such as children/students, women, Schedule Castes, handicapped citizens and BPL families will be maintained by the volunteers.

6. ***Health*** : The VKH will maintain a list of doctors, clinics and hospitals in the region. Health camps will be organized with the help of this VKH in the villages regularly. The volunteers will also be trained with basic first aid kits for various problems. Tele-medicine is becoming an integral part of health care services in several nations. Tele-medicine has been defined as the use of telecommunications to provide medical information and services. Hence, Telemedicine enables people in one geographical area to access of a trained medical practitioner in another geographical location.

Telemedicine is a method by which specialist doctors can examine, investigate, monitor and treat patients in remote areas through satellite video conferencing. Hospitals of the future will drain patients from all over the world without geographical limitations. High quality medical services can be brought to the patient, rather than transporting the patient. The Image acquisition, image storage, image display and processing, and image transfer represent the basis of telemedicine.

7. ***Books for Knowledge*** : Different books will be kept in the hub to avail the library facility to enrich their knowledge. Different varieties of books focusing on different age groups will be kept. The volunteers will give the books to study in the hub.

All the above mentioned subject matter contents would be prepared electronically offline by the volunteers and afterwards inserted it into the e-village portal fo. the online access of the information.

8. ***Transistor*** : A transistor will be kept in VKH. The volunteer will take care to convey effective information to villagers.

9. ***Tele Education*** : Instead of simply memorizing all the knowledge that has been accumulated in a particular field it should be in the windows of the new horizon. Knowledge village will be highly accomplished to create a knowledge intensive environment along with an enabling process to efficiently create, share, use and protect knowledge for the future. There are several tiers in Tele-education. Video-conferencing is now used in a wide variety of settings and is sometimes referred as Tele-education. It has many advantages over traditional teaching methods and is increasingly becoming a preferred medium for teaching larger groups of students. The tele-learning model is used to reach students in remote areas and helps overcome the shortage of teachers. A single lecturer can not only teach students in the far corners of the nation but also support good teachers in remote areas to learn about new concepts and, in turn, share it with their disciples. Through Tele-education, a university could host virtual classrooms in multimedia environment for students in remote corners of the country. The future students can also record the procedure for use as e-book.

Illustrations

1. Information village at Pondichery by Indian Space Research Organisation-M S Swaminathan Research Foundation delivers all the deliverables of e-village.

2. Warna wired village at Maharastra aims to

   - Utilise IT to increase the efficiency and productivity of the existing cooperative enterprise by setting up a state-of-the-art computer communication network.
   - Provide agricultural, medical, and educational information to villages at Facilitation Booths in their villages.
   - Provide communication facilities at the booths to link villages to the Warna cooperative complex.
   - Bring the world's knowledge at the doorstep of villagers through the Internet via the National Informatics Centre Network.

- Provide distance education to both primary and higher educational institutes; and Establish a Geographic Information System (GIS) of the surrounding 70 villages leading to greater transparency in administration especially in matters related to land.

3. Technology and Action for Rural Advancement (TARA) haat, a venture of Development Alternatives enterprise at Punjab, Haryana, MP and UP delivers
   - TARAdhaba - provides the villager connectivity and access to a new world.
   - TARAbazaar - provides access to products and services needed by rural households, farmers, and industries.
   - TARAvan - delivers goods ordered by users.
   - TARAdak - connects the rural families to the daughter married far off and to the son posted on the front.
   - TARAguru - a decentralized university provides mentoring and consultancy to village-based mini- enterprises.
   - TARAscouts / TARAreporter - collects relevant information for the portal.
   - TARAvendor - runs the store that will cater to products available at Tarabazaar.
   - TARAcard - enables the villager to order goods and services on credit.

4. E-Choupal by ITC delivers
   - Relevant and real time information: Commodity prices, local weather, news
   - Customised knowledge: farm management, risk management, marketing research
   - Direct marketing channel for farm produce: Lower transaction cost, better value through traceability
   - Supply chain for farm inputs: Screened for quality, demand aggregation for competitive prices
   - Education
   - Financial services : Life, general, health and crop insurance

Conclusion

Knowledge Village connectivity (e-village) aims co-operation with the challenge of new century and expands the use of new technology to mass level. Ultimately, the

nascent Village Knowledge Hub aims to use and expand the computer technology in the grass root level, to gain, to practice and further to develop their Information Communication Technology (ICT) skills, to learn about things of local interest and to get together to swap ideas, thoughts and suggestions by providing services that promote and support farmers, educators, researchers, planners, designers, journalists, social workers and entrepreneurs for improving their access to the national and global information. The ability to choose the right idea and option can change the world around us in our own way. The Village Knowledge hub should be information disseminating centers i.e.; keeping data on agriculture, natural resources, fisheries, livestock, health, education, environment etc into a village database, and it should be of easy access to people. Information Communication Technology (ICT) is the road, which must be brought to the doorsteps of the poor. The poor should be given the opportunity to master the skill to use this technology to their advantage. The scientists in this area must design the Information Communication Technology in such a way that a totally unprepared poor person can immediately get the hang of it without feeling threatened. Information regarding the government, the private sector, education, health, environment and the important daily issues must be available to all the people. All these things can be made available to the rural people with the help of Village Knowledge Hub. Knowledge Village can create a new saga in e-learning solutions to make the Knowledge Village a Knowledge-disseminating hub of the World. Knowledge village hub ultimately motivates and acts upon the principle of 'Think globally and act locally'.

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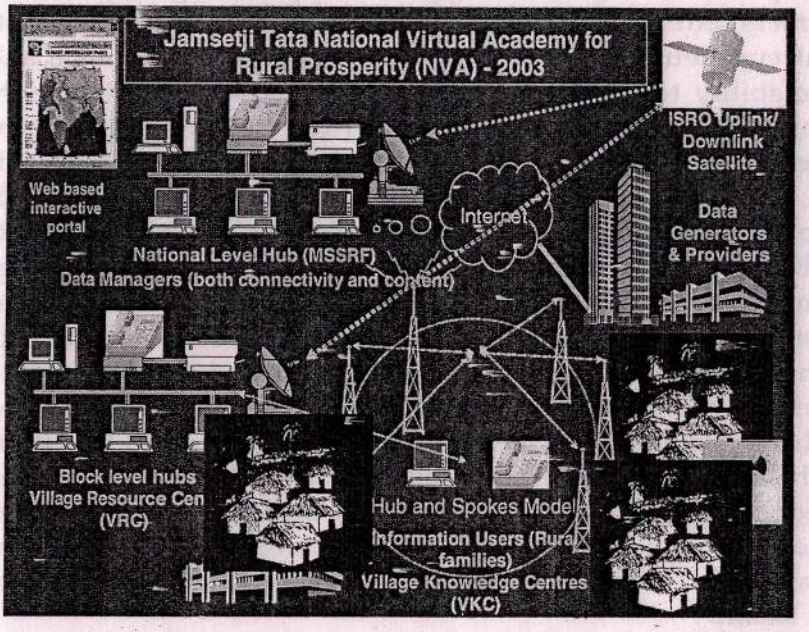
Annexure

Schematic presentation of an outstanding Village Knowledge Centre developed by ISRO-MSSRF



Source : Website of MSSRF

Integrated Farming Systems Towards Livelihood Security : Extension Imperatives

Dr. Baldeo Singh
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India is an agriculture-based country with 329 million hectares of land area, of which 143 million hectares are cultivated. Nearly 80% of the 115 millions farming families own one hectare or less of cultivable land. A recent survey by the NSSO revealed that about 60% of the farmers had no access to any agricultural information sources. Mounting agrarian distress, market competitiveness and consumers' preference specificity coupled with growing concerns of WTO implications necessitate closer examination, redemption and revamping of policy interventions for technology development, deployment and dissemination. The country can no longer afford to have a blanket policy framework in agriculture. Stark realities of farmers' suicide, starvation casualty, rural exodus to swelling urban slums for livelihood on one side and highly commercialized agriculture added with plunge of corporate sectors on the other side present the diverse scenario of agricultural system in the country. Issue becomes more intriguing with advent information technology and transgenic and their related implications.

Agriculture in India is, by and large, practiced at a subsistence level in the fragile ecosystems. Small and fragmented land holdings, poor economic conditions, little mechanization coupled with various soil and climatic constraints prevent farmers from adopting modern technology. Resultantly, the crop yields are not only low, but also highly unstable, showing large year-to-year variations, primarily due to the fluctuating rainfall pattern, non-availability of situation specific technologies and other operational constraints. However, there is a great scope for introduction of appropriate technologies to convert these natural resources for providing sustainable livelihood to the rural communities.

The major challenges facing the Indian agriculture are:

1. Stagnation in agricultural production and productivity
2. Increasing trends of unemployment, hunger and poverty
3. Shrinking and degrading production resources
4. Disparity between irrigated and rain-fed areas
5. Increasing climate change and environmental pollution
6. Declining investment in agricultural research and extension

7. Inadequate infrastructure and institutional support and fragile linkages
8. Confusing extension services by many players
9. Increasing rural-urban divide

Efforts for Agricultural Development

Organized efforts for agricultural development predate the planning era in India. The first effort was Community Development programme and thereafter, several programmes were launched. These programmes helped in the wide spread of modern technologies and increase in farm production and productivity, and overall quality of human life. The method and content of different programmes have remained the same except some minor variations in the emphases. All these programmes and strategies considered farming problems essentially as 'individual' concern and never as a 'collective' issue. The individual-oriented development strategy has resulted in the neglect of poor farmers and the concentration of efforts mainly on rich farmers. The approach has relied heavily on diffusion of innovation model and less on integrated farming systems or social action model. Contrary to the expectation, the development efforts or modern technology did not trickle down to most of the farmers at the bottom of development.

The changes in agricultural environment have laid emphasis on integrated agricultural development to address key constraints in technology dissemination with new institutional mode of Agriculture Technology Management Agency (ATMA) - a bottom up planning procedure in partnership mode involving all stakeholders by operating through farmers' group with intensive use of information technology and media back up and adequate backward and forward linkages. Although the impact of ATMA model is yet to be seen and realized, the model has created at least the ground for the partnership and group activities in the districts. At present, the farming community is in a state of utter confusion and desperation as to whom they should approach for the problems and how to compete and earn more from their small holdings in the changing scenario. This situation stresses a need to critically look into the developments in agriculture at village level and develop a comprehensive integrated strategy to cope with the emerging situations to safeguard the interests of the farmers and exploit the opportunities to their fullest advantages. As agricultural extension stands at the threshold on new millennium, the frontier quests to be considered are:

- What is the state of affair of public extension system and/ ATMA mode of extension and how to make the system more vibrant and responsive to the emerging demands?

- What should be the role and responsibilities of public research and extension systems and how well these systems be integrated in participatory development?
- What should be the nature and extent of partnership among various stakeholders and the mechanism for the monitoring and accountability?
- What should be the extension strategy to make the agriculture sustainable and commercially viable to generate additional income and employment?
- To what extent and how effectively the ICT could be utilized for the benefits of the farming community to harness the opportunities of agricultural globalization?
- What and how the extension human resources should be developed and equipped to cope the emerging demands effectively?

The need of the hour is to give stress on village-based development for integrated farming systems utilizing rural resources to enhance farm productivity, profitability and employability. We need to identify the competitive advantages that our research and extension systems have and exploit their potentials in order to retune our strategy to respond to the present situation. We cannot undermine the strong research base of ICAR and SAU system and a large network of Extension system. This strong research and extension base is the first competitive advantage that we can make use of. There is a strong need to revamp the existing research and extension systems with required human resources (both genders) and financial support.

In order to develop the agriculture and farming community in particular, the following directions are the most important to reckon with:

1. Maintaining and consolidating the gains made in agriculture and continuing to enlarge levels of potential productivity and profitability with eco-friendly technologies under farming systems perspective.
2. Extending agricultural gains in integrated manner on participatory farming systems development to the areas so far largely deprived, especially in rain-fed and dry areas, where the new farm technology has made only a limited impact.
3. Increasing emphasis on post harvest management, processing, value addition and marketing including entrepreneurship development on commodity and area basis by selectively involving private players and NGOs to take the fullest share of exports.

Need for farming system approach

Basically, the agricultural development is a holistic concept encompassing both natural and human resource development. The National Policy on Agriculture announced in July 2000, seeks to bridge the yield, productivity and production gaps and sustainably improve the rural employment opportunities, income, equity, livelihood security and environmental security. The policy envisages promotion of sustainable agriculture through a regionally differentiated farming systems approach, development and transfer of technology, improvement of input use efficiency, incentives for agriculture, strengthening of infrastructure, risk management and management reforms.

Producing more quality food from small landholdings warrants maintaining a healthy resource base, including healthy soil. This requires farming systems approach. In fact, most of the crop and animal activities on a farm are closely related to each other by the common employment of labour, land and capital. The cultural practices are also closely linked with the various crops and livestock combinations. The changes in any one practice usually require a reappraisal of all others to maintain the former balance. By and large, the existing farming systems in India are:

1. Irrigated farming systems embracing a broad range of food and cash crop production,
2. Wetland rice based farming systems dependent on monsoon rains and is supplemented by irrigation,
3. Rainfed farming systems in humid areas of high resource potential characterized by a crop activity (root crops, cereals, industrial trees- both small scale plantation and commercial horticulture) and mixed crop-livestock systems
4. Rain-fed farming systems in dry or cold low potential areas with mixed crop-livestock and pastoral system merging into sparse and dispersed system with very low productivity,
5. Rain-fed farming systems in steep and highland areas which are often mixed crop-livestock systems,
6. Dualistic (mixed large commercial and small holder) farming systems across a variety of ecologies and with diverse production patterns
7. Coastal oriented fishing often mixed farming systems
8. Peri-urban farming systems typically focused on horticultural and livestock production.

The farming system is a reasonably stable arrangement of family enterprises that the household manages according to its physical, biological, economic and socio-

cultural environment in accordance with household's goal, preferences and resources. Nevertheless, it is a complex inter-related matrix of soils, plants, animals, implements, power, labour, capital and other inputs controlled in part by farm family and influenced by social factors that operate at many levels.

Extension Imperatives for Integrated Development

To reach 115 million farm families spread over more than 590 rural districts and 6 lakhs villages is an up-hill task. Farmers' needs are now much more diversified and the knowledge required addressing calls for improving the capacity of existing research and extension systems. Studies on total factor productivity of crop sector conducted in Indo-Gangetic Plains of India at IARI indicate that extension accounts for around 45 per cent of the growth in total factor productivity, followed by research (36%), literacy (10%), infrastructure (8%) and urbanization (1.5%). Research and extension together accounted for nearly 80 per cent of the growth in total factor productivity. In view of this, we need to assess the strengths and weaknesses in our research and extension systems and prepare a roadmap to revamp these with sufficient investment, modern facilities and required manpower to meet the future challenges.

1. Revitalizing national extension system with robust structure and sound management function

After the T&V system of extension, the country had no extension system of national character. ATMA model through Community Development (CD) extension staff is in evaluative stage. It is high time to first gear up the **national CD extension system** with sound organizational structure - adequate physical facilities, human resources and Information Technology (IT) enabled service and defined management function to address the challenges. The number and role of private players need to be restricted and their involvement be limited to some sectoral needs and demands, but under the coordination of CD extension system to ensure accountability. The involving *Village Pachayat* in planning and implementation of development initiatives should be made mandatory.

Extension has a primary goal of helping people and its fundamental role is education and facilitation for new knowledge and skill, which go beyond the process of transfer of technology. Ironically, extension has been employed as service delivery system. Such gross negligence in understanding its philosophy and undermining its role has crippled the process of developing self-determination, community initiatives, grassroots creativity and sustainable development in rural areas. This calls for immediate corrections through proper role assignments, strengthening with adequate number of extension workers at gross root level and training them in newer and relevant areas of behavioural dynamics.

2. Professionalism in Extension

No one spares in making scathing and critical comments for slackness in extension, but one seldom analyses the facts about the structure and professional set up of CD extension system and KVK in the country. Ironically, people not trained in extension education philosophy manage most of the extension affairs. It is high time to introspect and put extension education specialists in lead role using SMSs for the farmers' concerns through policy intervention, at least at KVKs and SAUs.

3. Area coverage by extension agents

Several research studies conducted on extension organizations have revealed that the delivery of goods is effective when the grassroots extension worker covers a small area of jurisdiction. The existing system of large jurisdictions, each with a narrow range of activities, is less effective. The integrated strategy of broad basing requires grassroots extension workers to be more in number, at the cutting edge of extension and master of many trades. At least, two extension workers (1 male & 1 female) at *Village-Panchayat* are essential to cope up multiple demands of farming community, as techno-ware cannot become the substitute of human-ware to motivate and mobilize the farmers. IT strengthening of CD extension system can help enable extension staff to gather, store, retrieve and disseminate a broad range of information needed by farmers, thus transforming them from extension workers into knowledge workers to realize much talked about bottom-up development.

4. Reorienting extension system of SAUs/ICAR institutes

The extension education role of SAUs / ICAR institutes encompasses four functions i.e. extension research, education, training and field extension (TOT). These are carried out through extension directorate /extension divisions /sections. We need to assess the extension education role and identify critical gaps/areas requiring reorientation and infrastructure support. We need to focus extension researches on frontier and burning areas and develop capabilities to undertake researches in coordinated manner. The frontier areas for research and extension interventions are farming system research; impact assessment; participatory extension and entrepreneurship development methodology; socio-economic and organizational aspects; marketing extension, pluralism in extension; cyber extension etc. The extension advisory function needs to be more aggressive in its TOT approach and strategy not only to accelerate the transfer process for integrated agricultural development, but also to provide knowledge support to post harvest practices, value addition and marketing.

Areas like dairy, sericulture, beekeeping, mushroom cultivation, wasteland development, pond management, nursery management, rural crafts etc. are found to

be better managed by women and more paying in terms of income and employment generation. The diversified eating patterns and growth of number of women working outside home have created the needed demand for the retail food markets and also opening up domestic markets for external trade of processed foods. Effort is needed to introduce low cost post harvest equipments like miniaturized grain mills, dal-mills, cleaner, grader, maize-sheller, groundnut decorticator, etc. which the farm women would be able to operate without much difficulty, besides farm implements reducing women drudgery. Paradigm for practicing agriculture having farmwomen in focus needs to be restructured according to resource potential and market feasibility.

5. Reorienting KVK functioning and initiating ICAR's Lab to Land programme

The KVKs should be equipped with manpower, facilities and resources to play pivotal role for agricultural transformation in their respective areas. They should work as role model and light-house for agricultural development with new technologies and need based vocational trainings. The technical support on subject matter by the KVKs to women and their organizations is necessary. It is imperative to have KVK in-charges with agricultural extension qualification and all KVKs should be brought under the umbrella of ICAR/SAUs.

ICAR led previous front-line extension project of Lab to Land Programmes (LLP) should be reintroduced for socio-economic betterment of small and marginal farmers.

6. Public-Private Partnership

The integration of research, extension and client systems for sustainable development have assumed greater importance today. The private services need to be properly channeled and utilized to support the main extension system, particularly for post harvest management, entrepreneurship development through small-scale cottage infrastructure and export promotion. In this context, the public-private partnership has been expressed explicitly as follows:

- **Promotion of Agribusiness through development of Agribusiness Center**

  The agribusiness through development of agri-business centers at Block and Panchayat levels should be promoted. This objective cannot be achieved without the partnership with the private players.

- **Establishment of Agro-Clinics**

  The demand for specific farm information is on the rise on one hand and on the other a large number of agricultural graduates are in dire need of employment. Under government initiative through MANAGE with involvement of recognized

agricultural institutions/universities, agricultural graduates are being trained to open information shops as an entrepreneurs. Private agencies can play active role in supporting this initiative for its successful implementation.

7. Marketing and retailing

Smallholders are risk averse and their effective participation in regional, national and global markets requires a mechanism that could absorb such risks. Organized retail involving farmers/ their associations can help reduce wastage that currently characterizes farm production. The studies indicate that about 50 per cent of the population, below 30yrs of age, is aspiring for higher production, consumption and innovation. Involvement of these age groups in retailing of food and agricultural products by extension design to build their capability and financial investment/ infrastructure support by corporate sector on benefit sharing basis may help bring about a transformation in farm sector to improve production, productivity and quality.

8. ICTs infusion (Info-tech & Agro-biotech)

ICT diffusion and infusion in agriculture provide necessary digital opportunities or advantages for productivity increase, income generation, decrease in national disparity and improving linkages with the market. Preparation for future development and communication among masses require an extensive thinking regarding information technologies and convergence with mass media including the Internet. An important development is the emergence of e-Commerce, which can be assessed and utilized appropriately.

9. Area Approach

A systematic area planning in concentric zones with vertical and horizontal links keeping in view the important commodities in production cum food value chains is an appropriate integrated strategy. Linking small farmers to processing industries and fast food chains would be a good proposition. The priority need is to thoroughly study the existing situation of producing and retailing of agricultural products and promote it on three tiers basis: **First tier -** high-tech diversified agriculture, processing, value addition and trading at District level; **Second tier -** integrated agriculture, processing, value addition and retailing at Block level and **Third tier -** commodity based integrated agriculture, pre-processing and petty retailing at *Village Panchayat* level. While retailing at first tier should be promoted in partnership of corporate sector, but the retailing at second and third tiers should be restricted to rural entrepreneurs to create employment market and utilize local market avenues. The financial support at these two lower levels is essential. **The key areas** of food retailing are storage, transportation, segmentation based on class of buyers, packaging etc.

IARI initiative of Involving institutions in Technology Transfer

The IARI has initiated a national level extension programme on **'Village-based integrated models for market-led agriculture'** in different parts of the country by involving institutions since 2007. The programme aims at creating location-specific models to utilize properly prime land and rural resources for agriculture; realize the untapped production potential by bridging yield gaps; develop system approach with all attention to the links in production to food value chain and develop local capacity for participation, leadership, group action and entrepreneurship to promote quick spread of technologies through farmer-to-farmer extension in wider areas.

The IARI has established project field sites in north, south, east and west parts of the country to carry out TOT interventions in participatory mode in the fields of diversified/ commercial farming. The attempt is to understand the problems faced by the farmers related to their livelihoods and adoption and diffusion of farm enterprises, and address them to strengthen the technologies/enterprises movements through farmer-to-farmer extension. The local partners being involved include SAUs/ICAR institutes, development departments, NGOs or corporate sector. Some selected nearby sites are planned to be connected with IARI for information communication and knowledge sharing. The project is being carried out in phased manner in concentric mode across the country.

1. Peri-urban agriculture (up to 75 Kms. from IARI)- Three (3) sites in NCR of Delhi and Gurgaon (Haryana)
2. Integrated agriculture (above 75 to 500 Kms. from IARI)- Eight (8) sites (Sonepat in Haryana, Western districts & Mathura in UP, Patiala in Punjab, Churu, Jhunjhunu & Bharatpur in Rajasthan)
3. Integrated farming systems (beyond 500 Kms. from IARI)- Nine (9) sites (Gulbarga & Banglore in Karanataka, Parbhani & Rahuri in Maharashtra, Varanasi & Mirzapur in UP, Ranchi in Jharkhand, Udaipur in Rajasthan and Navsari in Gujarat)

A cluster of 2-4 villages/ a village *Panchayat* has been selected at each project site to implement the programme. The innovative farmers in different locations are also being linked and utilized for technology transfer. A mutual agreement for collaborative efforts between the IARI and SAUs/ ICAR Institutes/NGOs has been made. The SAUs/ICAR institutes involved are MPUAT Udaipur (Rajasthan), MPKVV Rahuri (Maharashtra), MAU Parbhani (Maharashtra), UAS Dharwad & UAS Banglore (Karnataka), BAU Ranchi (Jharkhand) and BHU (UP), IIVR, Varanasi & CIRG, Mathura (UP), NAU, Navasari (Gujarat) and NRC Rapeseed-Mustard, Bharatpur

(Rajasthan). ANUA&T Faizabad (UP), JNKVV Jabalpur (MP) RAU Samastipur (Bihar) are also in the process of joining the programme. The programme encompasses village-based natural resources management and lays emphasis on quality seeds production, protected horticulture, diversification with high value crops/vegetables/flowers, processing, value addition and marketing, capacity building for entrepreneurship development, SHG mobilization and leadership development by integrating indigenous knowledge and practices. The exchange of technologies among partners for trial and adoption in suitable locations and avoiding duplication of research efforts are also the concerns of IARI initiative. It involves a farming systems approach with emphases on development of the concepts of (i) **Seed Bank** by producing enough good quality seeds and planting materials of important crop/vegetable varieties and hybrids; (ii) **Water Bank** by harvesting rain water and judiciously using by adopting efficient water management techniques and crops and varieties; (iii) **Fodder Bank** by introducing quality fodders and their conservation techniques using Feed Block Making Machine through farmers' association/SHG/ *village Panchayat*; (iv) **Energy Bank** by harnessing renewable energy from different sources such as solar, wind, water, biomass, bio-diesel etc. (v) **Manure Bank** by utilizing cattle dung and other bio-mass for renewable energy; (vi) **Knowledge Bank** by developing knowledge society & local leadership and (vii) **Risk Mitigation Bank** completely owned and managed by the rural people with appropriate directions for helping the resource poor under unforeseen adverse situation.

Conclusion

There is a need for extensive and intensive increase in investment in strengthening research and extension systems. This is a priority area and needs adequate funding support.

Urgent need is to revive national extension system - Community Development (CD) system under ATMA - adequately equipped and revamped in respect of additional human power, physical facility including transport, ICT-computer, Internet facilities etc. to cater the multiple needs of farming community and agri-preneurs.

The public-private-client partnership should be selectively built and strengthened according to location specific needs and aspirations.

The IARI extension model of **'Village-based Integrated models for Market-led Agriculture'** need to be emulated and promoted for sustainability, profitability and partnership development.

A comprehensive area planning is required to develop agriculture on farming system perspective with vertical and horizontal links of concentric zones.

Farmers' needs are now much more diversified and hence, integration of research and extension for farming system research and development is essential.

The infusion of Agribiotech (agricultural bio-technology) and InfoTech (information technology) in farming system is needed to catalyze progressive changes in more sustainable ways and help to attack the problem of rural livelihoods.

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Scientific Knowledge and Indigenous Technical Knowledge : The Mutual Exclusiveness

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Indigenous knowledge on the flora of India and adjacent region is as old as ancient scriptures, bio-geographical niche, cultural history, natural resource on which the indigenous communities are dependent upon on this subcontinent. The topography coupled with gigantic watershed river system, diverse mountainous, desert, oceanic ecosystems and varied climatic influences and other factors have contributed immensely towards the rich flora of the region with variety of life forms subsistent on them. There is marked affinity of indigenous technical knowledge of different communities of India with that of Indo- Tibetan, Sino- Himalayan, Indo- Nepal, Bhutan, Bangladesh, Pakistan, Sri Lanka, Myanmar region rich in biodiversity and genetic resource. Globally Indian sub-continent has admixture of flora and fauna of African, European, Mediterranean, Australian and South American origin. Indian region is endowed with rich biodiversity, representing nearly 18000 flowering plant species occurring in various distinct floristic zones. About 75,000 species of animals, 340 species of mammals, 1200 kinds of birds, 420 reptiles, 140 amphibians, 2000 fishes, 50,000 insects, 4000 molluscs and other invertebrates are distributed. Indigenous communities are represented by nearly 430 distinct ethnic groups interspersed among 54 million under 227 linguistic groups and inhabiting different phyto-geographical locations. An appreciable proportion of the biological components is used by indigenous communities for variety of value-added products such as food, fodder, dyes, fibre, gum-resins, bamboos, medicinal herbs etc. through their traditional mode of survey, collection and usage. Indigenous knowledge on the traditional classification system being followed by indigenous technical knowledge holders in colloquial/ dialects/linguistics has not been by and large converted in to taxonomic language of scientific world. With the shrinkage of the bio-resources rich areas under indigenous communities and vanishing of knowledge along with indigenous communities, there is urgent need to make joint venture through the application and integration of scientific knowledge through the ways and means the communities understand and prefer most considering the components of indigenous technical knowledge. From the integration of taxonomic knowledge there is need for characterization of traditional methods of identification and classification, value addition and methods of pre and post harvesting of species. Popular beliefs and folklore have now scientific principles for interpretative approach. With the property right and patent regimes the lesser known aspects of indigenous technical knowledge have now larger attention and specific interest for commercial extraction. From the organizational level there is need for registration of grassroots innovations, certification of products for the authentication, besides developing benefit sharing mechanism on sustainable basis. The products of indigenous technical

knowledge base are used for their time tested, cost effectiveness, purity, environmental friendly nature and popular beliefs. It is found that the admixture of products of dubious taxonomic entity is in practice for commercial gains. With the upsurge of patent regime with out recourse to effective intellectual property right of knowledge holders in different areas, several agencies have competition among them for registration and marketing of the product. It is found that the little and less known indigenous technical knowledge on better known species diversity have higher prospects. In such case the differences in patent laws of different countries play a key role particularly when the inventory is at inter organizational- cum- international level. The improvements in integration of scientific and indigenous technical knowledge with regards to the products/ outputs and services may be proposed as (i) biogeographical levels of characterization of biodiversity rich areas of ethnobiological significance using remote sensing and Geographical Information System (ii) registration of grassroots innovations (iii) characterization of products through application of scientific knowledge (iv) relocation, reintroduction and rehabilitation of rare and threatened species (v)preparation of extension materials based on local dialects and language.(vi) involvement of community through participatory approach (vii) gender initiatives with regards to different aspects of sustainable utilization (viii) studying the aspects of indigenous technical knowledge entities of communities of disjunct and close affinity (ix) benefit sharing considering the sanctity of the region and ethics (x) developing at organizational and local government level accessibility to indigenous knowledge rich areas (xi) capacity building of traditional knowledge holder through integrated approach , and (xii) development of common format for the use of indigenous knowledge at regional/national/international levels for rapid assessment, evaluation of features of biodiversity significance and integration of knowledge.

Integration of ITK with Scientific Knowledge of Application

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Indian Technical Knowledge (ITK) is local specific knowledge and set of practices in Agriculture, Natural Resource Management, Health and Educational Development generated and preserved by people and farmer and confirmed for its stability over centuries. India has a rich traditional treasure of oral knowledge that goes back to the Vedic times. Indigenous knowledge is the knowledge generated by the people and their ancestors living in certain area through experience including knowledge originating from elsewhere internationalized by local people. Much of that wisdom is being rediscovered by modem world. Indigenous Technical Knowledge would help to understand the concept and practices of developing the element of sustain ability, integrated with modem information system for efficient resource management.

Modernization of agriculture has definitely helped in increasing food production but has left several anticipated and latent consequences such as degradation of soil and water, pollution of natural resources, ecological unbalancing and serious threats to the biodiversity. In fact indigenous agricultural practices have its roots in the nature and culture of social, biological and related system. Indigenous agricultural practices have varied adaptability and are nature friendly. ITK's importance therefore lies in its cost effectiveness, situation specificity and congruity to local situations. It has made the farmers independent of external social and economic forces. The documented ITK cover different agronomic practices, conservation methods, soil amendment, water harvesting, irrigation methods, seepage control, groundwater recharge, tillage and post harvest technologies. Although farmers practiced many indigenous technologies relating to soil and water conservation but their improper documentation restricts the identification of constraints and possible refinements.

Sources of Indigenous Technical Knowledge (ITK)

1. Farmers and the community members (especially elders).
2. Extensionists, local school headmaster, credit co-operative society officials, village milk co-operative members, men and women workers, and village Panchayat members.
3. Secondary sources include published and unpublished documents, databases, videos, photographs, museums and exhibits.

Constraints in using Indigenous Technical Knowledge

- Education and exposure have biased attitudes towards using ITK

- It is time consuming, exhausting
- ITK is not effective in large scale production
- Lack of standardization and documentation
- Variation in prescription
- Referring to it as ineffective
- Selfishness in passing on knowledge to others

Advantages of using ITK in agricultural production

- Cheap ITK products
- Creates social harmony and cohesion
- Knowledge can be passed on orally using the local language
- Not harmful to human health
- No side effects

Limitations to sustained use of indigenous knowledge

- Minimal sharing of "intellectual property rights"
- More application of modern and convenient technologies
- No standardized measures for application
- Bearers are not aggressive to discover more indigenous knowledge tools.

Identified Indigenous Technology Knowledge

Many of the Indigenous Technologies are based on long term experiences of farmers tested over centuries as traditional technologies. Some of the ITK's have been identified and documented in soil and water conservation, post harvest technologies, irrigation methods and storage structures.

A. Soil and Water conservation

The ITKs identified under soil and water conservation practices are categorized in live bunds, local water conservation structures, seepage control, farm operations, irrigation methods and water harvesting structures. Vegetative fencing with Kiluvai, Vegetative barrier with Agave, Mixed and intercropping, Zing system (Ladakh), are some of the ITKs. These structures were used for moisture conservation and to prevent grazing by the cattle up to 10 to 20%. The vegetative barrier like agave was used for making of fiber. The mixedlintercropping system is still followed by the farmers. Integration of groundnut, pigeon pea and pulses helps to reduce the runoff losses.

In case of water conservation structures Nala check with soil filled cement bags, stone bunds, loose stone waste weir were commonly followed.

B. Water harvesting structures

Percolation tank, percolation pit, Haveli (Bharel system-Madhya Pradesh), Bandh, Malgujari Talav, Khazana well in Maharshtra, Khadin, Johad and Kund (Rajasthan) were some of the structures used to harvest the rainwater. The stored harvested water was utilized for protective irrigation.

C. Farm implements

Traditional plough, Indigenous plough, Baliram plough, Kulav (Local harrow), Dawara (Hoe) were used for intercultural operations. These age old practice were practiced on 10- I 5% area furrowing 15-20 cm depth. The operation can cover about 0.5 ha/day, but the availability of animals and labors are the major constraints in theses practices.

D. Irrigation methods

Irrigation is the age old practice followed for protective supply of water to the crops. Phad system in Maharashtra, Bamboo drip irrigation in Meghalaya, Apatani system in Arunachal P~desh, KIll system (Himachal Pradesh) were commonly used. The 80-400 hectares area was covered in each system under irrigation through available natural resources. The practices were implemented because of their efficient water supplying capacity and effective cost structure.

Integration oflndigenous knowledge and improved methods

Indigenous knowledge systems have proven technical components, which enabled people to survive in the natural as well as the cultural environment. However, more attention has been paid to economic, political and social factors and less attention to cultural factors in the development process. Over the decades, indigenous knowledge basing on existing flora and fauna has been used to detect changes in seasonality patterns, predict the start of drought or define soil fertility and generally monitor the state of the ecosystem. Indigenous practices are dominant but not spreading due to introduction of modern technologies.

Examples of integration of improved and traditional methods like *in-situ* water conservation, Broad Bed and furrow, Conservation furrows, Topo-sequence cropping, Vegetative bunds, inter-bund hedge, CRIDA Terrace, Farm Pond, Check dam,

Percolation tank, Contour trench, Gabion structure etc. are effectively adopted. In addition use of farm implements like Tractor operated slasher, rotary Broad Bed Furrow (BBF), BBF former cum seed drill, Tractor operated Pneumatic planter, Tractor operated inter row cultivator have greater importance in low cost efficient farming.

Experiences of the University:

Dr. Panjabrao Deshmukh Krishi Vidyapeeth. Akola has been conducting ITK based research experiments from last 20 years. The experiments on adoption rate of conventional intercultural operations, Post harvest technologies, watershed development were undertaken to know the adoptability of these practices and significance in routine farming methods.

The information indicated in Table. I showed the percentage of farmers adopting indigenous technologies for production and protection of crops.

Table. 1. Percent adoption oflTK in Indi2enous A2ricultural Onerations

Sl.No.	Indigenous Agricultural practices	Percent
1.	Treating seed with cow urine before sowing	62
2.	Sowing of coriander in sorghum to control striga	60
3.	Pelting stone for scaring birds	94
4.	Spraying cow urine to control aphids n cotton	23
5.	Dusting of ash to control Jassids in Pigeon pea	29
6.	Traditional storage of grains	100
7.	Placing of neem leaves in storage bins	100
8.	Storing of pulses in earthen pot	61
9.	Mixing of Wekhand powder in stored grains	71

The data revealed that peoples in rural areas still using traditional methods for storage of grains. The study indicated positive correlation between age and farming experience while negative correlation found in respect of education and ITK.

In post harvest operation considerable progress has been made in threshing, drying, cleaning, storage transportation and marketing of food grains. Women involvement in post harvest technology is considerably high. ITK's in this area are mainly for storage pest control. Post harvest ITK are sustainable and proved effective over a long period of time. The following eleven ITK were identified and documented.

Table. 2. Post Harvest ITK's

Sl.No.	ITK's	Percent Adoption
1.	Threshing by bullock pair	100
2.	North South winnowing	95
3.	Drying of grains in sunshine	100
4.	Storage of grains in Kangi (Traditional storage bins)	100
5.	Storage of grains in metalic bins	98
6.	Storage of husk in traditional storage	84
7.	Placing neem leaves in storage bins	100
8.	Storing pulses in earthen pot	97
9.	Incorporation of dry chilli in pulses grains	42
10.	Mixing of wekahnd powder in stored grains	81
11.	Cow dung+Mud treatment on cucumber seed	68

Concluding remarks

Soil and water conservation is paramount importance because of fragile nature of eco-system. Limited land',availability, soil erosion, scearce ,water res,OllTces are some of the alarming ingicators for integrated efforts in soil and water management. Implementation of indigenous and improved technologies in soil and water conservation can sustain the intensity of these arising issues. In addition to this many ITK's are available which can be integrated with advance technologies for yield maximization through farm mechanization, efficient irrigation methods and post harvest management.

Integration of indigenous and improved practices provides fast adoptable solutions for sustainable agriculture development.

TECHNICAL SESSION-VI

Multi Functionality of Agriculture and Knowledge Intervention : The Task Ahead

Multifunctionality of Agriculture and Knowledge Intervention : The Task Ahead

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Agriculture refers to the art, science and the business of crops and livestock production. The basic functions assigned to agriculture are production of food , fibre and shelter. The underlying concept of multi-functionality of agriculture is that agriculture not only produce food and fibre, but also provide environmental benefits, food security and viability of rural areas. It is argued that these additional benefits to the society are inseparable from primary agricultural production. Furthermore, the society enjoy the multifunctional benefits, but do not pay for these and the farmers do not get any extra income for these additional benefits derived from agriculture. So the Government/ society has an obligation to compensate the farmers. Some countries have placed this concepts for negotiations in the WTO Rounds. There are countries who allege that this idea is put forward by some countries to legitimize subsidies given to agriculture, which otherwise is not acceptable in WTO regulations.

Never the less, the concept on functions of agriculture has changed considerably in many parts of the world. The indirect benefits of agriculture in preserving environment and biodiversity are accepted and more and more communities are advocating eco-friendly, sustainable agriculture in place of input intensive modern farming methods, which many claim has resulted in environmental hazards, pollution and destruction of biodiversity.

With changing concepts on the functions of agriculture, these scientific interventions and applications of validated traditional knowledge are very crucial for sustaining agricultural productivity and also for deriving the non-commodity out puts, i.e. multifunctional benefits from agriculture.

Knowledge interventions in agriculture

Over the years, the art of agriculture i.e. the practice of collection and storage of seeds, tilling and sowing at the right season , doing the required cultural management practices, harvesting at maturity and processing and storing the produce, was inherited from generations to generations. The transition from hunter – gatherer society to modern civilizations of the world involved applications of traditional knowledge as well as modern science and technology. Of late concepts of agri - business management is getting a lot of significance and knowledge in modern business management techniques is also of importance to the present day agriculturists.

We know that human race, after a long spell of hunter-gatherer style of living, learned to produce crops only about 10000 years back. However, the practices of

farming changed very little from early times until about 1700. In the 1700's an agriculture revolution took place which led to a large increase in the production of crops because of the use of scientific knowledge in the traditional practice of agriculture. In the 1850's, as an off-shoot of the industrial revolution in Europe , farm machineries were also invented. With new mechanized farming methods, vast areas were cultivated and more intensive farming was made possible. Modern agricultural implements/ machinery combined with crop rotation, manure and better soil and water management lead to a steady increase of crop yield.

If we look at the future progress and sustainability of agriculture, modern knowledge and traditional knowledge are equally important.

Significance of Traditional Knowldedge to Agriculture

Many innovations in agriculture are generated locally, based on the knowledge and experience of indigenous - local communities rather than by formal scientific research. Scientists should work more closely with local communities to validate the traditional knowledge / practices and to popularize the useful traditional knowledge.

Agriculture and Climate Change

Agriculture has contributed to climate change in many ways, for instance through the conversion of forests to farmland and the release of green house gases. Conversely, climate change now threatens to irreversibly damage natural resources on which agriculture depends.

Knowledge intervention is required to soften the influences of global warming and our farmers should be made aware of these possibilities. Proper land use management approaches can help to mitigate global warming.

Quality of Food

Although food production has increased in recent decades through technological intervention in agriculture, many people remain **under-nourished,** a problem accounting for 15% of global disease. People in many parts of the world still face protein, mineral-nutrient and vitamin deficiency. Meanwhile, obeisity and chronic **diseases** are increasing across the world because of people eating too much of the wrong foods. Agricultural research and policies should be devised to increase dietary diversity, improve food quality and promote better food processing, preservation and distribution. A sustainable healthy eating habit has to be promoted for judicial use of the diminishing supplies of per capita food.

Knowledge interventions may also be required to address the health concerns about food crops like the presence of pesticide residues, heavy metals, hormones, antibiotics and additives in foods.

Sustainable Use of Natural Resources in Agriculture

Agricultural sustainability means maintaining productivity while protecting the natural resource base. Historically, agricultural development was geared towards increasing productivity and exploiting natural resources, but ignored complex interactions between agricultural activities, local ecosystems and society. Technological interventions are required to enable sustainable use of resources like water, soil, biodiversity and fossil fuels . Multidisciplinary intervention with strict monitoring on the use of natural resources are required for sustainining agriculture and protecting environment. Organic agriculture and providing incentives for the sustainable management of water, livestock, forests, and fisheries are examples of responsible natural resource management. The knowledge intervension in future agriculture should be for ensuring that agriculture not only provides food but also fulfills environmental, social and economic functions such as mitigating climate change and preserving biodiversity.

"Information – Communication –Technology" (ICT) and Agriculture.

Recent innovations in ICT can be exploited for efficient disemination of agricultural technology . It may also be useful in marketing management in agriculture and to assure fair / competitive price to farmers. Bioinformatics, e-learning are other areas opened up with the innovations in ICT. The tools of ICT will provide networking ofAgriculture sector not only in the country but also globally and bring farmers, researchers, scientists and administrators together by establishing "Agriculture Online" for exchange of ideas and information.

By using ICT , access to knowledge can be made more democratic, can provide education to deprived rural masses like school drop outs , small and marginal farmers and women, by resorting e-learning /teaching. It will help to create entrepreneurial skills and self employment to farmers, rural youth, school drop outs, self help groups, local institutions, and field service providers in local community/villages

Agricultural education, research and extension programmes need to be reoriented to meet the challenges emerging out of the technological advances, social changes, globalization and the market demand. IPR issues, food – security, bio-terrorism and global climatic changes are issues which need urgent attention. Similarly, emerging technologies like nanotechnology, bioinformatics, biotechnology etc. has a lot of stake in the future agricultural progress. The course programmes and curricula of agricultural education institutions should reflect these global transformations, so that these knowledge are diffused to the farming community for harvesting more benefits.

I hope that the presentations and discussions today will provide useful insights on multi-functionality of agriculture and the future technological interventions required.

Village Knowledge Hub : Enhancing the Common Information Space for Animal and Fisheries Production

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There is a rapidly growing animal and fisheries production industry in Maharashtra. This industry, at present, is technically and information wise supported by its innovation system that has a dispersed set of multiple stakeholders, which include the Maharashtra Animal and Fisheries Sciences University (MAFSU), Department of Animal Husbandry (DAH) and fisheries, the livestock products processing Industry, Feed Industry, Pharmaceutical Industry, Farmers etc. There is an urgent need to enhance the space for the information needed by the innovation system that supports this industry so that it can further develop and do not only satisfy the future animal products needs of the State, but also effectively and efficiently participate in the increasing global market for animal products.

New information and communication technologies, such as the Internet, Wireless Telephony, linking radio and television with the Internet, can be effectively used to enhance the existing information space so that it can effectively and efficiently support the information, knowledge and training needs of this Industry.
The core institutional structures to develop this information space and the details are discussed.

Key words: ICT, A.H., Fisheries

There is a rapidly growing animal and fisheries production industry in the country. This industry, at present, is technically and information wise supported by its innovation system that has a dispersed set of multiple stakeholders, which include the State Agricultural and Animal Sciences Universities, Department of Animal Husbandry (DAH), the livestock products processing Industry, Feed Industry, Pharmaceutical Industry, Farmers etc. There is an urgent need to enhance the information space for the information needed by the innovation system that supports this industry so that it can further develop do not only satisfy the future animal products needs of the State and but also effectively and efficiently participate in the increasing global market for animal products. This also should serve as a media for continuing education to the farmers, as a part of L4 (Life Long Learning for Livelihood) and the others as ODL.

New information and communication technologies, such as the Internet, Wireless Telephony, linking radio and television with the Internet, can be effectively used to

enhance the existing information space so that it can effectively and efficiently support the information and knowledge needs of this Industry.

The core institutional structures to develop this information space would be :

1. Pashusoochnalaya
2. MAFSU Digital Information Repository
3. Public Information Access Points

Pashusoochnalaya

The core of the enhanced information space will be a Web portal that will support sharing and exchange of livestock production and fisheries related information through.

1. Services

- Web based information
  - * Market prices and forecasts for animal products, commodities and inputs for livestock and fisheries products.
  - * Weather conditions and forecasts particularly related to agriculture and livestock production including disease forecasts at State, district and taluka levels.
  - * Technological information related to
    - > Farming systems
    - > Crop and Livestock Production
    - > Post Harvest Processing, Packaging, Storage and Transportation
    - > Food and Bio-safety, including Phyto-Zoo Sanitary Standards.
- Agricultural News
- Directory Services and Yellow Pages for:
- Livestock, Veterinary and Fisheries Research Institutions
- Research Projects
- Institutional Resources such as laboratories facilities, experimental resources, costly equipment
- Veterinary experts and consultants.

- Suppliers, Market Intermediaries
- Veterinary services including disease and pest diagnostic services, soil and feed analysis, veterinary services, farm equipment mechanism etc.,
- Veterinary (Digital) Library an Information Services
- Internet Services for hosting:
- E-mail
- Discussion Lists
- Community of Practices for scientists, farmers and other agriculture related domains.
- Usenet/Newsgroup
- Chat/IRC
- Video and Audio Streaming
- Suitable courses for the stake holders.

2. Products

- Knowledge based systems for animal diagnostics
- Herd and Flock Health Management Models
- Decision Support Systems for small holder farming and livestock production
- Spatial and Reference Database including digital maps for diseases and production potential
- Collation of graphics, Audio and Video Clips
- Radio Scripts and Television Storyboards

3. Tools

- Search Engines and Finders
- Catalogues and Indexes
- Language Thesauri

MAFSU Digital Information Repository

A digital information repository to be created by MAFSU will support the Pashusoochnalaya. The development of information repository for information objects is critical to the Pashusoochnalaya for various reasons :

* To support generation of contents effectively and efficiently at least cost for the entire country. Content generation, including disease surveillance and monitoring database, without a centralized information repository would be very costly.
* To support development of products such as knowledge based systems that may require these objects.
* To create a valuable information asset for MAFSU in future with Maharashtra and India having to be a responsible member of World Trade Organization with phyto-sanitary information and patents on data and information bases can become an important asset.

Public and Private Information Access Points

The MAFSU information repository will be responsible for collection, collation, storage and access of digital data and information objects related to agriculture research in initially in Maharashtra.

At the user end, the portal site will be accessed through public information access points that provide not only agriculture information but also information from other sectors and ministers such as health, education and governance. These information kiosks may be a form of rural entrepreneurship. Entrepreneurs and Industry could also access this information space through private connections.

MAFSU Efforts

Maharashtra Animal and Fisheries Science University (MAFSU) initiated its efforts to adopt ODL and TechMODE back in 2004. MAFSU developed four courses for the field veterinarians in clinical expertise domain such as surgery and pathology. The demand for the courses was strong and the participants liked the new approach that suited their practices. However, the courses had seen limited success as the required support system and integration of the programme with MAFSU's regular activities was weak. Institutionally the infrastructure, human resources and policies that needed to be in place for the assured continuum of the programme was not sufficient due to an overall lack of understanding and appreciation of TechMODE. Lack of awareness and a support system conducive of Knowledge Sharing (KS) resulted in stagnant content as well.

The conclusion was to integrate and demonstrate the utility of technology aided knowledge management and delivery to the various colleges under MAFSU and to the University management so that an encouraging environment for required changes could be instigated. This was phase when most of the efforts were directed to develop

required awareness and earn support from various level of the university; particularly the students for building pressure on the management to adapt to a technology aided KM and KS system and develop a suitable administrative framework. The strategy worked in the two main colleges of MAFSU, namely Bombay Veterinary College (BVC) and Nagpur Veterinary College (NVC). Unfortunately the other colleges could not be approached continually to make an impact. It was felt the strategy resulted in a more urban centric approach for adapting TechMODE.

To develop a more inclusive approach and to revert to the vision of reaching the rural areas and farming community who could leverage from MAFSU's presence in the remote and interior areas of Maharashtra, In last two years the focus of the MAFSU TechMODE institutionalization efforts have shifted from addressing the field professionals to develop a knowledge network that enables and support a range of stakeholders that include Government and Non-Government Organizations, Self Help Groups (SHG), field professionals, extension workers and other institutions involved in sustainable livelihood support.

Following the L3 model of stakeholder consultation, partnerships and continuing learning support to farmers, MAFSU developed a multi channel communication strategy through available media such as radio, web and offline delivery mechanisms. The content developed for the service was primarily based on questions and issues raised by the farmers in Maharashtra region. To regularize the collection of questions and issues from the rural communities a number of ways were adopted; these included live sessions on radio (through All India Radio), extension and veterinary camps, postal and local mailing and through the call centers at different colleges of MAFSU. MAFSU also put its own letterboxes in the community spaces of various villages such as temples for collecting the common issues faced by the animal stockholders. One of the problems of this approach was a continued communication with the farmers on a regular basis as most of the methods needed some specific period to accumulate substantial questions to be converted into specific media suitable form. The idea behind the approach was to build a sample size large enough for the region and focus on the repeating pattern of the common issues and to develop a periodical review and up-gradation of content.

The approach needed a multi-stakeholder consortium that would act as MAFSU,s communication extension in the fields and for a larger population. The content is made available to all the partners through a common and open channel (currently web based) and the content format was made suitable for a number of dissipation medium, digital or print. Though the access to the content is open, it was essential to capacitate MAFSU partners to be able to access and use the content for the envisaged purpose. The capacity building included communication through new channels such as blog and emails so that the partner could ensure continuity in feeding queries and

issues from the rural community. Though the TechMODE initiative started with an aim of veterinary expertise intervention, it was seen that often queries were not related to it directly. For example, availability of water and fodder were to prime issues faced which were resolved by YUVA, a NGO partner; YUVA has been working on water harvesting and were ready with fitting support. The partnership was helpful in such cases where the questions were not related MAFSU,s subject expertise but from the systemic perspective of sustainable livelihood. The partnership also assisted MAFSU to break away from an academic institutions perspective and regulations to be able to capture a much more holistic picture of sustainable livelihood and continuing human capacity development.

Currently MAFSU is integrating the approach to its lower education initiative so that the programme becomes more future oriented by addressing the rural and semi-urban youth and promote entrepreneurship in rural Maharashtra, particularly in the tribal and resource deprived regions.

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Multi-Agency Extension System for Effective Knowledge Empowerment – Challenges and Policy Options

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Abstract

Dedicated efforts of Indian farmers, modern technologies and strategic support through various programs of Central and State governments have contributed significantly for the current land mark achievement of 230.67 million tons food production. However, sustaining this growth rate and achieving the required food grin production of 320 million tons by 2025 would be a herculean task considering some of the challenges like limited land, depleting soil and water resources, adverse impacts of climate change, rising cost of production, labour crisis in agricultural and less interest of young farmers' in agriculture. Addressing these complex issues requires multi-dimensional strategies to have an effective and efficient service delivery mechanism for increasing the agricultural production to meet the requirement of the country at desired mechanism for increasing the agricultural production to meet the requirement of the country at desired level. This can be achieved by well-coordinated multi-agency extension machinery through empowerment of farmers with the desired knowledge, skills, technology and input support. In India, has one of the largest extension system in the world wherein large number of private and informal extension service providers co-exists with the public extension system even then; nearly 40% of the Indian farmers are reached by extension service providers.

In public sector several programs were launched time to time from 1952 and onwards started from Community Development Approach to ATMA to meet food security of ever increasing population. The existing multi-extension system are also facing several challenges like power relations between NGOs and GOs, differ in philosophies, mandates, ethos, operating procedures, accountability, rural links etc. Therefore policy reform in agricultural extension initiated in existing multi-extension system that includes institutional restructuring, management reforms, strengthening research-extension linkages, capacity building and skill up-gradation, empowerment of farmers, mainstreaming of women in agriculture, use of media and information technology, financial sustainability and changing role of government.

The existing extension system is unable to respond to bottom-up and demand-driven activities upto desired level due various challenges and limitations. Therefore, it is need of the hour is to promote a well coordinated multi agency extension system at national, state and district level by involving private / corporate sector, farmers organizations, co-operatives, NGOs, para-professionals, self-help groups, input dealers and suppliers, electronic and print media and information technology for contributing in technology dissemination according to its own strength and capabilities.

Dr. A. P. J. Abdul Kalam, former President of India participating in a Video Conference Programme

Naik Bhavan - *Fulcrum of Administrative Activities*