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RESEARCH ARTICLE

SATELLITE COMMUNICATION AND REMOTE SENSING INTERVENTION BY RURAL DEVELOPMENT

P. Mary Elizabeth

Centre for Women's Studies, Arul Anandar College, Karumathur Affiliated to Madurai Kamaraj University, Tamilnadu, India

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ABSTRACT

The advances in Satellite Communication and Remote sensing has led to the development of solutions for various national development programs like National Natural Resource Management (NNRMS), disaster management, Tele-Education and e-Health care using telemedicine. The advances in sensor technologies and image processing have resulted in sensors with increased spatial, spectral and radiometric resolutions and provide images with rich details for remote sensing applications. India is a vast country with 29 states and 6 union territories with more than 1 billion population, which is predominantly rural and distributed at distant geographical locations apart from the high-density urban areas. Ensuring basic minimum health care to masses living in remote rural areas is a top priority for any government. Tele-medicine using the satellite communication as well as Fiber Optic communications is playing an important role to address health care requirements of people living in remote areas, rural areas, soldiers in battlefields etc. The Image processing techniques and advances in Database management of images and text made it possible to create 3D virtual images of human organs by using imaging techniques from MRI, CT & Ultrasound. The universalisation of education has become the top priority, especially for the developing countries. But the extension of quality education to remote and rural regions becomes a Herculean task for a large country like India with multi-lingual and multi-cultural population separated by vast geographical distances, and, in many instances, inaccessible terrain. Satellites can establish the connectivity between urban educational institutions with adequate infrastructure imparting quality education and the large number of rural and semi-urban educational institutions that lack the necessary infrastructure. This paper describes utilization of Satellite Communication and remote sensing with advanced techniques in providing solutions to areas of primary importance in rural development such as harnessing of natural resources, education and healthcare.

INTRODUCTION

The closing decade of twentieth century was the opening of historic information and communication technology interventions for development. This period has witnessed enormous and unprece-dented changes in every aspect of communications technologies, policies, infrastructure development and services. Political leaders of India have begun abandoning archaic government control over communication that has lately moved from government to national and international private players. Finally, airwaves and electronic signals have achieved their freedom from centuries old colonial bondage to reach out and connect people through a privately owned and operated communication network and infrastructure. Both international and national private players have taken a dominant role in redefining, reshaping and providing Tele-communication, broadcasting and information services for national development. It has initiated an era of partnership of public and private entrepreneurial skills and abilities to bring about unlimited connectivity. It has already started reshaping the life of a number of elites in India. Little is known, though there is a trickle down communication effect in many areas of development including rural development. The role of communication technology for development must be viewed in this new and changed environment. How these ICT global and regional changes have influenced the access and use of ICT for development remains an issue of discussion and analysis.

***Corresponding author:** lillymary10@gmail.com*

Socio-Cultural Perspective

We are one of the world's oldest and ancient civilizations that evolved, matured and decayed over several millennia. After independence we have been experimenting and carving a path of revitalization for development through democracy. The existing sharp divide between the small but economically, politically and socially "rich elite ruling class" and a very big but "economically poor and socially deprived" continue to persist as a legacy of the past. While the rich elite have had

access to knowledge, both oral and written, the economically poor remained confined only to oral knowledge. The imposition of British educational system for over two centuries help add another layer of social barrier though on surface it gives an impression of equitable access to education. Privatization of education has further helped the rich elite to dominate the contemporary social and political scene at the cost of the poor who remain oblivious of communication technology for any improvement in their existing miserable life (Agrawal 2000: 13).

Government Initiatives

After independence, the government took upon itself the major responsibility of development. Hence, the central and state governments carried out development projects. Four such projects are briefly described.

Radio for Rural Development

Popularly known as "Radio Farm Forum" was one of the earliest efforts in the use of radio for rural development. The experiment was carried out from February to April 1956 in five districts of Maharashtra State by All India Radio (AIR). Rural listener groups were organized, who would listen to radio broadcasts twice a week at 6.30 p.m. for half an hour. "The group then stayed together for discussion of what they had heard, the discussion lasted usually, about half an hour, seldom less, frequently more" (Neurath 1960:7). The summative impact evaluation indicated positive outcome of radio rural forum. Impressive knowledge gains as a result of radio listening were reported across illiterates and literates, agriculturists and non-agriculturists, village leaders and others. However, over a period of time the project withered away and could not be operationalised for large-scale implementation in one form or the other. Lack of political will and indifference of bureaucracy killed the rural development project even before it could help poor to take advantage of radio broadcast.

Satellite Instructional Television Experiment (SITE)

It is considered to be one of the biggest techno-social communication experiments in education and rural development. The one-year experiment (August 1975 – July 1976) aimed to provide direct broadcasting of instructional and educational television in 2400 villages in the states of Andhra Pradesh, Bihar, Karnataka, Madhya Pradesh, Orissa and Rajasthan. Over 500 conventional television sets spread over 335 villages in Kheda district, Gujarat was also part of SITE. Satellite technologists had called SITE as leapfrogging from bullock cart stage to satellite communication, which did not discriminate between rural poor and urban rich for information and communication. It had given 50 years communication lead to rural poor of the country. SITE provided telecast for rural primary school children in the age group 5 - 12 years studying in grades 1-5. (For details see Shukla and Kumar 1977) and teachers' training (Agrawal 1981). Rural adults viewed television programmes on improved agricultural practices, health and family planning. They were also able to view news. Television was considered as window to the world. The telecast reliability was above 99 per cent during the experiment period. More than 90 per cent direct reception television sets were in working order (for details see Agrawal ed. 1985: 21-24). Both quantitative (survey) and qualitative in-depth (anthropological holistic study) evaluation indicated modest gains in some areas, whereas no gain or negative gain in other areas. The one-year duration was thought to be too little for any positive results. Based on the experiences and positive gains, INSAT satellite was launched in 1981. Since than a series of INSAT satellites have been launched and used for nationwide television telecast for education and development. The sad part is that, in spite of best efforts, satellite television has been used for entertainment more than rural development.

Rural Development

As you are aware, among the developing countries, India is ranked as one of the fastest growing economies. India's GDP growth, as per our Planning Commission, would cross 10% towards 2025. We are all aware, while our country is progressing well in the economic front, the major livelihoods of rural India, the agriculture, is suffering due to various uncertainties, and currently shares only 18% of GDP. The many efforts of the government for rural development, as we are aware, include: National Food Security Mission (NFSM), Rajiv Gandhi Rashtriya Krishi Vikas Yojana (RGKVY), Pradhan Mantri Gram Sadak Yojana (PMGSY), Rural Housing (RH), Integrated Wasteland Development Programme (IWDP), Accelerated Rural Water Supply Programme (ARWSP), Total Sanitation Programme (TSP), National Rural Health Mission (NHRM), etc. Towards realising the growth potential of rural India, Bharat Nirman, a business plan for rural India, was conceived by the government, and is being implemented. It addresses various related components such as irrigation, all weather roads, rural housing, rural water supply, rural electrification and rural telecommunication connectivity.

We need to substantiate the government's efforts to start a revolution, which can take its 6 lakh villages 'fast forward' in time - converting them into economically viable units and growth engines. Realizing the advantage of space as a vantage point, the visionary in Dr. Vikram Sarabhai, the father of the Indian space programme, saw an opportunity to exploit the space technology as a resource for community outreach, capable of serving the remote villages transcending geographical boundaries. And today, India's space programme distinctly exemplifies how space technology could be the harbinger of rural development.

Space Technology

Making a modest beginning in 1963 with the launch of a small sounding rocket from Thumba (near Thiruvananthapuram), we have come a long way in establishing space systems like the Indian National Satellite (INSAT) and Indian Remote Sensing (IRS) satellite systems that form a crucial part of our national infrastructure for telecommunication, television broadcasting, meteorology, natural resources survey and management. We have succeeded in building our own satellites, INSAT and IRS, and our own Polar Satellite Launch Vehicle (PSLV) for launching the IRS class of satellites and Geosynchronous Satellite Launch Vehicle (GSLV) for launching the INSAT class of satellites.

At present, we have a constellation of IRS satellites covering the whole globe with a revisit period of 2 to 26 days to cater to various applications. Starting with IRS-1A in 1988, we have launched many remote sensing satellites into orbit such as IRS-1B, IRS-1C, IRS-1D, IRS-P3, Oceansat-1, Resourcesat-1, Cartosat-1, Cartosat-2, Cartosat-2A and RISAT-2. Today, India has 9 IRS satellites operating in orbit making it one of the largest constellations of remote sensing satellites in the world. The data from these satellites have been put to use for various applications ranging from agriculture, fisheries and forestry to urban planning and environment monitoring. The Indian National Satellite (INSAT) system, currently with nine of them in orbit, is one of the largest domestic satellite communication systems in the world. INSAT, since its commissioning in 1983, has brought in vast advancement in telecommunications, television broadcasting, radio networking, meteorology and disaster management services. Presently, INSAT family of satellites with 220 transponders in frequency spectrum of S, C, Ext-C and Ku bands is providing communication network across the country.

Space Technology Applications for Rural Development

Satellite communication and earth observation satellites have demonstrated their capabilities to provide the services relating to healthcare, education, weather, land and water resources, land records, agricultural advisories, etc., relevant at communities/ village level. The value-added, high-resolution earth observation images provide community-centric, geo-referenced spatial information for management of natural resources, such as land use/ land cover, terrain morphology, surface water and groundwater, soil characteristics, environment and infrastructure.

Satellite Communication

One of the major components and driving force related to rural development is communication. It has been given highest priority for bringing desirable social and behavioural change among the most vulnerable rural society. Satellite communications has the ability to simultaneously reach a large population, spread over vast distances, and inherently is a powerful tool to support development education and training.
ISRO had undertaken several projects that focused on development of humanity through sophisticated satellite-based communication. Right from the inception of utilizing space programmes for development, the experiments like Satellite Instructional Television Experiment (SITE), Kheda Communications Project (KCP), Jhabua Development Communications Project (JDCP), Training and Development Communication Channel (TDCC) have been carried out. We started with the basic premise that television communication would facilitate rural development, and we demonstrated the impact of television broadcast and interactive programmes on the rural society.

Tele-Education

The tele-education programme launched by ISRO, serviced by the exclusive satellite 'EDUSAT', is primarily intended for school, college and higher levels of education to support both curricula based as well as vocational education. With 5 Ku-band transponders providing spot beams, and one Ku-band transponder providing national beam, and 6 extended C-band transponders with national coverage beams, EDUSAT is specifically configured for audio-visual medium, employing digital interactive classroom and multimedia multi-centric system. Many important institutions such as the IGNOU, UGC, IITs, and many State Education Departments and Universities are making use of the EDUSAT network. Presently, more than 34,500 classrooms are in the EDUSAT network out of which 3,400 are interactive terminals.

Tele-Medicine

A healthy citizen contributes to make a healthy nation. Over the years, the government has introduced various healthcare initiatives and policies, which has resulted in the increase in life expectancy of our citizens. However, providing healthcare to millions of people in rural India is really a formidable challenge. It is a matter of concern that a meager 3% of the qualified doctors, who are attached to about 23,000 Primary and 3,000 Community Health Centres, are available to attend to the 70% of the Indian population. Satellite communication technology, combined with information technology provides a technological means of taking the benefits of the advances in medical sciences to large sections of people spread out in remote and inaccessible villages. ISRO's telemedicine network has enabled many poor rural villagers hitherto denied with quality medical services to get the best of medical services available in the country. As pf now, we have 377 tele-medicine nodes consisting of 320 remote/ district/ medical college/ mobile hospitals connected to 57 super specialty hospitals in different cities through ISRO's satellites. The ISRO telemedicine network is expanding to various regions in the country and has become one of the most visible and sociological applications in the world today.

Earth Observation

The Department of Land Resources of Ministry of Rural Development has recently embarked upon an important and most ambitious programme, the 'National Land Records Modernization Programme (NLRMP)'. This programme aims at creating 'conclusive titles' for all land holdings in the country, and making the scientific development efforts of the Government 'citizen-centric'. This phenomenal task requires right mix of technologies as suited for timely realisation of its goals. Farming in our country strongly depends on the weather. From the satellite meteorological observation point of view, India is having the INSAT/ KALPANA VHRR system operating over the past two decades, providing continuous monitoring of the weather systems over the Indian region. This system has enabled deriving various meteorological parameters such as cloud cover, cloud top temperature, cloud motion vectors, atmospheric winds, and sea-surface temperature. One can also monitor the developing weather systems such as Tropical Cyclones. One of the key elements for improved weather forecasting is to substantially augment the surface observation network, and networking it with the central weather modeling station. In this context, I would like to mention about the development of low-cost Automatic Weather Stations (AWS) and Doppler Weather Radars (DWR) by ISRO associating Indian industries. The indigenously developed AWS is capable of recording weather

data on a continuous basis and transmit through the INSAT system. The data from AWS network and the DWR will be of substantial use in the models being operationally run by the National Centre for Medium Range Weather Forecasting (NCMRWF) and the India Meteorological Department (IMD) for providing meteorological Services for agricultural purposes.

Disaster Management Support

India is one of the most disaster prone countries in the world with increasing vulnerability to cyclones, floods, landslides, droughts and earthquakes. In order to strengthen India's resolves towards disaster management, ISRO has evolved the Disaster Management Support (DMS) programme, which is a convergence of space communications and remote sensing capabilities. Today, INSAT and IRS satellite systems provide disaster management support for the preparedness, early warning, risk information, impact and damage assessment and emergency communication. The space based information is used by the stakeholders for various disasters such as floods, cyclones, drought, forest fires, earthquakes, etc., for relief and rehabilitation measures. INSAT Mobile Satellite Services (MSS) terminals are being put to use during emergencies for providing necessary connectivity.

Village Resource Centre

Among the many societal development related initiatives, I would like to emphasize on a unique programme of ISRO called 'Village Resource Centres (VRC)'. It is being implemented in association with the stakeholders at local levels, to reach the benefits of space and other IT enabled services directly to the common man. The VRCs are a step to bridge the societal divides, and are proving to be vital in improving the quality of life in villages - by way of providing locale-specific advisories for farm sector development, livestock management, local governance, skill development for livelihood support, awareness creation, market information, building disaster resilience, etc. All these services are reaching the doorsteps of common man, in local language. So far over 470 VRCs are set up in 22 States and Union Territories, and many more are in the offing. The uniqueness of VRCs is the knowledge connectivity between the experts at agricultural universities, research institutes and doctors at hospitals, and the village community. We are also making the natural resources data available at VRCs, which could be used to work out development plans at local levels.

Impact Satellite Technology on Rural Communication Systems

In rural communities, dwellers desire a good-quality television reception and two types of telephone calls; the local and the long-distance. The satellite technology would improve the employment of the Wireless Local Loop (WLL) for local telephone calls within the community. The achievement of the long distance call is improved both qualitatively and quantitatively by using the satellite terminals to access appropriate PSTN. Such satellite network is employed either as a relay service or as part of an integrated cellular/satellite system (CCITT, 1989). In India, a developing country, satellite technology has

- Enabled many Nigerians to have easy access to both local and long-distance telephone calls through mobile handsets,
- created employment for many Nigerians,
- Enhanced flourishing business transactions,
- Reduced the frequency of traveling by those who possess mobile phone and have access to satellite networks,
- Reduced road accidents in the country,
- Contributed immensely to the economic growth of the country,
- Established an improved broadband communication links with both urban and otherwise neglected rural communities of a developing country like India and China.

The recent launching of NIGCOMSAT with its many communication transponders, on 14 May, 2007, shall facilitate improved rural communication systems because, bandwidth requirements would more readily be satisfied, costs would be moderate and be paid in India a, our local currency. The effects on the country include improved foreign currency reserve, improved communication systems that would spread awareness of socioeconomic activities (including governments' activities through education, appropriate information dissemination and research to both urban and rural communities in a developing country (Businessday Newspaper, Aug. 16, 2007).

Wireless Local Loops (WLL) for Rural Local Communication

Currently**,** wireless technology offers different networking options for local loop telephone applications. Digital wireless telephone technology covers two well defined sections based on the technology platforms, services and characteristics; The cordless telephone systems which are also defined as Low-Tier Wireless Local Loops (L-WLL) for local calls and Cellular telephone systems are defined as High-Tier Wireless Local Loops (H-WLL). For scattered, semi-fixed rural users, multipath is not as big a problem as it is in urban applications. This high-tier WLL is basically a cellular mobile radio mobile system, which provides a wireless connection from the user's terminal (portable, mobile and semi-fixed) to the PSTN through a radio channel. Current cellular systems are classified as *Second Generation (2G),* since they are the digital mode of the analogue *First Generation* cellular systems. New development in technology brings what is called *Third Generation (3G)* cellular systems which is a further evolution on our current (2G) cellular systems. The (3G) systems allow higher bit rates able to serve services such as the INTERNET, e-mail, etc. In both cases, satellite access to PSTN is needed for long-distance applications (Williams, 2000: CCITT, 1989).

Conclusion

Communication has been seen by a large number of development planners as a panacea for solving major social ills and problems. Apart from development, the introduction of communication in the educational process for open and distance learning is seen as step towards improving the quality of education and bridging the social and educational gap. However, experience indicates that those rich who could afford to have access to private resources have hogged the

advantage whether development or education. In this respect, it seems that communication technology has, in no way has helped the poor for improving their socio-economic condition. These rural development projects broadly followed an "extension model" in which broadcast media were used to reach the large rural population or target groups. In the post economic liberalisation period, rural development projects added information and communication technology (ICT) to provide individual need-based information in broad development areas through Internet. In the post economic liberalization phase without abandoning the extension model "social marketing approach" to rural development has been adopted. We are sure, that if the human resources at Panchayat level are enriched with the knowledge of using space based inputs, many issues related to land use or reclamation of wastelands, agriculture, horticulture, infrastructure development, water harvesting, etc., specific to the local environment can be solved.

REFERENCES

1) Williams Webb (2000), Introduction to Wireless Local Loop, 2nd Edition: Broadbnd, narrowband systems, pp. 49-60, 120-124, 128, Artech House Inc., 685 Canton Street, Norwood, MA02062, U.S.A. *Adeloye*
2) Agrawal, Binod C. 1981 SITE Social Evaluation: Results, Experiences and Implications. Ahmedabad: Space Applications Centre
3) 1985 (Edited) Anthropological Method for Communication Research, New Delhi.
4) Armitage, John 2001 Resisting the Neoliberal Discourse of Technology: The Politics of Cyberculture in the Age of the Virtual Class. From Internet. Haqqani,
5) Hudson, H.E. (1984), When Telephones Reach the Village: The Role of Telecommunications in Rural Development,pp4, Ablex Publishing Corp., Norwood, NJ.
6) Johansen, K.G. (1995), Mobile P-Service Satellite System Comparison, Int. Journ. Of Satellite Communications, Vol. 13, pp. 453-471.
7) Price, K.M., Lazear, Y. (1996), Technologies to Enable Low Cost Satellite Communications, AIAA Int. Conf. on Communications Satellite Systems, pp. 1065 – 1075, Feb. 25-29, 16th, Washington, DC.

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