Application of ICTs in Rainfed Agro-ecosystem: Issues and Strategies

Sreenath Dixit
Central Research Institute for Dryland Agriculture
Santoshnagar, Hyderabad

Rainfed agro-ecoecosystem represents the largest agricultural production system of India. It accounts for over 65 % of the net cultivated area, houses 40 % of human and over 60 % of cattle population. Yet this region witnesses deprivation and high incidence of poverty. Agriculture here depends entirely on the erratic and ill-distributed rainfall. High risk associated with low investment capacity of farmers often results in higher rate of migration, school dropouts, food insecurity and poverty.

Though there is a considerable fund of knowledge to help tackle the problem of low agricultural productivity, it has often not succeeded in translating the gains into reduced poverty and improved rural livelihoods. The awareness that the problems faced by the rural society are far more complex and that better technology alone is not the answer (Ramachandran and Mahipal 1999) is gaining ground. And that facilitating rural communities with an enabling environment will go a long way in tackling the problems is being increasingly realized. In the present context of 'global village' the gap between the urban 'knowledge society' and the rural society is much wider and felt more significantly than perhaps two decades ago. Technological divide between the rich and the poor, and the rural and the urban have long existed. But this has never been so strongly felt as is felt in the present era of 'information age'.

It is being strongly recognized that agriculture sector in general and rainfed agriculture in particular has been bypassed by the advancements in information and communication technology (ICT) that has swept the industry and the service sectors. It is heartening to note that this opinion is echoed in several fora and the government and the civil society are debating this issue at length. The paradigm of agricultural development and poverty alleviation through out the developing world is assuming far more complex forms. Thus, conventional ways of delivering to the agrarian societies and the rural poor are being challenged. Aside from biotechnology, the on-going revolution in ICT is being seen as holding tremendous hope for 'reaching the un-reached' (Dar 2004).

Developments in ICT have transformed traditional societies into knowledge societies. When used as a tool for providing the rural poor with knowledge that helps them to avail a better livelihood, ICT can potentially herald a new era in development sciences. Technically, it can build communities across great distances and bring people together. It can complement and supplement the existing extension and communication systems and improve efficiency. It can expand information flow, make knowledge more accessible to people across a wider area and to facilitate the poor to make better choices, articulate opinions, demand rights, and to have more control over the way they want to live.

The potential is enormous. The problems are plenty. And the options are many. There is evidence of many pilot projects having made significant changes in the lives of the rural poor. These are highly sporadic and too few to significantly impact the magnitude of problems rural India is facing. But there is a long and tough way ahead. The need of the hour however is a carefully planned ICT4D policy to be implemented efficiently

Initial Attempts

The MSSRF Model

The annual inter-disciplinary dialogue organized by the MS Swaminathan Research Foundation (MSSRF) in 1992 debated on information technology. The proceedings of the dialogue led to the initiation of Information Village project in the Union territory of Pondicherry funded by the International Development Research Centre, Canada. Since information to be of value to rural women and men, should be location and time specific, the term Knowledge Centre was used to stress the need for converting generic information into location specific information and training local women and men for adding value to information. This experiment in the villages of Pondicherry was very valuable in terms of the learnings it generated. Some of the significant ones are:

- Connectivity and content must receive maximum attention
- Malady-remedy analysis is helpful to fix problems arising from time to time
- Cater to demand-driven information and information relevant to the life and work of rural women and men
- Adopt a principle of *Antyodaya* and social inclusion and present a win-win situation for all
- Inculcate a sense of ownership: client-managed and controlled
- Ensure that local people contribute to/pay for the services they use (Swaminathan, 2003).

This project has established a hub-and-spoke model (Fig 1) of data-cum-voice communication in a group of six villages in *Pondicherry*. The village centers communicated with each other as well as to the Internet. A hybrid of technologies was used - wired with wireless for communication and solar with mains for power supply. The hub provides connectivity to the Internet through dial-up telephone lines, and the staff there creates locally useful content. The village centers receive queries from the local residents and transmit information, collected from the hub, back to them. An important feature of this project is the strong sense of ownership that the village communities have developed towards the village centers.

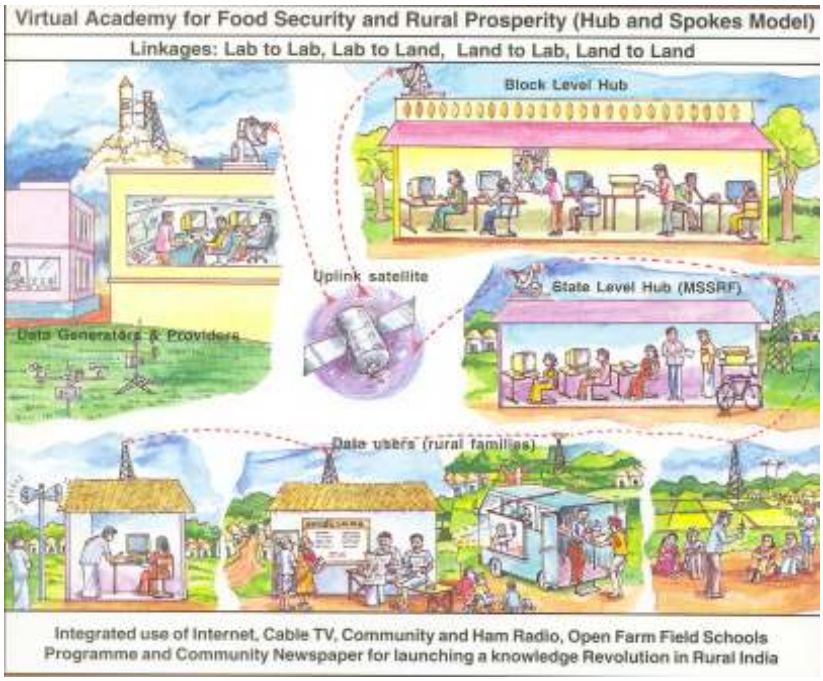


Fig 1. The Hubs and Spokes model adopted by the MSSRF

Policy Implications

The main issue of research in this project relates to sustainability in a context where most users tend to be ultra-poor. Formation of partnerships between local bodies and the local administration appears to hold the key. Development of applications, such as an online system for community banking, will contribute to the economic sustainability of the operations. The policy context should become more favorable in view of the character of government control of basic services in the telecom sector in many countries of South Asia. This has prevented applications-oriented services from being offered at low cost. There is hope that all this is set to change soon.

Value-added Agromet Advisory Service: A CRIDA initiative

All India Coordinated Research Project on Agrometeorology (AICRPAM), initiated in 1983 with its Coordinating Unit at the Central Research Institute for Dryland Agriculture, Hyderabad has 25 cooperating centers. This network project is a repository of valuable agrometeorological data from across different agro-ecosystems of the country. The a Agromet Databank has data on eight basic weather parameters viz. maximum and minimum temperature, rainfall, wind speed, relative humidity (morning and evening), sunshine hours and evaporation and seven derived weather parameters like potential evapotranspiration, actual evapotranspiration, estimated soil moisture, soil moisture index, water deficit, water surplus, index of moisture adequacy on daily, weekly, monthly and seasonal basis for all the 25 cooperating centers. Hither to the data was provided to the users on request.

AICRPAM started a new initiative to issue agromet advisory service by adding value to the data on different weather parameters through its website www.cropweatheroutlook.org The Web site is operating from the CRIDA, Hyderabad and is linked to the ICAR website for a wider use by the planners, researchers, farming community and others. All the cooperating centers update the website with relevant advisories based on the prevailing and predicted weather condition on a medium term basis.

Agromet Advisories (Value Added Weather Information)

This section contains links to all the AICRPAM centers. And the information on weekly report on crop-weather conditions andcurrent data on weather conditions besides agro-advisories is available here.

- **Weekly Report on Crop-Weather Conditions** – contains general rainfall and crop conditions in the region; information on incidence of pest/diseases; unfavorable weather conditions experienced during the last week and the contingency measures to be taken.

- **Current Weather Data** – displays the daily weather data such as minimum and maximum temperatures; rainfall; relative humidity; wind speed; evaporation; sunshine and soil temperature recorded at the cooperating centres during the previous week.

Agro Advisories are issued based on the models developed at the centres and the weather forecast issued by NCMRWF, New Delhi. These advisories help the farmers to take short/medium term decisions on crop cultivation. Besides these, this website has information on monsoon status in the country with the following details:

- Daily, weekly and seasonal rainfall conditions in the country along with the latest satellite picture (updated every six hours), graphs and maps showing actual and departure of rainfall from normal.
- State-wise weekly crop-weather conditions such as crop coverage, general crop conditions, adverse weather conditions and their impacts on agricultural crops.
- Climate outlook for the country in the next one to two weeks showing the expected changes in temperature and rainfall.
- Occurrence of natural disasters such as floods, droughts, frost, heat wave and cold waves etc., and incidence of pests and diseases.

Way forward

The Internet interface has helped to translate a valuable set of weather data into a widely accessible format that can be used to support medium term farming decisions. There is however a need to promote communities of practice that can adopt the advisories and give valuable feedback. Better technology needs to be put to use in recording and transmitting data on line so that the data reliability and predictability of weather events

can also be enhanced. A holistic technological solution is needed to improve the reliability of this application.

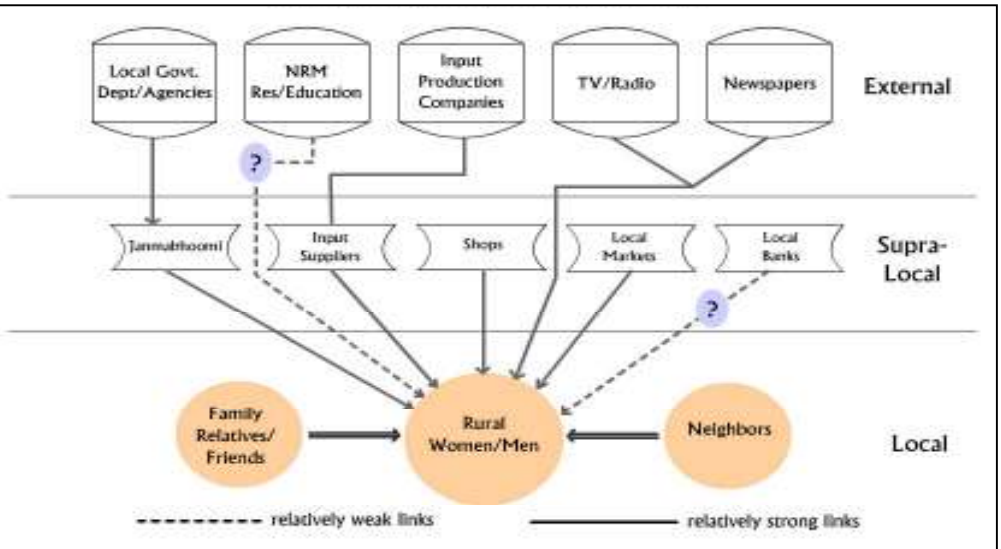
ICRISAT's VASAT initiative

Commonwealth of Learning, Canada supported a joint CRIDA-ICRISAT project (initiated in 2002) on developing innovative learning modules to help the rural poor to cope with droughts. This project emphasized development of a generic content to educate the poor on drought by adopting open distance learning (ODL) module. Once the generic content was developed it was localized to Addakal, a drought-prone village in Mahabubnagar district, Andhra Pradesh. This village was selected as there was already pilot hub connected to V - Sat that was installed under the Andhra Pradesh Rural Livelihoods Programme (APRLP). Addakal was considered focal point to localize the generic version of the ODL. The successful development of a generic and a location specific ODL module titled 'Coping with Drought" was released by His Excellency, the President of India, Dr Abdul Kalam in December 2002. This generated new enthusiasm in the project. Based on the recommendations of the National Brainstorm workshop held in November 2002, Virtual Academy for the Semi-Arid Tropics (VASAT) was launched after two round table consultations, one each in Hyderabad and Niamey, Niger in 2003. Thus, VASAT came into being in South Asia and, West and Central Africa (WCA). VASAT is a strategic coalition of national and international organsiations that deals with information, communication and non-formal distance education. The coalition is lead by ICRISAT and is jointly implemented by International Livestock Research Institute (ILRI) and International water management Institute (IWMI). VASAT aims to explore the interface of ICTs with ODL so that information can be shared in innovative and cost effective ways. Its main focus is to create demand-driven content that can be localized to suit the rural communities and intermediaries with an ultimate aim to convert the scientific know-how to field-level do-how. The initiative aims at using the state-of-the-art ICTs to achive its goals. For example, VASAT-Africa the interface of low frequency and solar powered FM community radio stations with satellite technologies are being used. Existing community radio stations serve as information-knowledge hubs (Fig 2). Trained community animators and multidisciplinary experts compliment these. This is to ensure that the project builds upon the existing capabilities, is community based, locally relevant and sustainable. The VASAT coalition ensures that the content is uploaded on to a global repository at www.vasat.org, which will then be accessed by national and local partners for further adaptation to suit local requirements. VASAT- Africa comprises of 15 partners including international, regional, national and local organizations while VASAT South-Asia is anchored by ICRISAT and Indira Gandhi National Open University with prominent open universities in Andhra Pradesh (AP) and Maharashtra, and CRIDA as principal partners.

Fig 2: Community radio to reach farmers in Africa

Initial steps

In India, pilot rural hubs have been established in AP with the support from the APRLP. Each hub is hosted by an NGO already familiar with the area. Simultaneously, the partners are working towards virtual groups of experts to work on needs analysis, content generation, connectivity and delivery systems and social mobilization. An information flow chart has been developed for the pilot site Addakal to understand the possible role of the ICTs to reach the rural poor (Fig 3). In WCA, an internet-supported community radio station located near ICRISAT's regional hub in Niamey, Niger has been identified as the pilot site and social laboratory. Needs analysis has been completed and content adaptation has just begun.



Information Flow and Linkages in Addakal Mandal (AP, India) as perceived by Rural Women and Men

VASAT Management

The governance of VASAT is based on the successful model of the Internet Engineering Task Force, a virtual organization composed of neutral experts. Following this multi-partnership model, a number of corporations in India and abroad have been invited as technology resource groups. VASAT aims to create a faculty of experts that will have frequent virtual interactions with rural communities to find relevant solutions. Further, by invoking successful models of ODL and blending them with virtual groups, rural youth and women will be helped to acquire better capacity to cope with the problems of rainfed agriculture.

ICT4D: Issues and Strategies

Connectivity

Despite fast changing telecommunication scenario teledensity in rural India is still appalling. There is a huge gap between urban and rural teledensity. The current trend in the growth of the information industry it is estimated that, a one per cent growth in teledensity leads to a three per cent increase in GDP according to industry statistics.

Table 1 State comparison of urban and rural teledensity

Telecoms Circle	Urban	Rural	Total
Andaman & Nicobar	14.36	5.15	7.63
Andhra Pradesh	9.77	1.54	4.06
Assam	9.09	0.25	1.33
Bihar	4.85	0.24	0.94
Gujarat	11.73	1.54	5.37
Haryana	11.63	1.44	4.25
Himachal Pradesh	25.00	3.34	5.31
Jammu & Kashmir	6.58	0.13	1.72
Karnataka	10.28	1.80	4.70
Kerala	12.33	5.32	7.51
Madhya Pradesh	5.74	0.36	1.81
Maharashtra	13.61	1.39	6.60
North-East	5.80	0.54	1.92
Orissa	6.51	0.51	1.52
Punjab	15.29	2.67	6.95
Rajasthan	7.57	0.86	2.57
Tamil Nadu	15.05	0.43	5.91
Uttar Pradesh	6.11	0.34	1.66
West Bengal	8.10	0.51	2.67
Delhi	20.67	0.00	17.66
INDIA (average)	**10.16**	**0.93**	**3.58**

Source: Across world Communications (September 2001)

The objectives of the National Telecoms Policy (1999) is to achieve a teledensity of 7 by the year 2005 and 15 by the year 2010 and invest of Rs 4000 bn in rural communications by the year 2010 (www.dotindia.com)

Cost

Presently most of the initiatives barring a few like the ITC- Choupal are in pilot stage and hence public funded. Once the funding is withdrawn, it is difficult to sustain the momentum, as the costs of initiating and running an Internet-based information dissemination system are still very high in our country. Many of the pilots are obsessed with the Internet and are not considering other technological advances made in the field of information and communication. It is worthwhile considering conjunctive use of radio, television and video and wireless telephony. For example, an extension professional's connectivity to the farmers in remote and inaccessible areas through mobile telephony can make a great difference in delivering timely service. ICT *per se* includes a range of options to reach and communicate with people and does not connote only the computer and Internet based technologies. A carefully chosen combination of the-state-of-the-art ICTs can do a lot good to reduce cost and achieve optimal efficiency.

Credibility

Knowledge in public domain requires utmost care in its management and dissemination. Rural communities over the years have reposed a high degree of confidence in radio, television and the print media. With the deregulation of media and multiplicity in 'knowledge managers', it is important to consider credibility of the sources. There is a need to explore this aspect of novel ICTs before going ahead with full steam.

Sustainability

As discussed above, the cost of providing service to the farming communities after the withdrawal of donor funding will determine whether ICTs will serve as tools that are sustainable over time to manage and disseminate useful knowledge to the rural communities. ICT ventures of business houses that have a limited interest have by and large shown that their initiatives are not only cost effective but also economically sustainable. In order to achieve this, the service base has to be widened so that the rural communities can get time and cost effective services. But care needs to be taken to avoid the knowledge centers turning out as mere kiosks akin to the Internet centers in urban areas.

Organizational response to changing ICT

It is very important to recognize that the ICTs are mere tools to supplement and complement the existing NARES. It should not be construed as substitute to the extension network of the line departments and the state agricultural universities. Successive governments in the recent past in many states have adopted policies that are slowly but surely destabilizing the extension network. The extension network is facing a severe crunch of manpower, as there is little or no addition to the aging staff while the number of farm families to be served has increased over time. The funding for extension is on the decline and has resulted in severe restriction on mobility. Mobility has always been a

serious constraint to deliver to the clients. Now the present developments in ICTs need to be examined in the backdrop of this constraint and strategies need to be devised as to how best the extension network can harness the ICTs to bridge the widening gap with their clients. This calls for building the capacity of the extension personnel to use the ICTs for empowering their clients. A massive HRD plan needs to be drawn if the states are serious to harness ICTs for development of their hinterlands. The states need to act quickly and build the capacity of their scientific and extension personnel to rise up to the changing ICT scenario.

National perspective of ICT4D

IT Action Plan Part-III of the Long Term National IT Policy of the Union Government of India has identified agriculture sector as one of the priority. It says " …it will be ensured that many government departments begin IT based information system to pave the way for practical IT-Citizen Interface. The initial set of such systems are: agriculture information services like agriculture prices of various commodities, availability, booking and ordering of agricultural inputs, inventory of state of the art agricultural practices, information about allied activities etc. Similarly information on weather forecasting, subsidies and other government schemes for the benefit of farmers could be disseminated through such Agricultural Information System. Pilot projects will be taken up jointly by the Central and State Governments to demonstrate the feasibility and the usefulness of IT."

The need for harnessing ICTs for providing better services to the rural sector is felt at the highest level of governance. However, the preparedness and the political will to put in place a system vary quite a lot across different states. Some states have taken to the ICTs and have brought in a good deal of transparency in governance and inculcated a sense of urgency in the delivery mechanism. This is a matter of concern, as the disparity among different regions will exacerbate and the so-called 'digital divide' will make it more acute. Therefore, better policy support is required to take all regions on board in the ongoing information revolution.

Conclusion

The information world has been completely swept over by the digital revolution. Many leading sectors have been benefited by the on-going changes. Agrarian and rural communities of the developing world that are experiencing high rates of poverty are the once that have remained un reached by these for long. There is considerable evidence that the poor rural communities can be better facilitated with information that can impact their livelihoods by harnessing the ICTs. It however needs to be recognized that like any other change, change through ICTs is also a slow process. It needs support from the government though sound policy and commitment to the purpose. Donors and civil society also need to extend their support for considerably longer period. It is the joint responsibility of all the stakeholders to see that the on-going ICT revolution touches the lives of the rural poor and brings out positive changes. Lest, the un reached should never be reached.

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