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Informational Development in Rural Areas: Some Evidence from Andhra Pradesh and Kerala*

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I. INTRODUCTION

This chapter examines the factors associated with the diffusion of information and communication technologies (ICTs) in rural areas, and in doing so it looks at the potential role that ICTs can play in the development of rural areas. Empirical support for the chapter is based on field studies conducted in July-August 2004 in two rural locations in two South Indian states—Kuppam in Andhra Pradesh and Malappuram in Kerala. Various projects and programmes to use ICTs for enhancing developmental opportunities are going on in both locations. A major conclusion of this chapter is that ICTs can play a potent role in rural development, but only if the basic obstacles to rural prosperity are removed through radical changes – through land reforms, revitalisation of rural credit, and greater state intervention in rural infrastructure, and primary education.

India has made impressive gains in the software industry and information technology enabled services (ITES) in recent years. The annual rates of growth (over the previous year) of India's software production (in current prices) were over 50 per cent in six of the

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nine years between 1992-93 and 2001-02.[1] There has been a phenomenal increase in the outsourcing of business operations to India by firms in western countries. India's English-speaking population, that numbers 30-50 million, and particularly the English-speaking technical professionals, whose labour costs are low by western country standards, is the major attraction for firms in the developed world. The Central government and various State governments in India have been giving great attention to the growth of the information technology industry.

India has a population of more than 1 billion people, 70 per cent of which live in rural areas, 29 per cent are below the poverty line, and 34.6 per cent are illiterates.[2] Indian development today faces a paradoxical situation: the much-talked about growth of industries based on ICTs in some Indian cities along with the continuing impoverishment in India's rural areas. The case of the State of Andhra Pradesh is much telling in this regard. Andhra Pradesh, and in particular its capital-city, Hyderabad, has received widespread attention in recent years for attracting sizeable investments in the IT industry. Over the same period of time, however, Andhra Pradesh has been passing through a phase of unprecedented rural distress, including cases of starvation deaths, distress migration of landless agricultural labourers, and suicides among handloom textile workers.[3] The former Chief Minister of Andhra Pradesh, Mr. N. Chandrababu Naidu, had won great adulation in the national and international media for the proactive policies of his government for the IT industry. However, Naidu's nine-year old government (between 1995 and 2004) fell flat after suffering a major debacle in the elections held in May 2004. There was, reportedly, great popular discontent against his government's neglect of livelihood issues of the poor (Hindu, 2004).

It is obvious that an enclave-type growth of the IT industry benefiting only sections of urban population and not making any noticeable change in the lives of vast masses of rural people is bound to generate contradictions and social tensions (see D'Costa, 2003).[4] In India and in other developing countries, it is a challenge for public policy to reach the benefits of ICTs to people in rural areas. The aim of this paper is to discuss some aspects of this challenge.

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[1] See Government of India (2001a), p. 35-6 and Government of India (2001b), pp. 1-7, p.15. See also Economist (2001b), Paul (2002), and Ashish and Athreye (2002).

[2] Poverty data for 1993-94, measured by Head-count ratio, from Drèze and Sen (2002), Table A.3. Literacy rates from Census of India, 2001.

[3] See Krishnakumar (2001) and Sainath (2003).

[4] According to D'Costa (2003), an enclave-type growth of the IT industry has led to "uneven and combined development" in India.

There are seven sections in this paper. The next section (section 2) examines the potential of ICTs in development, and some of the challenges in realizing this potential. Section 3 outlines the experiences of Andhra Pradesh and Kerala in regard to information technology and development. Section 4 is a note on the methodology and study areas for the field research for this paper. Section 5 discusses the diffusion of ICTs in rural areas and section 6 discusses the potential role of ICTs in the development of rural areas. Section 7 concludes the paper.

II. ICTs FOR RURAL DEVELOPMENT: POTENTIAL AND CHALLENGES

There is great optimism in policy-making circles that the new technologies, more specifically ICTs and biotechnology, will benefit the less-privileged sections of the world's population. *Human Development Report 2001* expresses the hope that advancements in ICTs and biotechnology "will lead to healthier lives, greater social freedoms, increased knowledge and more productive livelihoods" (UNDP, 2001, p.1). According to many of the ongoing policy discussions, the real potential of ICTs lies in the fact that ICTs have revolutionized the means for transmission of information and communication of knowledge. Information and knowledge are going to be the basis for economic development in the coming decades, as per these policy discussions (see World Bank, 1999).[5]

No doubt, information aids the process of development in several ways. Information about markets and technology can lead to increase in incomes of poor households in rural areas. With the opportunities offered by communications technology, a small business unit in a remote town can establish commercial links with distant corners of the world and update itself with the latest developments in production technology. In developing countries, poor farmers and craftsmen have traditionally been exploited by middlemen because of the former's lack of information about prices (Eggleston et al, 2002). By providing information about prices, ICTs can be powerful tools for empowerment of the disadvantaged sections of society. Economist (2001a) reports that, using mobile phones, fishermen in Kerala keep themselves informed of fish prices -- which fluctuate throughout the day and between the various landing spots -- while at sea;

[5] *World Development Report 1998/99* notes that knowledge is the basis for economic development and that it is because of information gaps and knowledge gaps that poor countries lag behind richer ones.

in this way, they manage to get higher prices than what they used to get earlier by selling their catch to middlemen.

ICTs can be instruments of participation for the excluded sections of society. For instance, members of an isolated community can voice their development needs through the Internet. ICTs have great applications in health and education. With the emerging area of telemedicine, medical advice and advanced medical services can be delivered to patients in a village dispensary through satellites.[6] Applications of ICTs such as multimedia are used in programmes of distance learning for working adults.[7] ICTs can considerably improve the efficiency of governance and state intervention, particularly of local bodies. They can, for instance, aid the speedy issuance of government certificates to citizens, and the sending of e-mail complaints by citizens to the administration (UNDP, 2001; World Bank, 1999; UNDP, 1999) .[8]

Challenges, with special reference to the case of India

However, there are several reasons to believe that the above-referred policy discussions are overly optimistic of the impact of ICTs on development (see Heeks, 2002; Keniston, 2002; Sreekumar, 2003).[9] It will be argued in this paper that there are two major concerns with respect to the potential of ICTs for rural development. These concerns are related to, first, whether people in rural areas have the *capabilities to use the new technologies*, and secondly, whether people in rural areas have the capabilities to *use the information provided by the new technologies*

A major factor that impairs the capabilities to use ICTs by people in rural areas is the poor level of physical infrastructure, including deficient telecommunication networks, low penetration of personal computers and poor Internet connectivity. In India, per 1000 population, there are only 50 telephone lines (in March 2003), and only 0.38 Internet subscribers (in September 2002). These are averages for India as a whole, which conceal the huge variations between different Indian States and between urban and rural areas of

[6] On the use of ICTs in the delivery of health services, see Chandrasekhar and Ghosh (2001) and Reddy and Graves (2000).
[7] See, for example, Patel (2002).
[8] ICTs also help to collect and report data at the local level. "Local reporting combined with global information" is the key to effective developmental action, writes Gage (2002).
[9] Heeks (2002) writes that, with respect to the impact of ICTs on development, a large part of the present discussion takes a highly optimistic and technologically deterministic view. A less optimistic and socially deterministic view will be more realistic, Heeks (2002) argues.

each State.[10] The cost of a telephone or Internet connection in India, in absolute figures and as a share of household's total income, is considerably higher than the corresponding costs in many other countries including South Korea and China (UNDP, 2001, Table A2.4). Telecom reforms in India from the 1990s have resulted in very impressive gains to the country's telecom infrastructure; yet the reforms so far have not been very successful in extending telecom connectivity to India's rural areas.[11]

Mansell and Wehn (1998) write that the capabilities for producing software and information content that are relevant to people in rural areas and the capabilities required for converting information into useful knowledge are equally important for realizing the opportunities promised by ICTs.[12] For effective spread of the Internet to rural areas, information content needs to be created in the local languages; at present, most of the content available on the Internet is in the English language. It is also pointed out that, while research in technologies is more often carried out in developed countries and cater to the demand for technologies in these countries, the specific needs for technologies in poor countries are often neglected (UNDP, 2001).[13] In India, there has been some progress in developing information and communication technologies that are cheaper and are suited to the country's needs, including technologies like simputer, wireless in local loop (WiLL), voice over Internet protocol (VoIP) and Ka-band satellite communications.[14] It is matter of concern, however, that research and development expenditure by the private and public sector India has declined over the 1990s.[15]

The impact of technologies depends on the structure of the society upon which the technologies are applied, and this is true in the case of ICTs as well.[16] Under the prevalence of a regressive social structure, ICTs can aggravate inequalities -- between people in urban and rural areas, between the well- educated and illiterates, and between those who possess some form of entitlements and those who do not.[17] Diffusion of new technologies will be very difficult among persons whose educational levels are low. It will

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[10] Information on Internet from the Ministry of Telecommunication, Government. of India; on telephones from Press Information Bureau, Govt. of India cited in www.indiastat.com (See Thomas, 2005a), Table 8.5.

[11] See Chandrasekhar (2003) and Pukayastha (2002).

[12] See Velden (2002) on this.

[13] It is argued, therefore, that developing countries have to build national systems of innovation in order to facilitate transfer of technologies from advanced countries and to create technologies that are appropriate to the needs of developing countries (see Mowery and Oxley, 1995).

[14] See Jhunjhunwala (2001).

[15] See Government of India (2001b) p.144 and Thomas (2005a), Table 8.6.

[16] According to Parayil (1999), technological change can be conceived as an evolutionary process operating within a contingent social milieu. See also Eischen (2000).

[17] For a review of some of the arguments of this nature, see Schech (2002).

also be difficult when social and asset-based inequalities are rampant, as when a person belonging to the scheduled caste (socially oppressed class) is barred from using a village community Internet server.[18]

In India, high levels of illiteracy and forms of social exclusion based on caste and gender continue to prevail in several regions of the country. Literacy rates in India are particularly low in rural areas, among females, among members of socially disadvantaged tribes and castes, and in States like Bihar, Madhya Pradesh, Orissa, Rajasthan and Uttar Pradesh. While adult male literacy rate for India as a whole was 76 per cent (in 2001), literacy rate was below 5 per cent among rural scheduled caste women (in 1991) in several districts of Rajasthan.[19] Successive governments in India have not been greatly committed to ensuring basic education for the masses: the country has still not achieved the goal of providing free and compulsory education to all until the age of 14 (Drèze and Sen, 2002, pp. 146-67).

Evidence presented in this paper will show that backward social conditions place limitations not only on the capabilities to use ICTs, but also on the capabilities to use the information provided by ICTs.

III. INFORMATION TECHNOLOGY AND DEVELOPMENT: EXPERIENCES OF ANDHRA PRADESH AND KERALA

The field study for this paper was carried out in July-August 2004 in two rural locations, one in Kuppam in Andhra Pradesh and another in Malappuram in Kerala. Experiments to use ICTs for the betterment of livelihoods of marginalised sections of the population are going on in various places in India. These include the use of personal digital-assistants by health workers in Rajasthan (Reddy and Graves, 2000); a project to impart functional literacy among working adults reported to be going on in some 80 locations in Andhra Pradesh (Patel, 2002); attempts by the MS Swaminathan Research Foundation (MSSRF) in a few villages in Pondicherry to reach the benefits of ICTs among farmers and fishing community (Dugger, 2000); the use of a centrally linked IT network by sugarcane farmers in Warana region in Maharashtra (Vijayaditya, 2000); the Gyandoot project of e-

[18] UNDP (1999) reports that people who access the Internet are more often the better educated and higher income groups; men rather than women; and younger rather than older people. A study by Arun and Arun (2002) showed that ICTs may reproduce or even intensify many of the broader gender inequalities.

[19] Census 2001 data on literacy rates among rural scheduled caste women in districts of Rajasthan is not yet available.

governance in Madhya Pradesh; and the TARAhaat and Drishtee rural IT projects currently going on in Punjab and Haryana respectively (Kaushik and Singh, 2004).[20] It is relevant to explain here why, from among such many experiments, the experiments in Kuppam and Malappuram have been chosen for the field study.

In April 2002, the State Government of Andhra Pradesh and Hewlett Packard Ltd. have jointly launched a programme to build an "inclusive community" (i-community) – a community that makes use of information and communication technologies to ensure widespread participation of its members in economic growth -- in the Kuppam region.[21] The key feature of the Kuppam i-community project is a network of community information centres, operated by local entrepreneurs, who receive financial and technical assistance from the State Government, Hewlett Packard and World Corps India (a non-governmental organization committed to rural development). This project aims at creating several developmental opportunities in Kuppam.[22]

The State Government of Kerala has launched the Akshaya project in Malappuram in November 2002. The most important feature of the project is a network of Akshaya information centres operated by local entrepreneurs, with assistance from local-self governing bodies. The project aims to impart IT literacy to at least one member of each household in Malappuram, to cater to the information and communication requirements of people, and thus create "powerful social and economic e-networks" in the region. As a result of the project, in August 2003, Chamravattom village in Malappuram district of Kerala has secured the distinction of being the first fully e-literate village in India, by imparting basic computer skills to at least one person in each of the 850 households in the village.[23]

Andhra Pradesh has been highly celebrated in recent years for its successes in IT. The State's capital, Hyderabad, is home to several large IT firms, public and private sector research centres, and is expected to join the select group of cities all over the

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[20] See <www. gyandoot.nic.in> on the Gyandoot project; see Satyanarayana (2000) and Kumar (2000) on the e-governance projects in Andhra Pradesh; and see <www.keralaitmission.org/> on the e-governance projects in Kerala.

[21] See <www.hp.com/e-inclusion/en/project/kuppam.pdf> (downloaded on 09-06-2004). See also the report by Dunn and Yamashita (2003) in *Harvard Business Review*

[22] The assembly constituency of Kuppam has been returning Chandrababu Naidu to the State Legislative Assembly continuously from 1989 -- and even in the most recent elections held in 2004.

[23] See the Editorial in *The Hindu*, August 9, 2003.

world, identified as top global hubs of innovation.[24] Andhra Pradesh sends large numbers of software professionals to the USA very year: software professionals from Andhra Pradesh accounted for 23 per cent of all Indian software professionals working in the USA in 1998 (Ramachandraiah, 2003). Number of engineering colleges in Andhra Pradesh increased from 36 in 1994-95 to 237 in 2004. According to the Government of Andhra Pradesh, 'IT industry' (including IT hardware, IT software and ITES) grew at a compound annual growth rate of over 80 per cent in Andhra Pradesh during the period between 1999 and 2002.[25] Kerala, although capable of more, is, today, far behind Andhra Pradesh in the growth of software or ICTs industry. In 2000-01, software exports through software technology parks of India (STPIs) was Rupees 1.4 billion (or 0.7 per cent of the total software exports through STPIs in India) in Kerala compared with Rupees 20.17 billion (or 10.06 per cent of the total in India) in Andhra Pradesh.[26]

However, for all its noted successes in the IT industry, the growth of per capita State Domestic Product in Andhra Pradesh in the 1990s was slower than the national average, and noticeably slower than the corresponding growth in Kerala.[27] Poverty level, measured by Head Count Ratio, in Andhra Pradesh is considerably higher than in Kerala (see Tabe 1). In 1999-2000, average household per capita expenditure in Kerala was the highest among all Indian States, and much higher than the per capita expenditure in Andhra Pradesh (Drèze and Sen, 2002, Table A.3; see also Table 1). In 2003, per 1000 population, there were 78.5 telephone lines in rural Kerala compared to 20.3 only in rural Andhra Pradesh (see Table 1).

Much more striking are the variations in social achievements between the two States. Kerala has been widely praised for its exceptional achievements in social spheres, particularly in health and education.[28] Andhra Pradesh's social achievements are, on the other hand, far from noteworthy. In 2001, female literacy rate was only 51 per cent in Andhra Pradesh compared to 88 per cent in Kerala. In 1993-97, an average male could expect to live for 61.2 years in Andhra Pradesh compared to 70.4 years in Kerala (see

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24 According to *Wired* magazine, cited in UNDP (2001), p.38.

25 'Information and Communication Technology Policy of the Government of Andhra Pradesh 2002', Government Order Ms. No. 27, dated 27-06-2002 (downloaded from <www.ap-it.com/ictpolicy02.pdf> on 09-06-2004).

26 <.http://planningcommission.nic.in/plans/stateplan/sdr_punjab/sdrpun_ch13.pdf>(downloaded on 05-10-2004).

27 See Thomas (2005b) for details on Kerala's economic and industrial growth over the decades.

28 For details on Kerala's development experience, see Ramachandran (1996) and the set of essays in Parayil (2000).

Table 1). Kerala has had a relatively successful programme of land reforms, and shows relatively low levels of inequality between members of different caste, gender, and between people in urban and rural areas; in all these, Andhra Pradesh's track record is far less impressive. Kerala's development achievements are, largely, the achievements of public action: of democratically elected State governments, of political and social movements, and of its people, acutely aware of their rights and responsibilities. Public action of a similar nature is yet to happen in Andhra Pradesh.

Table 1: *Selected indicators of development, Andhra Pradesh, Kerala and India*

	Andhra Pradesh	Kerala	India
Area (thousand square kilometers)	275	39	3288
Population, 2001 (millions)	76	32	1027
Life expectancy at birth, males, 1993-7 (years)	61.2	70.4	60.4
Literacy rate, age 7+, females, 2001 (%)	51	88	54
Average house hold expenditure per capita 1999-2000 (Rs/month)	541	810	589
Growth of real per-capita State domestic product (% per year) 1990-1 to 1998-99	3.5	5.1	4
Poverty Index: Head-count ratio (%), 1993-94	26	18	29
Telephones (per 1000 people), rural, 2003	20.3	78.5	14.9
Number of institutions for higher education, 1993-94	850	234	9003
Number of engineering colleges, 1993-94	36	9	323

Source: For indicators of economic growth and social development, and for population, see Drèze and Sen (2002), Table A.3. For indicators on development of new technologies, see Central Statistical Organisation (1999). For indicators of telecom infrastructure, see Press Information Bureau, Government of India cited in <www.indiastat.com>.

IV. METHODOLOGY AND STUDY AREA

The field study for this research included discussions with officials of government and non-governmental agencies involved in programmes for diffusion of ICTs in Andhra Pradesh and Kerala. It also included interviews with entrepreneurs operating the information centres in Kuppam and Malappuram. The core data for this research came from a stratified sample survey of households in selected areas in Kuppam and in Malappuram.[29]

The Andhra Pradesh government-Hewlett Packard (HP) i-community project is carried out in the Kuppam area or the State Legislative Assembly constituency of Kuppam, which comes within Chittoor district of Andhra Pradesh. In Andhra Pradesh, for administrative purposes, each district is subdivided into mandals, mandals are further subdivided into grama panchayats, and each grama panchayat consists of a number of villages or habitations. The Kuppam area has a population of approximately 320,000

[29] The methodology for field study for this paper is motivated by field studies conducted in Ramakumar (2004), Pais (2003) and Rawal (2001). It also benefited from an ongoing study conducted by V. Surjit of the Indian Statistical Institute, Kolkata.

people and is spread over five mandals: Gudupalli, Santipuram, Ramakuppam and Venkatagiri Kota. There are, in total, 99 grama panchayats and 714 villages in the five mandals that constitute the Kuppam area. At present, 13 community information centres (CICs) operate in different parts of the Kuppam area as part of the i-community project. Five of these CICs started operations in April 2002, three of them in September 2003, and another five of these CICs were started in April 2004.

After discussions with officials of HP, officials of the concerned Mandal revenue office, and entrepreneurs of CICs in the Kuppam area, it was decided that the sample survey would be conducted in Kadepalle village in Gudupalle mandal and Venkatepalle village in Santipuram mandal. These villages are located within a 3 km. radius of a CIC started in April 2002. I prepared a list of all the 141 households in Kadepalle village and 168 households in Venkatepalle village, with names of head of household and ownership of land holdings.[30] This list formed the sampling frame for the survey. A representative sample of 45 households was then chosen from the sampling frame, the representative sample consisting of 20 households from Kadepalle and 25 households from Venkatepalle (representing, respectively, 14.2 per cent and 14.9 per cent of the sample population in the two villages). Stratified random sampling procedure with stratification on the basis of the size of land holdings was adopted in the choice of representative samples.

Compared to the Kuppam i-community project, the Akshaya Project in Malappuram is carried out on a larger scale. The Akshaya project covers an entire district (Malappuram), and there are 582 Akshaya centres operating in different parts of Malappuram district as part of the Akshya project.[31] In Kerala, for administrative purposes, districts are subdivided into taluks, and taluks are further subdivided into villages.[32] There are a total of six taluks and 135 villages in Malappuram district.[33] After discussions with officials of the Akshaya project, officials of the district and local-level administration, and entrepreneurs of the concerned information centres, it was decided

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30 As part of the Integrated Child Development Services (ICDS) Project, which is being carried out in the Kuppam area, Anganwadi teachers conduct a door-to-door survey of all households in their village, collecting socio-economic information about households as well as health information of children in the households. I have used this information collected by Anganwadi teachers in Kadepalle and Venkatepalle in the preparation of sampling frame.

31 <http://www.akshaya.net/itmission/akshaya/vitem.asp>

32 There is a difference between a village in Andhra Pradesh and a village in Kerala. In Kerala, a village is an administrative sub-division of a Taluk. For purposes of local self governance, Malappuram district (district panchayat) is subdivided into 14 block panchayats and 100 grama panchayats.

33 The six taluks are Nilambur, Ernad, Perinthalmanna, Tirur, Ponnani and Tirurangadi.

to conduct the sample survey in Karachal ward (which is Ward No.2 in the village) of Pullippadam village located in Nilambur Taluk; an Akshaya information centre is presently operating in Karachal ward. I prepared a list of all the 381 households in Karachal ward with names of head of household and their ownership of land holdings.[34] A representative sample of 45 households (representing 11.8 per cent of the sample population) was selected from this sampling frame using stratified random sampling procedure, with stratification was done on the basis of size of landholdings.

It may be noted that the Kuppam i-community project and the Akshaya project are still in their initial stages: both these projects were begun in 2002. It is still too early to make any attempts to judge the success of the programme. Clearly, this was not part of the aims of the survey either. The sample survey focussed on how socio–economic conditions affect the diffusion of technologies in rural areas.

Description of Study Areas

In the 45 households in which the survey was conducted in Kuppam, there were a total of 215 persons (113 males and 102 females) – thus 4.8 persons on an average per household. The total number of persons in the 45 households in which the survey was conducted in Malappuram was 240 (118 males and 122 females) – thus 5.3 persons on an average per household. The total number of persons above the age of seven in the surveyed households in Kuppam and Malappuram were, respectively, 196 and 223.

In the surveyed households in Kuppam, primary occupation of the head of household was cultivation in 28.9 per cent of households, and agricultural labour in 17.8 per cent of households; in 15.6 per cent of all surveyed households, head of household was engaged in cultivation in addition to working as agricultural labourer. In all, 62.2 per cent of all surveyed households in Kuppam depended primarily on agriculture for their livelihood. Heads of 13.3 per cent of all surveyed households earned their livelihoods as non-agricultural labourers, which included construction workers as well as workers engaged in other jobs like the making of incense sticks. In 8.9 per cent of surveyed households, head of household ran small businesses including a small hotel and a shop for selling vegetables and fruits. Heads of 13.3 per cent of surveyed households worked in the service sector, in jobs including teacher, post-man, railway gang-man and lab-technician.

[34] As part of the Akshaya project, entrepreneurs running Akshaya centres have prepared a list of all households with their relevant socio-economic information. I have used this information in preparing the sampling frame.

Compared with the surveyed households in Kuppam, there was greater diversification of employment opportunities among the surveyed households in Malappuram. In total, 19 of the 45 surveyed households (or 42.2 per cent of all surveyed households) in Malappuram depended on agriculture for their livelihoods. These included 5 households in which the head of households were cultivators, 12 households in which the head of households were agricultural labourers, and 2 households in which the head of household reported no occupation but the major source of household income was agricultural labour by one or more household members. Heads of 6.7 per cent of surveyed households were non-agricultural labourers, mainly head-load workers; heads of 11.1 per cent of surveyed households were engaged in some small businesses, including working as a middleman for land transactions, running grocery shops and selling books; heads of 8.9 of surveyed households were engaged in other jobs, including estate supervisor, post-master and bus driver; and heads of 8.9 per cent of households were reported to be working in the Gulf countries. In total, in 26.7 per cent of all surveyed households in Malappuram, one or more member (not necessarily head of household) worked in the Gulf countries.

The major agricultural crops in the surveyed households in Kuppam are paddy, *ragi*, groundnut, tomatoes, *chamanthi* flower, and vegetables. The major agricultural crops in the surveyed households in Malappuram are rubber, coconut, arecanut, pepper, and banana.

In Kuppam, of the 45 households surveyed, 26 households belonged to a Hindu backward caste (officially, other backward caste or OBC); 3 households to other Hindu castes; 9 households to a scheduled caste (SC), and 7 households belonged to the Muslim community. In Malappuram, of the 45 households surveyed, 6 households belonged to a Hindu backward caste (OBC), one household to other Hindu caste, 2 households to a scheduled caste or scheduled tribe (SC or ST); 31 households belonged to the Muslim community, and 5 households belonged to the Christian community.

With respect to literacy status and level of education, the surveyed households in Malappuram were distinctly ahead of the surveyed households in Kuppam. Literacy rate among persons above the age of seven in the surveyed households in Kuppam was 63.3 per cent; the corresponding figures for Andhra Pradesh and Chittoor district, according to Census of India 2001, are 61.1 per cent and 67.5 per cent respectively. Literacy rate among persons above the age of seven in the surveyed households in Malappuram was

96.4 per cent – higher than the corresponding figures for Kerala and Malappuram, which were, respectively, 90.9 per cent and 88.6 per cent in 2001. [35]

In the surveyed households in Malappuram, persons who received 8-10 years of formal education and persons who received above 11 years of formal education, both as proportions of all persons above the age of seven, were, respectively, 41.7 per cent and 22.9 per cent. The corresponding proportions were much smaller in the surveyed households in Kuppam: 14.8 per cent and 10.2 per cent respectively. In the surveyed households in Malappuram, 28.3 per cent of all persons above the age of seven were attending some educational institution at the time of the survey; the corresponding proportion in Kuppam was 19.4 per cent.

V. DIFFUSION OF TECHNOLOGIES IN RURAL AREAS: ITS NATURE AND RELATED FACTORS

To understand the nature of the diffusion of information and communication technologies among people, four questions were asked to the head of each surveyed household. These questions were the following. Have you or any of your family members heard about computers? Have you or any of your family members heard about the information centre in your locality? Are you or any of your family members aware of the services of the information centre in your locality? Have you or any of your family members ever made use of the services of the information centre in your locality? Table 2 presents the responses to these questions by the head of households in Kuppam and Malappuram.

It is of note that the above-mentioned questions were asked to the head of each surveyed household. At the same time, opinions were sought and carefully noted from each of the family member present in the household at the time of the survey to verify the responses made by the head of household. It was found in the survey that it is more often the younger members who have heard about computers and have used the facilities of the information centre in the locality. In cases where none of the younger members of the family were present in the household at the time of the survey and where the head of the household had insufficient information regarding a family member's familiarity with computers, the responses made by the head of the household may not be correct.

[35] See the results of Census of India 2001 in <www.censusindia.net>

Therefore, the results in Table 2 may be seen as responses made by *head of surveyed household subject to the information available to her/him at the time of the survey.*

Table 2: *Some indicators of the diffusion of computers among surveyed households, Kuppam and Malappuram, 2004*

	Kuppam		Malappuram	
	Number	% share of total	number	% share of total
Households in which at least one member has heard about computers	28	62.2	45	100.0
Households in which at least one member has heard about the information centre in the locality	18	40.0	41	91.1
Households in which at least one member is aware of the services of the information centre in the locality	10	22.2	32	71.1
Households in which at least one member has made use of the services of the information centre in the locality	8	17.8	29	64.4
Total number of surveyed households	45	100	45	100.0

Note: These results are from the responses made by heads of surveyed households, subject to the information available to her/him at the time of the survey.
Source: Survey data, July-August 2004.

Table 3: *Penetration of computers and media technologies among population in the surveyed households, Kuppam and Malappuram, 2004*

	Kuppam		Malappuram	
	number	% share of total	number	% share of total
Persons who read newspapers	76	38.8	181	81.5
Persons who watch TV	148	75.5	159	71.6
Persons who hears radio	103	52.6	165	74.3
Persons who operates a telephone	94	48.0	187	84.2
Persons who operate computers	15	7.7	67	30.2
Total number of persons who are above age 7	196	100	222	100

Source: Survey data, July-August 2004

Broad Trends

Results in Table 2 indicate that at least one family member has heard about computers in all the surveyed households in Malappuram and in 62.2 per cent of all surveyed households in Kuppam. The proportion of the sample of households in which at least one member has heard about the information centre in the locality was 91.1 per cent in Malappuram and 40 per cent in Kuppam; the proportion of the sample in which at least one member is aware of the services of the information centre in the locality was 71.1 per cent in Malappuram and 22.2 per cent in Kuppam (see Table 2).

The use of computers by people in the sample of households was far more widespread in Malappuram than in Kuppam. Questions were asked to the head of surveyed households regarding the use of computers, newspaper, radio and TV by each household member. Results of the responses, given in Table 3, show that 30.2 per cent of all persons above age seven in the surveyed households in Malappuram have operated a computer; the corresponding proportion in Kupam was 7.7 per cent (see Table 3). In Malappuram, at least one family member in 75.6 per cent of all surveyed households has operated a computer. The Akshaya programme in Malappuram has been successful to some degree with respect to its stated aim of imparting e-literacy to at least one person in every household. One or more family members have made use of the services of the information centre in the locality in 64.4 per cent of the sample of households in Malappuram; the corresponding proportion in Kuppam was 17.8 per cent (see Table 2). In many surveyed households in Malappuram, more than one household member has taken part in the e-literacy programme conducted by the information centre.

It was learnt that members belonging to *Paniyar* community (a socially backward community of scheduled tribes) have taken part in the e-literacy programme in some of the Akshaya centres in Malappuram. Female members have actively taken part in the e-literacy programme and also made use of other services at the Akshsya information centres in Malappuram. The main instructor in the Akshaya centre in Karachal ward is a 21-year old Muslim woman who holds an undergraduate degree in Arabic and has also completed a course in computers.

Diffusion of Computers and Socio-economic Characteristics of Households

The study shows that a relatively high level of literacy and education aids the diffusion of information and communication technologies. As shown in section IV, the literacy rate and educational level in Malappuram are much higher than the corresponding rate and

level in Kuppam. This has contributed to the better awareness about computers, the more widespread use of computers, and the more widespread use of the services of information centre by members of the surveyed households in Malappuram. In several households in the sample in Malappuram and Kuppam, an important source of awareness about computers was school going children, who learn about computers as part of their academic curriculum. There were many surveyed households in Malappuram in which one or more household members have either completed or have been participating in a professional training course in computers, after completion or along with their formal education.

The association between literacy and awareness about computers is evident in an analysis of the results for the sample of households in Kuppam. As shown in Table 4, of the 28 surveyed households that have heard about computers in Kuppam, 19 (or 67.9 per cent) are 'literate households' or households in which the proportion of literates among total household members is more than 50 per cent. On the other hand, of the 17 surveyed households that have not heard about computers, 15 (or 88.2 per cent) are 'illiterate households' or households in which the proportion of literates among total household members is less than or equal to 50 per cent (see Table 4).

There is evidence for a positive association between diffusion of computers and level of education of household members. In Kuppam, the average number of persons per household who attend an educational institution is 0.47 among surveyed households in which no household member has heard about computers; the corresponding figure in Kuppam is 1.07 among surveyed households in which one or more household members have heard about computers. In Malappuram, the average number of persons per household who attend an educational institution is 0.73 among surveyed households in which no household member has operated a computer, whereas the corresponding figure is 1.62 among surveyed households in which one or more members have operated a computer (see Table 5).

Diffusion of computers among surveyed households is seen to be positively associated with levels of assets. Ownership of land holdings is a good indicator of assets in the surveyed villages in Malappuram and Kuppam. In Kuppam, the average size of landholdings among households in which no member has heard about computers is 0.67 acres. The corresponding figure for households in which one or more members have heard about computers is 1.93 acres. In Malappuram, average size of landholdings among households in which no member has operated computers is 0.25 acres, while the

corresponding figure for households in which one or more members have operated computers is 0.78 acres (see Table 5).

Table 4: *Households whose members have and have not heard about computers and the local information centre, by literacy status of household members, Kuppam, 2004*

		Computers	Information centre
1	Households in which one or more member has heard about:	28	18
2	Of which proportion of literates among total household members is more than 50 per cent	19	14
	2 as per cent share of 1	67.9	77.8
3	Households in which no member has heard about:	17	27
4	Of which proportion of literates among total household members is less than or equal to 50 per cent	15	16
	4 as per cent share of 3	88.2	59.3

Notes: Total number of household surveyed = 45
Source: Survey data, July-August 2004

Table 5: *Penetration of computers, average number of persons attending an educational institution, and average size of landholdings owned, surveyed households, Kuppam and Malappuram, 2004*

Type of surveyed household	Average number of persons attending an educational institution	Average size of land holdings (in acres)
Kuppam		
Households in which no member has heard about computers	0.47	0.67
Households in which one or more member has heard about computers	1.07	1.93
Malappuram		
Households in which no member operates computers	0.73	0.25
Households in which one or more member operate computers	1.62	0.78

Notes: Total number of household surveyed = 45. Number of households in which none of the household members operate computer is 11 in Malappuram.
Source: Survey data, July-August 2004

It was shown that the proportion of surveyed households which were aware of the local information centre in Kuppam was 40.0 per cent, much smaller than the corresponding proportion in Malappuram, which was 91.1 per cent (see Table 2). Two points may be noted in this regard. First, in Kuppam, the proportion of surveyed households which were aware of the local information centre was noticeably smaller than the proportion of surveyed households which were aware of computers (62.2 per cent) (see Table 2). More over, of the 27 surveyed households which were not aware of the information centre in Kuppam, 11 households (40.7 per cent) were 'literate households', households in which the proportion of literates among total household members is more than 50 per cent (see also Table 4). Clearly, the low level of awareness about information centre in Kuppam is not all due to low level of literacy. Some of the differences between Kuppam and Malappuram with respect to the awareness about information centres are related to the nature of implementation of the programme in the two places.

In Kuppam and Malappuram, information centres are run by small entrepreneurs, belonging to the locality. The Akshaya programme in Malappuram is implemented through panchayat raj institutions or local self-governments. Therefore, local entrepreneurs running Akshaya information centres work in close association with and receive support from officials of local self-governments, local politicians and social activists. Entrepreneurs of information centres in Kuppam do not receive such local support. Officials of the State government, HP and World Corps India oversee the operations of information centres in Kuppam, but none of these officials have any deep links with the local community. This is one reason why the information centres in Malappuram are more popular with the village population than the centres in Kuppam.

The two-week training programme to impart basic IT skills to at least one member of every household has been highly effective in popularizing the Akshaya information centres in Malappuram. In the information centres in Kuppam, according to entrepreneurs running the centres, the main users of computers and Internet were not local people, but officials of government offices and students of two professional colleges located in Kuppam who mostly do not belong to the village. Interestingly, the i-community project is sufficiently advertised. Large hoardings showing pictures of villagers using computers greet a visitor as she passes through various parts of the Kuppam area. Calendars with pictures of the i-community project were hung from the walls of many of the surveyed households. Apparently, such advertisements have not been very helpful as members of some of the households in the sample expressed their

ignorance about information centre in their locality standing in front of a calendar advertisement. This points out that the creation of awareness about technologies at the grass root level is important for diffusion of technologies in rural areas.

VI. DEMAND FOR INFORMATION AND POTENTIAL ROLE OF TECHNOLOGIES IN RURAL AREAS

In the case of Kuppam i-community project and Akshaya project, efforts are going on at present to make use of information and communication technologies in a range of areas that affect the daily lives of people: agriculture, health and medicinal care, and education. These projects aim to provide farmers access to information about new and better agricultural practices, and information about agricultural markets, specifically agricultural prices. They also aim to provide information about educational and vocational opportunities, and information about health-care facilities. In July-August 2004, when the field study for this paper was carried out, the Kuppam i-community project was building a 'farming information system', 'tele-agriculture', and an 'expert system' for farmers. It proposes to create an electronic employment exchange and an electronic 'public grievance system'; through 'Yojanalu', a scheme of the Kuppam project that is already under implementation, people can submit online applications for various government programmes.[36] The Akshaya information centres in Malappuram propose to develop and provide information content on education, jobs, agriculture, health, and law. These centres will provide modules on spoken English, vocational training, personality development, career planning and accounting. [37]

The above-mentioned programmes are yet to be fully implemented in Kuppam and Malappuram. Therefore, it was not possible to ask members of the surveyed households how they benefited from the information content from some specific programme. Instead, the survey attempted to understand the demand for the information proposed to be provided by the above-mentioned programmes. The questions that were asked to the head of households to understand the nature of demand for information included the following. Are you aware of the prices of agricultural goods produced in your locality? What, in your opinion, are the major constraints to agricultural growth in your region?

[36]Discussions with officials of the Kuppam i-community project; See also <http://www.hp.com/e-inclusion/en/project/kuppam.pdf.> (accessed on 29-04-04).
[37] Department of Information Technology, Government of Kerala.

Are you or any of your family members searching for jobs? Do any of your family members have plans to pursue higher studies?

Demand for Information from Rural Households

As shown earlier, the dependence on agriculture for livelihoods is greater in Kuppam than in Malappuram. One, therefore, expects that the demand for and potential role of information on agriculture from the surveyed households are greater in Kuppam than in Malappuram. Evidence from field studies indicates that this is not the case.

First, 22.2 per cent of all surveyed households in Kuppam did not possess land (see Table 6). In 70 per cent of these landless households (or 15.6 per cent of all surveyed households), heads of households were agricultural labourers; given the meagre employment opportunities in agriculture, these households survived under distressful living conditions. In Kuppam, households of landless labourers did not have much to gain from information on better agricultural practices or agricultural prices for the simple reason that these households did not have land to cultivate crops, did not have agricultural crops to be sold in the market, and also did not have the bargaining power to convert an increase in agricultural prices into a corresponding increase in wages.

Information on better agricultural practices or agricultural prices did not have great usefulness to a large number of land-holding households as well in Kuppam. In Kuppam, 33.3 per cent of all surveyed households owned land that was not irrigated. Agricultural production in many of the land-holding households in the sample suffered from small size of land-holdings and absence of irrigational facilities; these households were not selling their agricultural produce in the market. In fact, the survey showed that households selling their agricultural produce in the market as a proportion of all surveyed households was 35.6 per cent in Kuppam.

According to 51.1 per cent of all households in the sample (or 65.7 per cent of all land-owning households in the sample) in Kuppam, the major constraint to agricultural growth was the absence of irrigational facilities. A substantial number of surveyed households in Kuppam (17.1 per cent of all land-owning households in the sample) noted that non-availability of credit is the major problem they faced with respect to agricultural growth. It is noteworthy that the there was only a single source of institutional credit in the surveyed villages in Kuppam -- a Grameen Bank under the management of a religious institution. Not any of the scheduled commercial banks or co-operative banks operated in the surveyed villages in Kuppam. Absence of adequate

physical infrastructure for marketing agricultural goods was another important problem faced by the sample of households in Kuppam. The head of one of the surveyed households, who is the owner of a six-acre agricultural plot and a High School English teacher by profession, pointed out that he was keen to adopt new agricultural practices and venture into cultivation of new crops, but he was concerned as to how he would be able to sell his agricultural products. Sharp fall in recent years in the prices of many of the agricultural commodities produced in the village, particularly tomatoes, is another issue of great concern to the cultivating households in Kuppam.

Given the persistence of fundamental constraints to agricultural growth as discussed above, there was only limited demand from the surveyed households in Kuppam for information on better agricultural practices or agricultural prices.

The demand for information on agriculture from the sample of households in Malappuram was high compared to the sample of households in Kuppam. In Malappuram, 46.7 per cent of all surveyed households were aware of the prices of agricultural goods produced in their village; the corresponding proportion in Kuppam was 28.9 per cent (see Table 6). Most of the surveyed households in Malappuram used to regularly keep track of the news about agriculture from newspapers, TV and radio. The fluctuations in the price of rubber, the major agricultural produce in the village in Malappuram, were a topic of every-day conversation in public places in the village. Many households in the sample in Malappuram were keen to know about better agricultural practices and venture into production of new crops like vanilla.

What are the reasons for the greater demand for information on agriculture from the sample of households in Malappuram than from the sample of households in Kuppam? First, unlike in the case of Kuppam, all households in the sample in Malappuram possessed some plot of land, which was more than 5 cents in the case of 97.8 per cent of the sample and was more than 10 cents in the case of 84.4 per cent of the sample. Most households in the surveyed village in Malappuram (as in the rest of Kerala) had a well dug up in their plot of land; and given the plentiful rainfall in the region, availability of water was not a major constraint to agricultural production in Malappuram. Even a household in possession of only 5 cents of homestead land could cultivate vegetables or some other agricultural crops. The major agricultural crops in the village in Malappuram -- rubber, coconut and arecanut –are high value-adding commercial crops. The surveyed households in Malappuram received credit from more than six different sources of institutional credit, including scheduled commercial banks and co-operative banks. In

respect of the physical infrastructure for marketing agricultural products, the sample of households in Malappuram was found to be far better placed than the sample of households in Kuppam. Agricultural workers in Malappuram, like agricultural workers in the rest of Kerala, have sufficient organizational strength to convert an increase in prices of agricultural crops to an increase in wages. Therefore, in Malappuram, even agricultural labourers who do not produce any agricultural crop to be sold in the market are still interested in knowing about agricultural prices.

The demand for information about employment opportunities and higher studies was significantly higher among the sample of households in Malappuram than among the sample of households in Kuppam. One or more household members were searching for jobs in 57.8 per cent of the surveyed households in Malappuram; the corresponding proportion in Kuppam was 26.7 per cent. Members in 35.6 per cent of the surveyed households were interested in pursuing higher studies in Malappuram compared to 6.7 per cent only in Kuppam (see Table 6).

One or more members in 26.7 per cent of all sample households in Malappuram were working in the Gulf countries (see Table 6). In comparison, a family member was working outside the village (but not outside the country) only in 4.4 per cent of the surveyed households in Kuppam. In Malappuram, 84.2 per cent of all persons above the age of seven in the surveyed households have used a telephone compared to 48.0 per cent in Kuppam (see Table 3). To the households in Malappuram, Internet offers a cheaper and much-needed means of communication with their dear ones in the Gulf.

Demand for Programmes in E-Governance

There is evidence for greater interaction between government and people among the surveyed households in Malappuram than among the surveyed households in Kuppam; therefore, measures for e-governance will produce greater benefits in Malappuram than in Kuppam. The proportion of surveyed households in which one or more household member has ever visited a government office is 93.3 per cent in Malappuram and 82.2 per cent in Kuppam. The proportion of surveyed households which have received loans from formal financial institutions is 73.3 per cent in Malappuram and 62.2 per cent in Kuppam (see Table 6).

Most of the proposed initiatives in E-governance are aimed at reducing the time and transaction costs involved in government-people interaction. Two points may be noted in this regard. Among the surveyed households in Kuppam and Malappuram,

respectively 62.3 per cent and 68.9 per cent answered that they did not face any difficulty – and made two or less trips to a government office per transaction – while interacting with government offices. An explanation for this relatively high degree of satisfaction in transactions with the government offices is that the opportunity cost of the time spent in transactions is likely to be low for people rural areas. Secondly, the surveyed households in Kuppam and Malappuram pointed out that their interaction with the government happens mostly at times when the government introduces new schemes or programmes like food for work. These suggests that the programmes for computerization of government to people interaction will have less demand in rural areas than in urban areas, and of course, the demand for these programmes are limited by the schemes and programmes that the government introduces.

The observed differences between Malappuram and Kuppam in the demand for and potential use of information are, as evident from the earlier paragraphs, related to the differences in socio-economic structures between the two locations – in turn, due to the differences between Kerala and Andhra Pradesh in bringing about positive transformation in the countryside (see section 3). The association between existing socio-economic status and demand for information is clear, also when we extend our analysis to the various land owning categories of sampled households in Malappuram and Kuppam. The proportion of households which were aware of agricultural prices, whose members were searching for jobs, and whose members were interested in pursuing higher studies are the highest in the highest land-holding category in Kuppam and Malappuram; it was in the same category of households that the proportion which have received loans from formal sources of credit was also the highest in Malappuram.

Landlessness among labouring households is a continuing feature in several parts of rural India; a relatively successful programme of land reforms was implemented only in two Indian States, Kerala and West Bengal. There has been a significant slow down in public investment in agriculture and rural infrastructure in India particularly during the period of economic reforms (after 1991) (Ramachandran and Swaminathan, 2003). There was also a decline in the volume of rural credit disbursed by banking institutions over this period of time (Ramachandran and Swaminathan, 2002). Landlessness, absence of irrigational facilities and institutional credit, and illiteracy are among the fundamental constraints to the freedoms of labouring women and men and to the growth of agricultural incomes in the Indian countryside. The evidence presented in the earlier paragraphs showed that these fundamental constraints also significantly affect the

demand for information and the usefulness of ICTs in rural areas. ICTs can play an extremely potent role in rural development; but only if the basic obstacles to rural prosperity are removed through radical changes – through land reforms, revitalisation of rural credit, and greater state intervention in rural infrastructure and primary education.

Table 6: *Some indicators on the potential role of information and communication technologies in development, surveyed households, Kuppam and Malappuram, 2004*

	Kuppam		Malappuram	
	number	% share of total	number	% share of total
Households which are landless	10	22.2	0	0.00
Households which are aware of the prices of agricultural goods they produce	13	28.9	21	46.7
Households in which one or more members are looking for a job in the organised sector	12	26.7	26	57.8
Households in which one or more members are looking for higher studies	3	6.7	16	35.6
Households in which one or more member is working in a foreign country	0	0.0	12	26.7
Households in which one or more members have visited a government office at least once	37	82.2	42	93.3
Households which have received some loans from formal sector	28	62.2	33	73.33
Total number of households	45	100.0	45	100.0

Source: Survey data, July-August 2004

VII. CONCLUSIONS

There is abundant optimism today about the potential impact of information and communication technologies in the development of rural areas. This optimism originates from the fact that ICTs are a revolutionary means for the transmission of information, and also from the belief that information is a key aid in the process of development. Information about prices, markets and opportunities will enhance incomes and empower the less-privileged and the rural population, so the argument goes. This paper attempted

to examine the validity of this argument. It is based on field studies of the Kuppam i-community project in Andhra Pradesh and Akshya project in Kerala. Kerala is much ahead of Andhra Pradesh in respect of indicators of social development, and this provides an interesting context to the study.

The study shows that the capabilities to use information and communication technologies are associated with the existing level of socio-economic development. The diffusion of ICTs is faster among literates than among illiterates; diffusion of ICTs is also faster, the greater the level of education and greater the level of assets. Compared to Kuppam, the diffusion of ICTs was more widespread in Malappuram, where ICTs were used by women in large numbers and also by the socially backward class of scheduled tribes. The Akshaya programme in Malappuram elicited greater public participation as it was implemented through local self-governments with support from social and political activists in the locality.

It is found that the capability to use information or the demand for information is also crucially dependent on the level of social and economic development already achieved. There is no doubt that information about better agricultural practices helps the expansion of rural incomes. Such information, however, will be irrelevant to landless agricultural labour households or to land-holding households who suffer from problems such as absence of irrigational facilities and institutional credit. There will be little demand for information about jobs and higher studies from the less-educated. The demand for information from the surveyed households was greater in Malappuram than in Kuppam, and this is seen to be associated with the better indicators of socio-economic development in Malappuram than in Kuppam. Among the surveyed households in Kuppam and Malappuram, the demand for information was greater, the larger the ownership of land-holdings.

The evidence presented in this paper has great implications for the developmental discourse in India and other developing countries. It shows that while ICTs offer great possibilities, they are no elixir of development. In fact, ICTs can offer little help as long as fundamental constraints to development – including unequal distribution of assets and illiteracy – persist. The current policy enthusiasm with information technology should in no way detract attention from the much needed policy interventions in income growth and distribution, including land reforms and public investment in health and basic education.

Another policy implication is that the focus in programs to introduce ICTs in rural areas should be not only on supply-related factors like physical infrastructure for ICTs, but also on creating demand for ICTs and for the information provided by ICTs.

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