ICTs For Agricultural Extension:
A Study in the Indian Himalayan Region

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ABSTRACT
This paper reports on the availability, use and information seeking behaviour of a farming community with specific reference to Information and Communication Technologies (ICTs). It fills a research gap by examining what people do with a medium when they have access to it, rather than looking at barriers surrounding the use of ICTs and digital divide issues arising due to differential access and capabilities. The study was conducted in a state in North India, and provides insights into intentions and factors surrounding the use of various media by farmers. It highlights the socio-cultural context within which information seeking and use occurs in rural India.

Keywords
Agriculture, farming community, ICT, information seeking behaviour, middle men.

1. INTRODUCTION
Agriculture is the key sector of the Indian economy. According to the IMF (2006), the sector contributes 18.6% to the national Gross Domestic Product (GDP). The sector’s contribution came down from 52.3% (1950-51) to 18.5% (2008-09). This shift has been attributed to the enhanced contribution of the service and industry sectors, which have grown at a rate of 9-10% per annum in recent years. On the other hand, the agriculture sector has shown a growth rate of only 2% (2006-09). Despite this sluggish growth, agriculture is crucial to the nation as 57% of the total workforce of the country is engaged in agriculture and allied activities.

Today, Indian agriculture is faced with the challenge of providing adequate and sustained livelihoods to over 103 million farm families spread across the country, under changing social, economic and environmental conditions (Chattopadyay, undated). Small scale farming is an important feature of Indian agriculture and it has been estimated that about 80% of the farmers belong to small and marginal categories with an average landholding of less than 1.4 ha. Small scale farming not only limits efficiency but also effectiveness due to the limited scope for capital and technological inputs.

As is true for most sectors, information is one of the key inputs in agriculture. In India, the task of providing agricultural information to farmers is primarily vested with the government agencies or the Public Extension System. A network of the Indian Council of Agricultural Research (ICAR) Institutes, State Agricultural Universities (SAU) and Krishi Vigyan Kendras (Farm Science Centres) spread across the country, is responsible for developing, refining and disseminating the latest technologies to farmers. In addition, extension activities are also carried out by state agriculture departments, private agri-business companies and NGOs. The Information needs of the farming community have been addressed by the public extension system through a two pronged strategy. Mass mediated
broadcasts supported by trained agricultural extension personnel at the field level form the backbone of the agricultural extension system in India. All India Radio (AIR) – the state controlled radio network - started broadcasts for farmers in the late 1950s. These programs cater to the day to day seasonal needs of the farming community and provide information on the latest agricultural technologies. They are broadcast for 60 to 100 minutes every day. Since 2004, AIR has also started broadcasting daily market rates and weather reports for farmers through 94 FM stations of AIR. In addition, non-formal educational programs known as “Farm School on Air” are also broadcast by AIR. Doordarshan (the state controlled television network) started telecasting agricultural programs (Krishi Darshan) for farmers on an experimental basis in 1966. At present, these programs are broadcast for half an hour on week days.

Mass mediated messages are, however, too general to be of much use and they usually serve only as a reminder for regular field operations. On the other hand, individual contact through field level staff is limited by logistics, resources, skills and sheer numbers. It has been estimated that there are roughly 110,000 extension workers to cater to the needs of farm families spread across 600,000 villages. Furthermore, the government run public extension system has a poor track record of reaching small and marginal farmers (Parikh, 2007). All these factors combine to result in an information deficit situation where about 60% of the farmers – usually the small and marginal – do not have access to a reliable source of agricultural information.

The National Commission on Farmers has noted that knowledge deficits constrain agricultural productivity in India. It added that the use of Information and Communication Technologies (ICTs) for agricultural extension is one way of addressing the information needs of farmers. In keeping with this view, the Working Group on Agricultural Extension constituted by the Planning Commission (Eleventh Five Year Plan), Government of India has recommended that there is a need to respond to emerging challenges to the sector by strengthening information dissemination to farmers through use of ICTs. With the help of ICTs, agricultural extension is expected to become more diversified, knowledge-intensive, and demand-driven, and thus more effective in meeting farmers’ information needs. (Zijp, 1994).

In a comprehensive review of ICTD projects in India and the use of ICTs in the agriculture sector, Chattopadyay (undated) estimates that there are over 200 ICT-enabled development interventions in various stages of implementation across the country. Most of these include some component related to agriculture. These projects provide broadly four kinds of services. The first category of ICT projects (e.g.; Bhoomi, Drishtee, etc.) provide information regarding government schemes and programs to rural people and they provide access points for retail products and services in rural India. (Bhatnagar et al., 2007; Hasson et al., 2003). In the case of the agriculture sector, these projects provide the latest data on land records, etc. The second group of projects is largely concerned with e-commerce and trading issues (e.g.; e-Choupal, Warana, etc.). In such cases, agricultural markets have been computerized and networked to provide commodity prices to farmers. The idea is to leverage ICTs to reduce transaction costs, thereby making agriculture more attractive to small growers (Bowonder et al., undated). The third category of projects (e.g.; Krishi Vigyan Kendras/Farm Science Centres at Baramati, Ahmednagar, etc.) provide off line static content on a package of practices, recommendations, locally relevant technologies, weather information, etc. through strong inter-institutional linkages (Dhawan, 2004). Lastly, projects like Shiksha, SEWA address capacity building issues of farmers, rural artisans, women and extension personnel (Chattopadyay, undated). The ICT tools used in these initiatives present an impressive list and include video conferencing, voice activated call centre facility, internet enabled PC based networking, voice and text messaging via mobile phones, internet based
crop specific digital video, and interactive community radio (Kokil, undated, Rajendran et al., 2004; Lal, 2007; Mittal, 2010)

Initially, ICT-enabled development projects in India started off with a telecentre or community information kiosk model (Village Knowledge Centres, e-Choupal). In all such cases, the farmers had access to agricultural information using a PC with an internet connection (Chattopadhyay, undated). For example; telecentres (e-Choupal) set up by the Indian Tobacco Company (ITC) have more than 4 million users across the country. Farmers use these centres to access commodity prices at local and global markets, information on new farming techniques, place orders for inputs (seeds, fertilizers, etc.) at prices lower than the local market. During the procurement season, ITC buys the crop directly from the farmers at a competitive price. The farmer usually gets on average, about a 2.5% higher price when compared to the government market. The key reasons behind the success of the e-Choupal initiative are; customization to suit local conditions and the agriculture sector, the leadership role played by e-Choupal operators, and the trust, transparency, equitable and tangible benefits that can be traced to the use of e-Choupal (and technology) covering all aspects of the agriculture supply chain (Bowonder et al., undated; Annamalai & Rao, 2003).

It was realised, however, that many telecentres registered less than optimal usage of “development” services leading to questions regarding their sustainability. In some cases, it was found that the usage of “development” services at these telecentres was less than 10% of the overall telecentre/kiosk usage (Veeraraghavan et al., 2006; Kiri and Menon, 2006; Kuriyan and Toyoma, 2007). In a comparative study on the availability and usefulness of agricultural information provided by public extension system vis-à-vis Rural Knowledge Centres (Soochna Kutir), Barala (2006) found that only 3% of farmers in the study area had visited these Centres. The study, conducted in Nainital district of Uttarakhand, India, revealed that time lag, high cost, low technological literacy and infrastructural problems were the major impediments to the use of Rural Knowledge Centres by farmers. Furthermore, the absence of linkages with other input agencies (seeds, fertilizers, pesticides) resulted in low applicability of the suggestions given by the Subject Matter Specialists (SMS). Other significant barriers to the use of telecentres by rural communities included, English language content, hardware non availability, poor network capacity, absence of a legal environment, and socio-cultural norms governing use of technology and public space. In some cases, it was also found that accessing information through an intermediary (usually the kiosk operator/owner) poses limitations. The telecentre owners usually provide other revenue generating services to augment their income and in such cases, there was very little initiative and encouragement by the intermediary to use the centres for development applications (Barala, 2006).

Studies on usage and impact of telecentres have led to a search for alternative models and tools. Expanding rural mobile markets and increasing ownership of mobile phones in rural areas led to mobile based initiatives (IFFCO Kisan Sanchar Limited, m-krishi, etc.). Faced with sustainability issues, some of the PC based initiatives were redesigned into mobile phone based systems (Warana project). In the state of Kerala, India, adoption of mobile phones by fishermen translated into direct economic benefits. Mobile phones helped in reducing price dispersion, elimination of waste, and adherence to one price, thereby benefiting both fishermen and traders (Jensen, 2007). On the other hand, in a study on usage of mobile phones for accessing agricultural information under the IFFCO-Airtel Kisan Card initiative, Sahota (2009) found that proactive usage of the service by the farmers was very low. None of the farmers had made a voice call or sent an SMS to the service providers to seek additional agricultural information. It was found that most of the farmers who had purchased the mobile phone as a part of the initiative were using it for social networking. Though the initiative also had provision for sending video clips or still photographs to the

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experts for seeking advice, it was found that the farmers were not able to use this feature due to their limited technological skills. Further, farmers (especially small landholders) felt that the advice was not practicable, as the inputs suggested by the experts were either not available in the local market or were too expensive. Hence, the impact of mobile phones on small enterprises, farmers, etc. is far from obvious and conclusive.

Most ICTD studies focus on access and use issues. An unspoken assumption in many of these initiatives/studies was that increased access leads to more information. This in turn is expected to result in development outcomes (UNDP, 2001; Yunus, 2006). Problems surrounding use and access are attributed to various barriers which have been extensively studied and categorised. Another set of ICTD studies have followed the “knowledge gap hypothesis” tradition. In such studies, the differential impact of ICTs has been studied under the broad umbrella of “digital divide”. It has been proposed that ICTs widen the pre-existing gap between different sections of the society due to differential access and capacity to use the technology. These studies mainly focussed on gender issues and use by different segments (usually economic) of the society. It had been concluded that the full value of the information could not be actualized by the “have not’s” due to an absence of other necessary preconditions. While that is often the case, the intent of the users often plays an important role in the purpose for which a medium/technology is used. The question of “what do people want to do with a medium when they have access?” has largely remained unaddressed and unanswered in ICTD studies.

2. **RESEARCH QUESTIONS**

   Against this backdrop, this study sought answers to the following questions:
   1. What is the agricultural information seeking behaviour of the farming community in the study area?
   2. What are the reasons for seeking agricultural information through certain sources/media by the farming community?

3. **OBJECTIVE**

   The locale of the study, Uttarakhand state, lies in the Indian Himalayan region and is characterised by low agricultural productivity but immense potential in the changing world trade scenario. Public extension services in the area are limited by harsh climatic conditions, dispersed habitation and high male migration. Hence, this study was conducted to examine the relevance of ICTs to the farming community and to explore ways of integrating ICTs with the existing public extension system.

4. **METHODOLOGY**

   The Indian Himalayan region extends over an area of 531,250 sq km, which is about 16% of India’s total geographical area. It comprises of the states of Uttarakhand and Himachal Pradesh besides parts of Jammu and Kashmir. The study was conducted in the state of Uttarakhand which is spread over an area of 55,845 square kms. The state has 13 districts - 11 in hilly regions and two in the plains region. About 90% of the villages in the state have a population of less than 500, indicating low population density and dispersed habitations, which are some of the major challenges to extension work in the region. The state has 15,828 villages spread over 13 districts. Six out of these 13 districts fall in Kumaon division and rest are in Garhwal division. Two hill districts from each division (Dehradun and Pauri Garhwal from Garhwal division and Almora and Nainital from Kumaon division) were selected for the study. As integration with the external economy may play an important role in the use of ICTs by the farming community, the divisions were divided into two zones; lower and middle hills. One district was selected from each zone in the division. Further, two villages from
each district were selected randomly to meet the objectives of the study. From each village, 15% households were selected for in-depth interviews.

Table 1: Sampling Plan of the Study

<table>
<thead>
<tr>
<th>S.No</th>
<th>Division</th>
<th>District</th>
<th>Village</th>
<th>Number of respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Kumaon</td>
<td>Nainital</td>
<td>Alchona</td>
<td>32</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td>Amritpur</td>
<td>22</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>Almora</td>
<td>Majheda Mafi</td>
<td>10</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td>Dongra</td>
<td>08</td>
</tr>
<tr>
<td>5</td>
<td>Garhwal</td>
<td></td>
<td>Haripur</td>
<td>11</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td>Korwa</td>
<td>07</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td>Pauri Garhwal</td>
<td>Kyarko</td>
<td>08</td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
<td>Nisni</td>
<td>34</td>
</tr>
</tbody>
</table>

**Total Number of Respondents** 132

In-depth interviews were conducted with 132 farmers in Amritpur and Alchona (Nainital District), Majheda Mafi and Dogra (Almora district), Haripur and Korwa (Dehradun district) and Nisni and Kyarko (Pauri Garhwal district) villages. Most of the farm land in the area, as in the rest of the country, is legally owned by men. However, as women often contribute more towards agriculture in some parts of the state due to heavy male migration, it was decided to include as many women as possible in the sample. Out of these 132 randomly selected respondents, 32 (24%) were women and the rest (76%) were men. Two types of schedules were developed for data collection. Both instruments were pretested in a village in Nainital district and modified to meet the study requirements. A closed ended questionnaire was used to collect data on human, natural, infrastructure and institutional resources in the village. Key informants were interviewed to collect this information. Individual farmers were interviewed using a questionnaire that had a mix of closed and open ended questions. Most of the items related to the demographic and socio-economic characteristics of the farmers were closed ended. On the other hand, items related to media usage, relationship and linkages with agricultural input agencies and information needs were open ended. Information was collected through face to face interviews by the research team.

5. **FINDINGS**

Agriculture is a major source of livelihood for more than three fourths of the population in Uttarakhand. Agriculture and allied activities contribute 27.8% (2001-02) to the state’s domestic product. This figure is much higher than the national figure of 18.7% and is mainly attributed to poorly developed manufacturing and services sectors in the state. Though the state has outperformed the national average in the yield of some major crops in recent years, this growth has mainly come from the Terai and plain regions of the state. However, a vast natural resource base and favourable climatic conditions present immense potential for increasing agricultural productivity in the rest of the state and for developing entrepreneurial activities based on flowers, fruits, vegetables and medicinal and aromatic plants. Wheat, rice, madua, maize are the major cereal crops. Farmers in the study area cultivate only two crops cycles in a year due to poorly developed irrigation facility and water scarcity.

An analysis of the age of the respondents indicates that only 25% belong to the middle age category (i.e. between 35 and 45 years of age). Due to increasing urbanization and decreasing income from agriculture, farm operations in the study area are carried out by people who have either retired from full time employment or are not able to find full time.
gainful employment outside the village due to low levels of education or lack of opportunities. The majority of respondents (39%) was above the age of 45 years and many of them were ex-army personnel. Further, only 9% of the respondents had no formal education. This is a reflection of the high literacy rate (72%) in the state, which is above the national average of 64.84%. It also indicates that use of ICTs in the state may not be constrained due to lack of formal education among the users, especially if there is adequate and appropriate content in the local language (Hindi/Kumaoni/Garhwali).

The sampled villages presented a wide diversity in terms of productivity, crops grown, accessibility to input agencies and market, scale of operations, etc. Farmers in Haripur village (Dehradun) were engaged in commercial agriculture due to assured water supply, fertile soil, proximity to market and urban centres and efforts of the Krishi Vigyan Kendra staff. Many of them had contract farming agreements with agribusiness firms for the production of Basmati Rice and sugarcane. On the other hand, farmers in Korwa village (Dehra Dun) and Nisni (Pauri Garhwal) were constrained by the lack of irrigation facilities, harsh terrain, damage to crops by wild animals, absence of input agencies and resultant low yields. Despite this wide variation, an overwhelming majority of the respondents (86%) in the study area were marginal farmers. This indicates a high degree of land fragmentation in the study area. In such cases, agriculture is a less lucrative livelihood option in the absence of crop diversification and value addition. Widespread land fragmentation plays a major role in low levels of agricultural productivity due to sub-optimal usage of inputs and resultant low overall returns.

Furthermore, 33% of the respondents in the study area had no assured source of irrigation water and were fully dependent upon rain water for irrigation. This was especially the case with villages in Almora and Pauri Garhwal districts where a lot of damage to crops had been reported due to erratic rainfall. Shrinking natural resource base and land fragmentation have been identified as two important challenges to Indian agriculture. The water resource base for an average farm holding has declined considerably during the last five decades due to inappropriate and unscientific use of water resources. Consequently, most of the future agricultural growth will have to come via yield enhancement through intensive but more appropriate and scientific use of natural resource and from rain fed areas like Uttarakhand hills (Sulaiman and van den Ban, 2000). These twin factors explain farmers’ (especially small holders) reluctance to seek agricultural information in villages with no irrigation facilities.

![Fig 1 Land Ownership Pattern](http://www.ejisdc.org)
All media owned by the respondents in the area were documented to understand the communication behaviour and media ownership pattern. A look at the media ownership pattern reveals that 80% of the households owned at least one prepaid mobile phone connection. Such large ownership was due to the wide network, competitive rates, prepaid and incoming call facility, mobility and less paperwork. However, none of the respondents were subscribers of IFFCO Airtel Kisan Card, which is operational in the area. They were also not aware of the scheme or any other mobile based agri-information service. It was also found that the respondents had not received agricultural information on their mobile phones (either as voice call or SMS) from input agencies, government departments, nearest KVK, etc. In the study area, mobile phones were primarily being used by the respondents for maintaining social networks (contacting relatives and friends) and for emergencies. This indicates that while mobile phones are increasingly available to lower income groups, they are being used to improved communication with family and friends (social use). Similar results have been obtained from studies in other developing countries (IICD, 2005: Molony, 2008).

Among the conventional mass media, television was found in most households (68%) and seems to have decisively edged out radio as the ubiquitous and popular medium in the rural areas. This shift can be attributed to the visual nature of the medium and diversified content that affords multiple gratifications. It was also found that television was mostly used for watching movies, soap opera, religious programs (i.e. entertainment) and news on a regular basis. Male farmers reported watching Krish Darshan “when they have time”. This confirms Toyama’s (2010) contention that “the sum total of television’s development impact comes nowhere near expectations and that it had not been consistently beneficial to national education or agriculture....Whatever television’s potential, society has failed to apply it consistently towards development on a large scale”.

Radio was owned by 38% of households, but was rarely used in the study area. Respondents felt that television provided all the content available on radio with the added advantage of visuals. Hence, it appears that the gratifications afforded by radio have been subsumed by television. This change, however, is ironic in the context of the present study as radio was instrumental in heralding the Green Revolution in India and some high yielding varieties of rice popular at that time were referred to as “radio rice” by farmers. Ownership of newspapers was limited to 24% of households due to their high cost. But men often reported reading newspapers at the village grocery store or tea shop. Fixed line phones were confined to 12% of households due to lack of infrastructure, the nature of billing and extensive paperwork. Computers with internet connection were available in 1.5% households. This is mainly due to technological, cost and infrastructural limitations. This indicates that an internet based system for providing agricultural information would be feasible only under an effective institutional structure and arrangement that facilitates communal usage through intermediaries.
Farmers in the study area received agricultural information from a wide range of sources and channels. These include district and block level agriculture/horticulture offices, *Krishi Vigyan Kendras* (Farm Science Centres), daily local language new papers, agri portals, television, friends and relatives, helpline, farmers’ cooperatives, radio, private input agencies and dealers and mobile phones. People often relied on more than one source/channel for information. Among these, most farmers (62%) approached private input dealers (seed and pesticide suppliers)/middlemen (*adti*) for information. This heavy dependence on middlemen is due to the absence or inaccessibility of formal institutions to farmers. In rural areas, middlemen (*adti*)/input dealers not only provide credit at times of need, all inputs required in the farm (seeds, fertilizers, pesticides) and but also a ready market to the farmers. As a result, the *adti/private* input dealers and the farmers often have a reciprocal arrangement in the absence of other institutions in rural and remote areas.

Despite several constraints, a sizeable percentage of farmers (48%) reported getting information from government agencies (district agriculture and horticulture departments). Government agencies were also ranked as highly reliable due to technical know-how and lack of personal agenda. Friends and relatives were also important and reliable sources of information, especially in remote villages. However, it was observed that only 2% of the respondents reported using TV for seeking agricultural information despite high ownership and regular broadcast of agriculture programs.

**Fig 2: Media Ownership Pattern**
It was observed that information seeking behaviour and sources/channels used by the farmers followed a distinct pattern. Farmers made no effort to seek new agricultural information in villages where agriculture was constrained by structural and environmental factors (Kyar and Korwa). In these villages, farmers followed a traditional cropping pattern and relied on information passed on by their peers or elders (local interpersonal channels). The uncertain nature of the enterprise discouraged them from seeking and using the latest know-how and constant attempts were made to find alternative sources of employment. These villages also witnessed very little presence of public extension agencies and their activities were limited in scope and number. In these villages, input dealers/middlemen (aditi) were the main source of agricultural information.

On the other hand, in villages where agriculture was profitable either due to favourable structural and geographical conditions (Haripur and Amritpur) or crop diversification (Alchona and Nisni), farmers were proactive in seeking up-to-date and diverse kinds of information. In these villages, farmers reported seeking information on new varieties, pest control measures, market prices and extension activities and mostly sold their produce through cooperative societies or middlemen. It was also observed that public extension agencies were active in these villages and conducted regular outreach programs and supplied inputs to the farmers. In villages that mainly produced horticultural crops (Nisni, Dogra and Alchona), it was noticed that the farmers used mobile phones for post-sale inquiry rather than negotiating sale prices before completing the transaction.

6. DISCUSSION

Media ownership patterns in the study area indicated a wide range and high availability of mobile phones and television. Farmers have distinct reasons for using different media. Mobile phones are primarily used for fulfilling social needs (contacting friends and relatives). Television is mostly used for entertainment (pleasure) and escape (after a hard day’s work). Use of television for fulfilling cognitive needs is occasional (news programs) or rare.
(agriculture programs). It was also observed that needs fulfilled by a certain medium in the past are now being met by a new medium which affords additional gratifications due to advances in the technology. This is one of the reasons for a change in media ownership and usage patterns (for example: radio to television in rural areas). Print medium mainly fulfilled cognitive needs but it was confined to men due to its high cost and the norms surrounding the use of public space where it was mostly available.

Farmers in the study area have access to a wide range of sources/media for seeking agricultural information. These range from interpersonal sources (friends and elders) to new ICTs (mobile phones). Despite wide ownership, some media like television or mobile phones were rarely used for this purpose. Access to ICTs (in this case mobile phone) and the ability to use them does not alter the relationship between the producers and sellers in the rural context. Farmers are often forced to accept the price quoted by the middlemen due to the perishable nature of the produce, a lack of storage facilities, the inaccessibility of markets and other institutions. Also, in the study area, the middlemen are major creditors for smallholder farmers in the absence of rural financial institutions. Similar observations were made by Molony (2008) in Tanzanian context.

Trust and the interrelated nature of informal institutions in rural areas play an important role in determining the choice and use of sources/media. Most of the farmers in the study area seek agricultural information from middlemen, who also acts as input and credit suppliers. In most cases, the middle man happens to be a person known to the farmer personally and is therefore, seen as trustworthy. He usually belongs to the same area or village or has a relative in the village and the farmer may sell his produce to conform to village norms or maintain good relationship. Hence, the middlemen (aditi) fulfil cognitive, social and integrative needs (multiple gratifications) of farmers besides being their creditor, buyer of produce and supplier of seeds, fertilizers and pesticides.

Despite their poor track record, the trust implicit in face to face interactions and the government machinery results in frequent use and reliance on the public extension system for seeking agricultural information. While friends and relatives are ranked high on trust, farmers do not always prefer to seek information from them (especially when faced with a new problem) as they are not able to give new information (i.e. fulfil cognitive needs) due to the similarity in their socio-personal attributes.

The study also indicates that an information deficit does not necessarily lead to information seeking behaviour. It depends on the returns derived from the activity itself (in this case agriculture) and the value that information can add to that enterprise. Agriculture in India is limited by several factors like infrastructure, credit, inputs, market, etc. and information is just one of the many inputs that a farmer needs in order to make it a profitable activity. Most of the ICTD initiatives address only the information needs of the farmers. As a result, farmers are not able to leverage new/ additional information and transform it into tangible benefits (increased income or enhanced productivity). This limitation of ICT initiatives is also highlighted by successful cases like e-Choupal which address the entire agricultural supply chain.

7. CONCLUSIONS
Information is one of the key inputs in agriculture and information deficits constrain agricultural productivity in India. This paper discussed the agricultural information seeking behaviour of farmers in the state of Uttarakhand, India. It tried to explain the reasons behind use of certain media – including ICTs - by the farmers over other available sources. It was observed that, though farmers have access to a wide range of media/sources, they mostly relied on middlemen, and local and official sources for agricultural information. Among new ICTs, mobile phones were widely available in the study area but were mostly being used for
post sale inquiry rather than price negotiation, accessing markets or price information or increasing production efficiency. In the rural Indian context, the availability of ICTs does alter the reciprocal relationship between the seller (farmer) and the buyer (middlemen). In the absence of formal and effective institutions, the middleman is also the supplier of seeds, fertilizers, pesticides and credit to the farmers and this skewed relation limits the advantage that can be derived from use of ICTs.

While this study indicates that the possible advantages from use of ICTs in rural areas are offset by an absence of other input agencies, interventions in other parts of the country indicate that the entire agricultural supply chain can be made more efficient by use of ICTs. Hence, rather than negating the possible benefits that can be derived from the use of ICTs in agriculture sector, this study points to issues that need to be addressed simultaneously.

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8. REFERENCES