INFORMATION AND COMMUNICATION TECHNOLOGIES IN AGRICULTURE: STUDY OF A NON-STATE INITIATIVE IN THE DECCAN REGION

Synopsis

of

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CERTIFICATE

This is to certify that the thesis entitled **"Information and Communication Technologies in Agriculture: Study of a Non-state Initiative in the Deccan Region"** submitted by **Mr. Naveen Kumar Cheripelly** bearing Regd. No **09SSPH05** in partial fulfillment of the requirements for the award of Doctor of Philosophy in **Sociology** is a bonafide work carried out by him under my supervision and guidance which is a plagiarism free thesis.

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DECLARATION

I **Naveen Kumar Cheripelly** hereby declare that this thesis entitled: **"*Information and Communication Technologies in Agriculture: Study of a Non-state initiative in the Deccan Region",*** submitted by me under the guidance and supervision of **Dr. C. Raghava Reddy** is a bonafide research work which is also free from plagiarism. I also declare that it has not been submitted previously in part or in full to this university or any other university or institution for the award of any degree or diploma. I hereby agree that my thesis can be deposited in Shodganga/INFLIBNET

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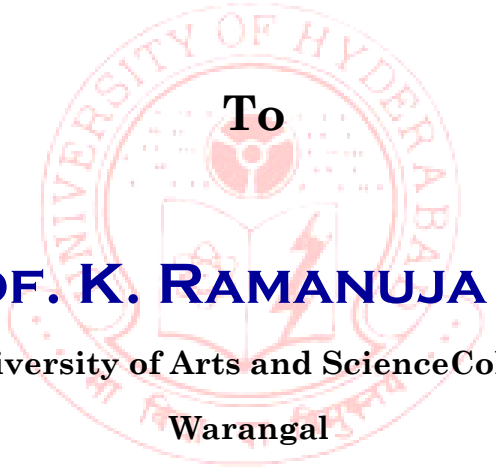

To

Prof. K. Ramanuja Rao

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But by the grace of God I am what I am

Abbreviations

A.O: Agricultural Officer

ATMA: Agricultural Technology Management Agency

ACABC: Agriclinics and Agribusiness Centers Scheme

ANGRAU: Andhra Pradesh State Agricultural University

ATIC: Agriculture Technology Information Centres

DoA: Department of Agriculture

DAC: Department of Agriculture and Cooperation

DAATTC: District Agricultural Advisory Transfer of Technology

D.A.O: District Agricultural Officer

ICT: Information communication Technology

ICAR: Indian Council for Agricultural Research,

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IFFCO: Indian Farmers Fertilizer Cooperative Limited

KVK: Krishi Vigyan Kendra

FFS: Farmer Field School,

FBO: Farmer-Based Organization

FGD: Focused Group Discussions

SHG: Self-help Group

SAU: State Agricultural University

SG: State Government

MANAGE: National Institute for Management of Agricultural Extension

NABARD: National Bank for agricultural and Rural Development

NTI: National Training Institute

NGO: Non-Governmental Organization

NARES: National Agricultural Research and Extension Systems

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Chapter -1

Introduction

Introduction

One of the important characteristics of the developing societies is the rural and subsistence agrarian economy. Agriculture has been an integral part of the traditional culture in Asia, including India, where farming was a self-contained system (Chaudhuri 1992). About two-thirds of India's total population continue to live in more than half a million of its villages. Agriculture has been the source of livelihood for millions of people in the country and continues to remain a major sector of the Indian economy, although the share of agriculture in GDP declined steadily from 55 percent in 1950- 51 to 15 percent in 2009-10 (IRDR 2012-13). Although the share of agriculture in the total national income declined from 50 percent in 1950 to 18 percent in 2007- 08 more than 60 percent of the workforce is still engaged in agriculture. Even today the growth of other sectors and overall economy of the country depends on the performance of agriculture. Because of these reasons, agriculture continues to be the dominant sector in the Indian economy (Amarnath and Prasad 2009).

Watson's Longman Modern Dictionary (1976) defines agriculture as the 'systematic and controlled use of nature to improve the human condition'. The term agriculture at a broader level refers to crop production, livestock and animal husbandry, dairying, fisheries, agricultural extension and transfer of technology, credit and cooperation, and agricultural marketing. It would be more meaningful to view agriculture not just as farming alone, but as a holistic value chain, which includes farming, wholesaling, warehousing, processing, and retailing (Govt. of India, State of Indian Agriculture 2011-12). Sociologists and anthropologists view agriculture as involving not merely of technological arrangements, but also a set of social arrangements (Jodhka 2012a).

For centuries agriculture is a way of life, a tradition which has shaped the culture and the economic life of the people of India (Jodhka 2000). Agriculture is the center of rural social life and economic activity. It provides employment for a majority of the people living in rural areas. 'Agriculture has been the anchor for achieving socioeconomic

growth, it is perhaps more important as governing a way of life and forms of organization and patterns of value. Indian rural life is completely identified with agriculture and activities that supported by agriculture where it is embedded in the iniquitous caste system' (Vasavi 2012). The institutional framework of agricultural production determines how and by whom land is cultivated, what kinds of crops can be produced and for what purpose, and in what way or on what terms the agrarian sector is linked to the rest of the economy. The social structure of agriculture is linked to the larger political and economic dynamics as agriculture is influenced by the state policies like credit, market price of the product and availability of capital, irrigation etc.

Agriculture in India

Jodhka (2014a) observes that Indian villages vary significantly in size and in their social fabric. Their character is determined more by regional agrarian histories and the local trajectories of social, economic and ecological processes. India's agriculture has long been associated with diversity that resulted from a combination of a wide variety of agro-ecological zones and a plurality of cultures. Ludden (1985) notes that 'each agriculture zone has its own style of life because farming routines and material conditions dominate the human experience'. There are varied and identifiable regional agricultural complexes in which each region has its own cultivation patterns, knowledge systems associated with them, socioeconomic relations and political structures.

The government policies regarding agriculture have influenced the social organization of agriculture. Many policies in land reforms, irrigation, cooperative credit societies, abolition of intermediaries, infrastructure facilities, etc., initiated by the state have influenced the village social structure. Since 1970s, Indian economy has undergone fundamental shifts in the economic and social relationships between the agriculture and industry, and within agriculture itself. Politically, it has shifted from development policy towards a neo-liberal form of economic regulation and has become integrated into the global economy. The rural has become both, a site for populist palliatives, a target for mass marketing of consumer goods and the villages have become the site of global interaction (Bauman 1998). In turn, rural populations constituted an important 'home

market' for industrial production, and villages are slowly becoming or linking themselves with the globalization through the means of new technology, seeds etc. Understanding the prevailing structures of agrarian relations and working out ways and means of transforming them were recognized as important priorities (Jodhka 2000).

Modernization of Agriculture

The traditional institutions like the village and caste began to change, initially during the colonial period under western influence, and later with the process of development and democratization. The development literature suggests that if a high proportion of the net domestic product is dependent on agriculture and if a large proportion of its labour force is employed on farms, then the country is considered as underdeveloped (Gupta 2012). Sein and Harindranath (2004) observe that under developed countries do not have the ability to break out of traditional and outdated modes of production, because they lack knowledge or resources to do so. To become developed, they need to emulate developed nations who have utilized technology. Modernization theorists claim that traditional (developing) societies can be transformed into modern (developed) societies by changing the forces and relations of production as well as 'by transforming and remolding archaic social structures that resist technological change in these societies' (Kumbamu 2009).

After independence high priority was given to agricultural development as agricultural surplus would drive growth of other sectors in the country. Nehru considered agriculture as a solid foundation on which nation could be built by increasing production and surpluses for further growth (Nehru 1946). For this reason, the agricultural sector was central to development in the post-independence era. Application of scientific knowledge in agriculture gained prominence for the reason that immediately after Indian independence the economy was to depend on agriculture for considerable period. The first task of the government was to raise agricultural productivity through the application of scientific knowledge (Gupta 2012). The ideology of modernization has been a powerful tool to bring systemic changes in society. Claimed to be development oriented modernization tries to install new ideas and outlooks. Thus the state of India undertook

massive changes in agriculture under the ideological framework of modernization of Indian agriculture.

After independence, India faced a serious food grain shortage not just due to regular droughts, but because of the fact that population growth outpaced food production. Need of the hour for the state was to increase agricultural production to save the country from gravest crises it faced after independence. The agenda for the state was to achieve food grain self-sufficiency and food security. It embarked on the new agricultural strategy known as green revolution. Green revolution consists of the use of improved seeds, modern farm machinery such as tractors, harvesters, threshers, etc., chemical fertilizers and pesticides in an optimal combination with assured irrigation (Stratan *et al*. 2013).

During 1960's a number of changes took place in the agricultural sector. Expansion of irrigation, infrastructure, spread of new technology through extension, additions to rural infrastructure works like roads, market yards and warehouses were witnessed as part of modernization of Indian agriculture (Rao and Jeromi 2000). These changes in the physical features of agriculture necessitated changes in the institutional structures like new credit institutions, extension agencies, regulated markets, control of moneylenders. Chuanqi (2012) call these wide ranging changes as modernization of agriculture. Thus the green revolution model is seen beyond, as a form of agricultural practice, to be a means of modernity and social mobility. Green revolution in all its phases in India represents a case of the 'gardening posture' of modernity (Bauman 2001).

Till 1960's, the methods of farming were largely traditional, the farming communities were involved in the whole process of agriculture like seed conservation, breeding and selection, etc. The first phase of green revolution from 1967 to 1980 known for imported seeds, chemical fertilizers, irrigation, received significant state support in the form of capital, establishment of farmer training centers, subsidies for fertilizers, seeds and technology, and a remunerative price regime (Vyas 2004). Analyzing the role of state in the modernization of Indian agriculture Baku and Dholakia (1992) highlight two levels of state intervention in promoting agriculture. They are (a) direct intervention in the market mechanism through price support and procurement policy and (b) subsidization of major

agricultural inputs. The state has also been instrumental in encouraging the adoption of high yielding varieties which hastened the process of modernization. Jodhka (2014b) notes that the success of green revolution technology during the 1960s and 1970s, though confined only to some pockets of India, was an important turning point in the development history of modern India. Byres (1981) observes that before the introduction of green revolution agriculture was based on indigenous knowledge where farmers used to grow crops with traditional knowledge. But the green revolution turned agriculture into 'knowledge based farming', as the new technology demands appropriate knowledge levels to achieve high productivity and efficiency. There have been drastic changes in the practice of agriculture since then concentrating mostly on productivity through new agricultural technology.

Indian agriculture and globalization

The second phase of green revolution in the post 1990's, promoted by the corporate organizations led to greater integration of rural India with the global economy. Corporate companies by showing the images of bountiful crops, miraculous technologies, easy credit, new seeds, new crops and new cultivation techniques through hoardings, television advertisements lured the marginal and small farmers from the semi-arid and dry regions into input intensive agriculture (Vasavi 2012). In the post 1990s the role of the state has become minimal in agriculture. Patronage of agriculture of the state has declined and after liberalization farmers interests have been replaced by the interests of agriculture corporate companies.

Aggarwal (1971) points out that while the first phase of the green revolution focused only on farmers who had access to resources (land, capital and irrigation) the second phase of green revolution witnessed the spread of commercial agriculture to the marginal and small cultivators. Scott (1998) observes that during the second phase of green revolution even dry and semi-arid regions began to adopt improved seeds. Media has been playing a crucial role in this spread of green revolution by laying emphasis on bounty yields and prosperity through commercial agriculture. The important point here is that while the state's role declined to that of facilitator, the role of corporate companies and private

players became critical in agriculture. In the market led agriculture, farmer has been reduced to a consumer rather than a citizen. As a result, marginal and small farmers are forced to negotiate with the market to gain the benefits of commercial agriculture.

Lele *et al*. (2010) is of the view that commercial agriculture needs up-to-date information, strong and effective communication channels to make agriculture sustainable. The role of agricultural communication has expanded to include aspects of mobilization of farmers through transformation of attitudes and values in tune with knowledge. During the second phase of green revolution knowledge became central to agricultural production. Although the green revolution expanded into new regions and to newer sections of farmers, knowledge dissemination did not take place accordingly. This discrepancy in knowledge is termed as knowledge gap. The existence of this gap does not mean that the lower sections of farmers remain completely uninformed or even absolutely worse off in knowledge, but rather they become relatively lower in knowledge and hence the gap widens (Tichenor *et al.* 1970).

Agriculture in the post reform phase

Jodhka (2012b), who made pioneering contributions to the sociological discourse on the green revolution, observes that due to commercialization of agriculture, farmers with limited resources face greater risk, while large farmers have benefitted the most. Commercialization enabled large farmers to reinforce their dominance in the villages. Gaiha (1987) notes that the richer peasants often get a better price due to greater scale of economies in marketing, especially when high yielding varieties increase output and greater ability to hold grain off the market until prices improve.

Growing commercial and specialized nature of agriculture demands quick and technically sound advice, based on scientific analysis with appropriate marketing information. However, the agricultural extension system which is supposed to play an important role in disseminating agricultural information to all sections of farmers proved to be ineffective in providing latest and timely information. The conventional agricultural extension system largely focuses on the progressive farmers who have enough capital to

invest in new technologies. Progressive farmers are considered as those who are ready to accept the innovations quickly and active agents of social change and development in the countryside (Parayil 2002). Often research stations concentrate on developing innovations which benefit large farmers, and researchers also consider feedback from these farmers only (Mbithi 1972). Mencher (1978) contends that the state policies aimed at progressive farmers continue to ignore the needs and requirements of marginal farmers, thus leading to exclusion, exploitation, oppression and discrimination of small and marginal farmers.

Rao and Jeromi (2000) argue that after 1990's Indian state opened agriculture to global markets paving way for globalization of agriculture. Theoretically, globalization of the economic sector means its total integration with the rest of the world without any control or restrictions. Globalization encompasses both free imports and exports (total outward orientation) and the convergence of domestic prices with the international prices (Krishna and Kapila 2009) . The objectives of globalization are to improve the efficiency of resources and orient production based on the comparative advantage of the country. However, such promising position in India and other third world countries never happened.

Gulati (1998) observes that in the Indian context, globalization led to freeing of agricultural exports and imports. He argues that the process of globalization favors private investments and reduces restrictions for imports and exports. Till late eighties Indian agricultural sector was relatively closed as the export orientation was confined to only some commercial crops like spices, tea, coffee, etc. and imports were largely restricted. However, in the post globalization era, the degree of export orientation increased considerably with the removal of some of the restrictions and control on the export of agricultural commodities as well.

It is argued that the benefits of globalization in agriculture accrue only in some areas which are well endowed in terms of resources, to some crops which have comparative advantage in production and to some sections of the population who produce agricultural commodities for export. Other areas, crops and farmers are unlikely to be benefited from

the globalization process. In other words, the benefits of globalization process may not be neutral to areas, crops and people. Further, as globalization may raise the prices of some of the essential commodities, it will have adverse welfare consequences for the people who are not engaged in the agricultural sector (Gulati *et al*. 1994).

Social organization of agriculture

Agrarian social structure in India is based on caste system. Beteille (1974) argues that caste hierarchy is one of the most crucial features of India's agrarian social system which makes lower caste subordinate to upper caste. In general, agrarian societies are composed of two groups. One, which controls the land and constitute the immediate sources of economic power and engaged in agriculture and the other constituted by wage labourers. The most important basis of inequality in Indian society is distribution of land. The caste system remains the key social structure that largely determines the rights, access to land and resources centering around agricultural production, especially the control and use of land. It is the primary basis on which economic and political sources, institutions and networks are made available to and accessed by people.

Harris (2006) observes that caste still persists as a fundamental principle of social organization. Caste is not merely an arrangement of groups which are ranked high and low, it is also a system of values in which the idea of hierarchy occupies a pivotal position. Social inequality is present in one form or another in all complex societies, but the Indian caste system is different from others for the degree of its rigidity, visibility and legitimacy. Caste generally represents a distinct ethnic group with its own history, tradition, and identifications, and each caste lives in more or less separate quarters of the village where each caste forms a separate little community (Lewis 1965).

The upper castes have been the landowners and agriculture has been their primary occupation. The middle-ranked (backward) castes are comprised of castes engaged in farming and artisanship. The lowest-ranked (scheduled) castes have been agricultural labourers and also who performed the menial tasks. The land holding castes belonging to the upper strata have been economically dominant and command power in the village social structure (Ambedkar 1948). Ambedkar (1948) observes that the untouchables who

belong to the lower strata of social hierarchy have been exploited and oppressed by the upper castes. They were neither allowed to acquire wealth in the form of land or cattle, nor allowed to practice agriculture. The majority of the untouchables in the village were landless laborers or bonded laborers. This is one of the important factors that perpetuated unequal access to land. Singh (1993) views that the jajmani and feudalist characteristics of Indian agriculture allowed exploitation of landless laborers while the profits were usurped by the landlords. Untouchables have a weak political and economic strength which makes them depend on the upper caste for their needs.

System of hereditary obligations and occupational duties associated with jajmani relations was used by dominant upper castes to perpetuate and legitimize the feudalistic relations (Beidelman 1959). Jodhka (2012a) views that Hindu caste system, which formed the basis of social divisions, as the prototype of a hierarchical system. Nehru described 'the caste system and much that goes with it' as 'wholly incompatible, reactionary, restrictive, and acts as a barrier to progress (Nehru 1946).

The impact of caste on Indian economic performance has also been the subject of a long debate. Panini (1998) predicts that in the long term, economic liberalization would dissolve caste-based distinctions and destroy the 'true life of the caste system'. Supporting this argument White (2003a) emphasizes that economic liberalization and modernity would dissolve the caste. In contrast Dumont (1998) argues that caste did not disappear with the process of economic and political change, but its logic has been altered. Even after many reforms and development activities still caste remains an important element in accessing different resources and thus agrarian structure has remained same (Vakulabharanam 2010).

Historical evidence on green revolution suggests that agricultural technologies are not scale neutral. The size of land holding plays a crucial role in agriculture even today. During the 1960s and 1970s great debate took place on the relationship between farm size and agricultural productivity in India. It was argued that the net benefits of agriculture would decline at the small holdings with the adoption of modern technology. The studies by Hanumantha Rao (1966) and Saini (1971) report the inverse relationship between farm

size and productivity. Foster and Rosenzweig (2010) using plot level panel data (between 1999-2008) of the Rural Economic Development Survey (REDS) data of the National Centre for Agricultural Economics and Policy Research (NCAER), report that small-scale farming is inefficient in India.

Globally, there are about 525 million farms out of which about 85 percent are small holdings of less than two hectares. Out of this 87 percent of small holding farms are located in Asia, followed by Africa (8 percent). The rest 5 percent small holdings are located in Europe and America. China stands first in terms of concentration of small holdings followed by India, Indonesia, Bangladesh and Vietnam. Between 1970-71 and 2005-06, the total number of operational holdings in India increased from 71.01 million to 128.89 million, whereas the average farm size reduced from 2.28 ha to 1.21 ha. In the same period, the share of small and marginal holdings in the total operated area has doubled. Small holders now cultivate only 42 percent of operated land area, but constitute to about 83 percent of the total land holdings (Chand *et al*. 2011).

Rao and Jeromi (2000) observe that 96 percent of land holdings are marginal, small and semi-medium. More importantly, two-thirds of land are owned by medium and large farmers. Professor Dantwala (1986) drawing attention to the skewed distribution of land holdings in India observes that the small and marginal holdings are predominant in numbers while large part of the land is in the hands of medium and large farmers. It is important to mention that a large majority of the marginal and small land holdings belong to the farmers from the lower strata of the caste system.

Communication and agriculture

The role of communication in agriculture has been realized world over during the expansion of agriculture. Agricultural extension in India emerged during 1945 -50. Information was identified as the missing link in the development chain (Melkote 1991). It was realized that the major developmental programmes would not reach their targets without adequate and planned communication inputs (Rao 1992). It is argued that communication can help farmers to raise their aspirations and motivations, obtain access

to information and knowledge, and learn what 'know-how' is necessary for the adoption of technology. Communication plays a key role in facilitating the participation of people relating to sustainable development. The communication channel that carries a new idea is important in determining an individual's decision to adopt or reject it (Rogers 1976). The mobilization of mass audience through its social organization at the local level depends heavily on communication. The information rich (innovators) and the information poor (laggards) often tend to grow apart as one consequence of communication activities *(ibid).* This is not to suggest that communication, it is political, but the structural forces may operate in such a way that communication reaches in a skewed manner.

McNamara (1973) argues that generally only a few privileged farmers access new technology. In particular, those farmers who are above the category of marginal, small and medium land holdings enjoy a higher social, economic and educational status, and tend to have more communication opportunities. It may also be stated that the rural social structure impedes small and marginal farmers' access to information. Hence, the extension literature suggests that all modern agricultural technologies seldom reach small and marginal farmers in the initial phase of their launch.

Background to the study

The discourse on agricultural policy has changed substantially in the last six decades. It is suggested that while the plight of tenant farmers dominated the policy landscape immediately after independence the difficulties facing small and marginal farmers seem to be dominating the post 1990's scenario (Jodhka 2012a). Agriculture, carried out by small land holders, face continuous problems regarding technological and non-technological issues.

Ever since people have grown crops and raised livestock, they have sought information from one another. Even though there are many advances in production technologies, particularly with relation to inputs such as seeds, fertilizers, pesticides, etc. small and marginal farmers couldn't improve their net earnings. The main reason attributed is the

inadequate agricultural information. It is believed that in the absence of adequate information the marginal and small farmers are not guided properly regarding the use of inputs such as seeds, fertilizers and pesticides and subsequently face tremendous loss of crops and low yields. In the first phase of the green revolution, the state provided safety nets for production, whereas after 1991, in the post-liberalization period, the role of the state has declined as the state policies paved way for the entry of private players, both national and multinational, into the agricultural sector (Revathi and Murthy 2005). Today the agricultural practices are promoted by market forces and multi-national companies. As a result, modern agricultural agenda has led to a 'Taylorisation of agriculture'. It supports the erosion of the local practices of agriculture and agrarian culture and promotes state and agribusiness directed agendas, making farmers dependent on the market (Vasavi 2012).

Farmers' aspiration for upward mobility and the need to raise their income levels may be considered as another factor for pushing farmers to adopt new agricultural technologies, new crops without adequate knowledge. As a result, the intensity of risk is increasing inversely with the extent of land holding. In other words, the extent of risk is more for the marginal and small farmers when compared to the semi-medium and large farmers. However, modern agricultural changes that have taken place over a period has generated a new sense of individualization in the village society. In the absence of viable economic opportunities and social support structures, village society has been witnessing a new sense of anxiety, a kind of 'ontological insecurity' (Jodhka 2014a). It is also argued that the disintegration of caste and hierarchical social order has also weakened the sense of collective identity significantly and led to the transformation from collective to individualized agriculture thus leading to anomalies (Rizov 2005). In traditional agriculture, collective decision making at the community level prevented risks to a greater extent.

Watts and Bassett (1985) argue that macro level analyses of agriculture pay inadequate attention to the problems of small and marginal farmers. Raj *et al*. (2004) argue that in case of India, modern agricultural technologies were not accessible to a majority of

Indian farmers. State led public extension services played a critical role in providing information, opportunity of increasing the access of farmers to new technologies during the initial phases of the green revolution. The agricultural extension performed the task of dissemination of new technologies and also advocated for better utilization of resources (Chnag 2009). An FAO (Food, Agriculture Organization) survey of agricultural extension services in 1988-1989, conducted at 207 institutions across 113 countries reveals that during the 1970s and 80s the state agricultural extension agencies played a dominant role in disseminating agricultural information. It reports that by 1990s the scenario has changed with the spread of neo-liberalist paradigm across countries which influenced the state's approach to agriculture. Globalization induced privatization directed the state's withdrawal from direct service provision in areas where competitive markets exist. Applied to the agricultural sector this ideology influenced the nature of agricultural information communication leading to the withdrawal of state from agricultural extension (Dina *et al*. 1994).

The National Sample Survey (NSSO 2005) study reports that at the all-India level, only 40 percent of farm households have access to one or more sources of agricultural information. Among the sixteen different sources of information on modern technology, about 16.7 percent of the farmers reported to have got their information on a daily basis from progressive farmers in their villages. Other sources were input dealers (13.1%), radio (13.0%) and television (9.3%). State extension agencies were reported to be accessed by only 5.7 percent respondents of the survey. The survey also highlights that small farmers relied primarily on progressive farmers and input dealers, whereas medium and large farmers relied on radio, TV, and newspapers. Information dissemination through agricultural extension workers for medium and large farmers was almost double that of smallholder farmers (Adhiguru *et al*. 2009).

It is believed that linkages between farmers, extension agents and research systems are weak and thus agricultural research does not reflect farmers' priorities. There is also a lack of an effective mechanism to transfer innovations from research to the extension system because communication strategies are not effective (Aker 2011). In his

conclusion, Aker (2011) suggests that the growth of ICTs in developing countries offers new opportunities for accessing information.

Statement of the problem

Indian villages function on the principle of caste hierarchy which represents a particular type of inequality. Mencher (1978) argues that the low caste people, who are part of the agrarian economy, always accepted their position as agricultural laborers. Moon (1989) suggests that the agrarian social structure driven by a caste system did not allow Dalit's and other marginalized sections to acquire assets such as land and cattle. However, Vasavi (2012) contends that, over a period, due to various reasons, Dalit's and marginalized sections of society acquired land and entered into agriculture. Substantiating the transformation of agricultural laborers into farmers, Gupta (2012) observes that electoral pressures have always pushed political parties towards land distribution to Dalits in return for their votes. Also, the two major reforms, abolition of zamindari system and land reforms have increased the number of small and marginal farmers. The status of agricultural labourer has changed to farmers as they are now engaged in agriculture. Planning commission (2006) report suggests that about 80 percent of the land holdings are small and marginal and most of these farmers belong to Dalits and other marginalized castes.

Gupta (2012) contends that over a period traditional farming transformed into knowledge intensive modern farming. Increasing number of small and marginal farmers and the spread of knowledge intensive modern farming placed new demands on the ways of disseminating agricultural information. Need for personalized, interactive communication system to address farmer's specific problems arose. Also that farmers, particularly marginal and small farmers, who have newly entered into agricultural sector lack knowledge about new agricultural practices and are unaware about making 'choices' (Vasavi 2012).

At the same time, on the other hand, there is a visible decrease in the state expenditure on agricultural extension services. In the post-liberalization era the role of the state has

become minimal in providing agricultural information (Bhalla 1995 and Vyas 2004). In the absence of state agricultural extension, many reports suggest that, the input dealers have emerged as the key source of agricultural information. This in turn led to inefficient, inappropriate and disproportionate input use, making agriculture more risky for farmers. In the absence of state agricultural extension services, private agencies engaged in agricultural inputs taken up extension services more as a means to increase their market presence rather than providing extension services.

In this context, Information and Communication Technologies (ICTs) have emerged as an important means of agricultural information communication dissemination (Jones 1997). ICTs are believed to play an important role in bridging the information gap by providing two way communication. It is considered that ICTs disseminate knowledge to farmers to make choices and reduce the information asymmetry, which exists between farmers and agricultural scientists. It is also claimed that ICT based agricultural information can act as catalyst to enable better adoption of improved technologies, seed varieties, and farming practices even at small, marginal farm holdings (Mittal and Tripathi 2009). Computer mediated communication has been described as a different state of communication, which 'may change the psychology and sociology of the communication process itself…(creating) new linguistic entity with its own vocabulary, syntax and pragmatics' (Rice and Love 1987).

However, given the peculiarities of Indian agrarian social structure marked by caste hierarchy and caste based land ownership (high castes owning large land holdings and vice versa), increasing number of marginal and small holdings coupled with the absence of state in agricultural extension the important concern is about the extent to which the ICT based extension services deliver equitable services and provide access to farmers irrespective of caste and land status. Critical understanding of the design, use and the context of ICTs is agricultural extension is essential as to know the extent to which the ICTs enable the choices for the farming community. These concerns assume greater importance when the ICT based agricultural extension services are provided by the non-state actors.

Objectives of the study

Modernization of agriculture and increase in marginal and small land holdings on one hand, and changes in information technologies and withdrawal of state support to agriculture on the other hand have been the hallmark of the contemporary agricultural scenario in the country. In this context, information has become more critical in the practice of agriculture. Knowledge as a product for sale has begun to revolutionize both public and private extension organizations and thus technology transfer has become a business (Rivera 2000; Buttel 1991). In this context, dissemination of agricultural information through private extension services has been thought of as the way out to fulfill information needs of farmers. However, commercial orientation of private agricultural services appears to be leading to the commodification of agricultural extension (Buttel 1991).

It is widely claimed that while the developed countries have been using the advanced communication technology effectively, the developing and the underdeveloped countries are still lagging behind in making optimum use in addressing local problems. Stressing upon on the need for closing the knowledge-information gap the advocates of ICTs in agricultural communication emphasize that ICTs can help reduce the gap by accelerating the information flow. It is assumed that information is primarily a commodity, rather than a gift or something to be shared communally.

Senapathy *et al.* (2009) emphasizes that ICTs would have a major role to play in promoting sustainable agriculture and rural development. Lyon (1998) notes that it is important for social scientists not to promote ICT developments uncritically, but to subject them to critical analysis to help citizens exercise their power and responsibility to influence the pattern of developments. He also argues that the nature of the information society will largely reflect whatever the dominant sections in society believe the information society should be. It is believed that ICTs will reinforce existing inequalities and create new inequalities.

Moving beyond the rhetoric that eulogizes the ICT's role in agricultural information communication sociological understanding of the making of such technologies in terms of their design, purpose, actors involved becomes necessary. It is important to study how social factors shape and design the technological developments. The assertion that social factors determine how the advances of technology are used is relevant to the present thesis because it is important to understand the forces which operate the flow of information through networks like the internet, and mobile phones etc. and content of the information (Castells 2001 and Urry 2000).

In this context the study aims at understanding how ICTs are operationalized in agricultural information communication. The study also aims at examining the location of ICTs in agricultural information communication in the contemporary agricultural scenario and makes an attempt at a sociological understanding of ICTs by raising such questions as do ICTs help overcoming the old agrarian structural hierarchies? Do they benefit the marginal and small farmers to enable them to cope with the demands of modern agriculture? Can the ICTs be claimed as alternative modes of information dissemination for conventional agricultural extension? The study aims at understanding the social dynamics in the operationalization of ICTs in agricultural information communication. It problematizes ICT based agricultural information communication by engaging with the agency that is marked by the presence of a large number of small and marginal farmers belonging to the lower strata of society to decipher the social and structural aspects of non-state ICT initiatives in agricultural communication. The study also makes an attempt to understand whether ICTs provides new opportunities to overcome the old hierarchies in agricultural extension. It attempts at analyzing the varying nature of participation and reception of choices offered and content of ICT based agricultural communication with farmers belonging to different social categories. In other words, locating the argument in the notion of 'democratization of technology' the study critically examines whether ICT based agricultural extension offers choices for the small and marginal farmers to benefit. The study also concentrates on the issues of access, equity and control in the delivery of ICT based agricultural communication.

Methodology

To decipher the issues raised, the field site where the ICT based agricultural communication initiative has been grounded for the last ten years was selected. At the same time to explain change and impact of ICT based agricultural communication initiative a field site where conventional agricultural extension services have been functioning was selected as a benchmark. Thus the study was conducted in two field sites, one each from the states of Telangana and Maharashtra (Vidarbha region). Karimnagar district from Telangana and Parbhani district of Maharashtra were selected for the study. Data were collected from three villages (Asola, Nandgaon bk, and Malsonna) in Parbhani District and two villages (Jubillenagar and Chenjarla) in Karimnagar district. In Parbhani district the ICT initiative has been offering agricultural extension services to the farmers whereas in Karimnagar district the source of agricultural extension services is the state led services.

The study adopted a multi stage sampling method to identify the field sites for data collection. In the first stage an effort was made to identify the districts in Maharashtra, where a robust non-state ICT initiative has been functioning since a decade. At the next level Parbhani district was selected as it is where an ICT initiative has been functioning successfully. On other hand Karimnagar district in Telangana was selected as it presents greater similarities in terms of agro-climatic conditions with that of Parbhani and both the districts are part of the Deccan region. Karimnagar was selected because of its varied social background of farmers and heterogeneous cropping pattern.

After identifying Parbhani district as one of the field sites for the study, at the next level a list of all those villages where ICT based agricultural extension programmes are functioning actively in the district was generated. From the list, three villages were selected for data collection. The selection of the three villages was based on purposive sampling strategy. Three villages were selected in consultation with the officials of state extension and the private extension organizations. Similarly, two villages in Karimnagar

were selected. After the identification of villages, respondents were selected on the basis of their socioeconomic background and their years of engagement with agriculture. Thus, respondents belong to different social categories and those who have more than ten years of experience in agriculture.

Data were collected using semi - structured questionnaire which included data on the details of the household, education, annual income, land holding, caste, agricultural information sources, use of pesticides, etc. Data were collected from 120 households in Parbhani district spread across three villages and 99 households from Karimnagar district belonging to two villages. In addition to this, information related to the research was collected through discussions with agricultural officers, DAATT (District Agriculture Advisory and Transfer of Technology) center officials. Focused group discussions were used to collect data from farmers across the spectrum of small/ marginal, medium farmers. Observation at the i-krishi[1] centre in the village, transactions at the procurement site, and farmers' gatherings in the village yielded rich data. The study relied heavily on empirical Data. Qualitative and quantitative methods were used in collecting and analyzing the data. In depth interviews and interactions with respondents constituted the core of the study methodology.

Selection of study villages

The villages selected in Karimnagar district of Telangana are Chenjarla and Jubillenagar. These villages are located 20 km away from the district headquarter town Karimnagar. A majority of the land holdings in these villages are small and marginal. The process of modernization in agriculture is taking place rapidly in these villages. The major irrigation source of Jubillenagar is canal irrigation whereas Chenjarla is highly dependent on bore wells and rainfall. The rationale behind selecting these villages is that these two villages represent the character of the Deccan region in terms of crops grown, nature of irrigation facilities, land distribution and the social organization of agriculture. These villages are covered by the state extension services. In case of Chenjarla there are 120 households out

[1] Pseudonym used by the researcher for the private organization that is providing ICT based agricultural extension services.

of which the 100 are backward class (belongs to backward castes) households and only twenty belong to Dalits (scheduled castes). Cotton, paddy and maize are the important crops cultivated in the village. In Jubillenagar Dalits are dominant. There are 150 households in the village out of which 75 belong to Dalits, 72 belong to backward classes and 3 belong to other caste. The Gram Panchayat is the place where farmers meet regularly. Sreram Sagar canal, the main irrigation source of the village, passes through the village agricultural lands. Paddy and cotton are the two important crops cultivated in this village. In this village majority (64%) of the farmers are young below 45 years of age. Indira Kranti Patham is the important market mechanism that operates in the both the villages. It is important to note that the majority of the agricultural land is held by backward classes. The details of socio-economic profile and land distribution are discussed in the Sixth chapter.

In the case of Parbhani district, a major non-state ICT initiative has been operating since a decade effectively. Three villages namely Asola, Nandgaon bk, and Malsonna are selected for the study. These villages are located within a radius of 30 km from the district headquarter. The major reason behind selecting these villages is that a majority of the farmers from in these villages is utilizing the private ICT based agricultural extension services. In Asola there are 160 households belonging Nomadic Tribe whereas Nandhgav (120 households) and Malsonna (100 households) are dominated by the Maratha caste. The major irrigation source of Asola village is canal irrigation while the major irrigation sources of Nandhgav and Malsonna are bore wells and canal. The size of land holdings is medium, semi -medium, small and marginal. The major crops grown here are soya bean, cotton, sugar cane, wheat, tur, jowar etc.

Justification of the study

The contemporary agricultural sector is passing through many transformations, particularly in the area of agricultural extension services. Over the past few decades the government curtailed its direct involvement in agricultural extension. There has also been a move to privatize and decentralize the extension services. Present day farmers are paying for agricultural information services which were provided at free-of-cost in the

past through conventional extension organizations. Modern agriculture has been demanding effective and appropriate information for sustainable agriculture and for increasing output. In this context the role of agricultural extension has become more critical. During pre-1990s, agricultural extension was carried out by the government agencies but after liberalization of agriculture, government agricultural extension services started shrinking. As a consequence, many ICT based agricultural extension initiatives have emerged as an alternative to public agricultural extension services. Most of them are location specific, isolated and are confined to a small area, initiated and operated by other than agricultural department with or without profit motive.

The study is expected to contribute to the advancement of knowledge in the area of Science. Technology and Society studies as it attempts at understanding the social conditioning of ICT initiatives in agricultural extension. This study attempts at a social constructivist understanding of the design and implementation of ICTs in agricultural extension. The outcome of the study would help formulating the policies in agricultural extension of state for the benefit of marginal and small farmers.

Plan of thesis

Introduction chapter discusses about the nature of agriculture, status of Indian agriculture and it deliberates on the role of caste in Indian agrarian social relations. This chapter also makes an attempt to look at the process of modernization of agriculture and the growing importance of communication in agriculture. Placing emphasis on the changes after liberalization of Indian economy this chapter discusses how the Indian agricultural sector is coping with the challenges of globalization. This chapter also presents the statement of the problem, research questions, objectives of the study and the methodology adopted in the study.

The Second chapter makes an attempt at understanding technology from the Sociology of Science and Technology perspective. It discusses different sociological perspectives on Science, Technology and Society relationship. It makes an effort to locate ICTs in the contemporary context, the growing importance of information and communication and

presents a sociological perspective on the social embeddedness of communication technologies. Based on this framework, the next Chapter locates the discussion on the issues of sociological concern with relation to technologies in general in an attempt to figure out agricultural technologies and ICTs in agricultural extension in the Third World countries context. Presenting the critical understanding of technology, it highlights the limitations of applications of technologies in agricultural communication.

The fourth chapter reviews the different state and non-state agricultural extension initiatives, both conventional and ICT based, functioning in India. It makes an effort to understand the shift and changes that have taken place in the agricultural extension system over the years. This chapter traces the reasons for the gaps that exist in conventional agricultural extension. This chapter emphasizes on the need for a review of the traditional agricultural extension services in the light of fast paced changes in agriculture. On this ground the study makes an attempt to understand one of the non-state initiatives operated in the Deccan region. Fifth chapter discusses the functioning of i-krishi and the processes involved in the delivery of extension services using ICTs. It further delineates the background to the emergence of i-krishi, and the reasons for the failure of local agricultural extension services of both state and community based.

The Sixth chapter, which is based on empirical observation and findings of both the field sites, analyses data and makes comparative observations about the socioeconomic profile of the respondents and major findings. This chapter concentrates on understanding how the ICTs is used by farmers belonging to different social groups. It makes an attempt to answer the broader research questions and objectives of the study. The Seventh chapter draws important observations based on the findings of the study. It places the findings of the study in the popular discourse on technology and society relationship.

Chapter -2

Review of Literature

Introduction

In the third world countries farming has been both a way of living and a means of livelihood for the mainstream population. For a typical peasant, agriculture is a way of life and a sense of identity and it connects him/her to the community and past generations. Being an agriculturally predominant society more than two-third of India's total population continues to live in more than half a million of its villages. The caste hierarchy is one of the most crucial features of India's rural social system, as hierarchical principal plays an important part in the social organization of cultivation and use of land (Beteille 1974). Sociologists view that agriculture requires a detailed knowledge as it is not just about the technological arrangement or manipulation, but also about of social organization of production. Thus, social science researchers bring caste into the centre of discourse on agriculture and it has been subjected to more rigorous analysis to understand the nature and form of agrarian social structure (Jodhaka 2012; Vasavi 2010).

Traditionally, caste and village called out to each other in synergy. Caste is not merely an arrangement of groups which ranked high and low it is a system of values in which the idea of hierarchy occupies a pivotal position (Jodhaka 2012). For Ambedkar (1948) village is a site of oppression where the institution of caste presented itself in its most brutal and inhuman form. The village life is marked by experiences of exclusion, exploitation and untouchability. Untouchables (Dalits) are exploited and oppressed by the upper castes. Unequal distribution of land and wealth is the basic feature of agrarian economy, which is manifested in caste relation as well (Kannabiran 2009). Caste is an important element used by the dominant castes as they used the system of hereditary obligations and occupational duties to perpetuate and legitimize the feudalistic and exploitative relations. Village as a reflection of caste relation is much criticized for its hierarchic and undemocratic practices. In caste terms, the rural power revolved around the landowning dominant castes (Srinivas 1995). Those who used the framework of class

argued that it was the rich landowners and money lenders who controlled the rural economy (Thorner 1956).

Table 2.1: All India distribution of operational holdings 1970-2010

Year	No. of holdings ('000)	Area ('000 ha)	Average size (in ha.)	Distribution of land holdings (%)				
				Marginal	Small	Semi-medium	Medium	Large
1970–71	71,011	162,178	2.28	51.0	18.9	15.0	11.2	3.9
1980–81	88,883	163,797	1.84	56.4	18.1	14.0	9.1	2.4
1990–91	106,638	165,507	1.55	59.4	18.8	13.1	7.1	1.6
2000–01	119,931	159,435	1.32	62.9	18.9	11.7	5.5	1.0
2005–06	129,222	158,323	1.22	64.8	18.5	10.9	4.9	0.8
2010–11	137,757	159,181	1.15	67.0	17.9	10.0	4.3	0.7

Source: All India Report on Number and area of Operational Holdings, Agriculture Census, 2010-11. Ministry of Agriculture, 2012.

In India over a period the number of marginal land holdings has increased considerably while semi-medium, medium and large land holdings have decreased. Average size of land holdings in 2010-11 in the country is 1.15 hectares, which was 2.28 hectares in 1970-71 (see Table 2.1). It may be inferred from Table 2.1 that the number of operational land holdings has increased from 71,011 in 1970-71 to 137,757 in 2010-11. The area cultivated by small and marginal land holders has doubled over a period while the area cultivated by semi-medium, medium and large landholders has decreased. A gradual decrease in the size of the agricultural holdings is attributed to the fragmentation of holdings as the land is the only wealth available with rural population to bequeath to their children.

Technology and society

Contemporary society may be described as a knowledge society based on the extensive penetration of all its spheres of life and institutions of scientific and technological knowledge. Technology has been seen as the most prominent source of instant solutions. Technological change has been a primary driver and the generator of long-term growth and structural changes (Saith and Vijayabaskar 2008). Technology has been around since the beginning of humankind and it is part of culture and social change. Technology is not just the technical means people use to improve their surroundings, but also the knowledge

of using tools and machines to do tasks efficiently. A historical understanding of the relation between science, technology and society were probably first made by the British lawyer and thinker Francis Bacon in 1527 in his book 'The New Atlantis'.

Technology has been regarded as one of the main causes of social change. Social change has been largely affected by the developments made by science and technology during the past century. Science and technology were a driving force in the transition from traditional to modern societies and they are central in explaining the great socioeconomic transformations. Technology has been viewed as an important tool in the advancement of the production process (Kumar 2005). There are three main sociological paradigms (functional, conflict and symbolic interaction) which explain social change from different perspectives (Cleeff 2006).

Technologies involve networks, skills and knowledge. It is a set of tools and techniques and means for accomplishing recognized purposes (Merrill 1976). Technology is a means of transforming, storing and distributing knowledge and practices (Heidegger 1997). Technology refers to the systematic set of practices through which radical interventions help in negotiating the nature (physical, biological and human) to place the future at our disposal (Simpson 1999). Technology per se does not solve social problems, but the availability and use of technologies are a pre-requisite for economic and social development (Dagron and Tufte 2006). Adoption of technology depends upon the setting, design and the type of technology available in the society. Technology design is often based on the designer's way of knowing and being in the world (Oudshoorn *et al.* 2004)

The dynamics between the technology and society is described by the social scientists in terms of technological determinism, according to which changes in society are attributed to technological changes. The technological deterministic approach looks at technology as an independent factor that causes changes in the social, economic, political and cultural aspects of human society. Technological deterministic accounts consider technology as the driving force of society, as an independent factor outside of society that has linear effects on social systems (Mesthane 1972). According to UNDP (2001)

‘technology is not inherently good or bad, the outcome depends on how it is used’. The general perception is that new technologies are developed or existing technologies are upgraded to enhance efficiency in the field of agriculture or industrial production. The motto of all technological improvements is economic efficiency. However, the consequences of scientific and technological advancement pervade all areas of life.

Technological determinists view technology as the prime mover in history of mankind. According to technological determinists technical developments are the prime causes of social change and patterns of social organization (Chand 1999). The influence of technology in the contemporary society is much widely noticed and seems qualitatively different from that of past societies. It is viewed that technology is an important determinant of changes and development of society and institutions (Thomas *et al.* 2003). Kleinman and Klein (2002) suggest for looking at structural forces that determine the course of technological development.

Science, Technology and Society (STS) studies, analyzes technological entities in relation to their social context. One of the most central theoretical assumptions of STS is that technology is socially shaped. Technologies are socially shaped and at the same time society is shaped by technology. Thus, these are not seen as separate structures, but as deeply interwoven. Technological change is conditioned by the social factors and technological designs and functions are the outcomes of social processes rather than of internal standards of scientific- technological rationality (Thomas *et al.* 2003). STS scholars emphasize that users, regulators and others also affect the design and operation of technologies and the way in which technologies are interpreted and used. Pinch and Bijker (1987) suggest interpretive flexibility, which means that technologies can be interpreted, used in different ways and social contexts shape technological advancements.

Modern society places greater emphasis on technology for it being used as a catalyst for change and for the functioning of modern institutions. In modern society, technology has become integral part of the working of social institutions viz. Government, economy and education. Most of the collective actions have become thoroughly mediated and shaped by modern technologies, which function as co-actors. Technology is often analyzed as a

mere catalyst of institutional, cultural and epistemological change, or as a means through which institutions, cultural forms and knowledge structures are realized. Technology is not usually recognized as an institution itself. It is neither seen as a separate regulative framework such as capitalism, government, nor the family, but rather as one of the means through which these frameworks operate (David 1998).

Modernity and technology are seen as coalescing agents for the reason that modernity entails usage of advanced technological applications for progress and technologies further modernity. Habermas analyzes modernity as an 'unfinished project'. He theorizes modernity into two phases, i.e., early and later phase. Early modernity witnessed the rise of the 'bourgeois public sphere', which mediate between the state and the public sphere. In late modernity, the state and private corporations took over vital functions of the public sphere, as a result of which the public sphere became a sphere of domination (Habermas 1989).

In Heidegger's critique of modernity, technology encloses and turns the world into standing reserves. Technology is not defined as material process or as a mode of action, but as a particular mode of thinking. Technology has often identified with technology or formal rationality, which is a mode of thinking that characterizes not only modern technology but also modern thought and economic and social processes (Heidegger 1997). According to Heidegger (1997) the idea of society as a network of social relations is false, because society is made up of sociotechnical networks, consisting of interlinked arrangements both human and non-human actors.

Edge and Williams (1996) provides a conceptual framework for the creation of new technology with a model of interaction between scientific and technical factors on one side, and economic, social, and political factors on the other. They introduce new concepts regarding technology, i.e., 'symptomatic technology' which suggests that society demands strongly for suitable technology and that technology is a symptom of social change.

Mackenzie and Wajcman (1999) point out that the challenge for sociology is not so much to deny the weight of technology, but rather to develop analytic categories that allow us to capture the complex imbrications of technology and society. New technologies from a sociological perspective require avoiding a purely technological interpretation and recognizing the embeddedness and the variable outcomes of these technologies for different social orders (Sassen 2002). They can indeed be constitutive of new social dynamics, but they can also be derivative or merely reproduce older conditions. The contemporary dominant mode of analysis in Social Studies of Science and Technology (SSST) deals with the interactive and reciprocal relations of science and technology rather than science and technology as socially isolated phenomena. The interactive approach claims that technology and society mutually influence each other. It criticizes the theory of technological determinism of society which conceptualizes technology and its development as a force that is independent of society (Latour 2004; Law 1991). Though there are different approaches to technology the SSST approach established that the form and content of technology are important, and are amenable to social analysis. Central to SSST is the concept that there are 'choices' (though not necessarily conscious choices) inherent in both the design of individual artifacts and systems (Edge and Williams 1996).

Lian (2007) defines technology as part of a social system and technology is the product of human activity. He argues that technology is not a 'material aspect' rather it is a 'non-material' aspect. The 'non-material' aspect suggests that the word 'technology' refers to concepts and not just things. Sociological perspective highlights the 'vacuum' of which technology is created, as it emphasizes on our understanding of 'technological determinism'. Green (2001) contends that 'social determinism' of technology opens different windows and approaches. He also suggests that society is responsible for the development and deployment of particular technologies. From sociological perspective, technology is seen as relationship to power and privilege and it is not 'neutral' at all. Mackenzie and Wajcman (1999) argue that a technology is only neutral so far as no one knows what the technology is used for. However, technology is not a physical object to be neutral. As soon as knowledge of what the technology was used for and/or how it

worked or developed it would be a 'subject' on how social actors are able to implicate patterns of privilege and exclusion. The Social Constriction of Technology (SCOT) approach pioneered by Pinch and Bijker (1987) argue that relevant social groups, play an important role in the development and dissemination of an artifact. These groups can be formal, like existing institutions or organizations, or they can be informal groups whose bond are the result of some common aspect of the artifact's existence.

Importance of language

Kuhn (1962) in his famous book, 'The structure of scientific revolution' argues that there is no one continuous scientific tradition, but a succession of different traditions, each with its own basic assumptions and standards of truth, its own 'paradigms'. Technology is often referred to the language, signs and modes of knowledge. Language and reality are co-constitutive of each other and they represent organizational units and their values. Habermas (1984) proposes language as the medium of communication that allows us to relate human individuation and inter-human socialization specifically and systematically. According to Habermas, common languages provide us with sufficient complexity for carrying these functions. Habermas assumes that common language is a given. Natural languages provide the mediation between nature and culture, while cultural communication is rooted in community life. Common language is then considered as the integrating operator of the social system. Language is assumed to have a complex inner structure that allows us to communicate and to regulate our communications both internally at the level of the social system and as individuals. Rasmussen (1990) observes that Habermas's strategy is to retrieve the project of modernity through a highly specialized form of the philosophy of language. His project is to show that language as communicative discourse is emancipatory and his task is to rehabilitate the project of modernity by reconstructing the theory of communication, i.e., communicative action, communicative reason.

Language is a medium of communication, but communication is a broader concept and 'communicative action designates a type of interaction that is coordinated through speech acts and does not coincide with them' (Bolton 2005). Communicative action is individual

action designed to promote common understanding in a group and to promote cooperation, as opposed to strategic action designed simply to achieve one's personal goals (Habermas 1984). Habermas attempts to understand society from the vantage point of the language suggesting that 'society is to be explained by referring to the structures of discourse' (Taylor 1991). Whorf (1956), an influential linguist, maintains that language is not only a method of voicing ideas, but is a very important force in shaping them. Language has a determining influence on thought and behavior. Production is determined at once within a web of relations-technical, social, ecological, cultural, and academics.

Language and communication are integrally embedded in power in an existing social system where they serve the interests of domination (Kellner 1995). The social systems are maintained by the instrumental action exerted upon the external surroundings, as well as by specially regulated stereotyped communicative action with respect to the internal surroundings. The theory of communicative action (Habermas 1984), situates social communication within a top-down hierarchy of goals and resources in the context of social norms and cultural values.

Importance of communication

The word communication is derived from the Latin word 'communis'. It is a process of exchange of facts, ideas, opinions and is a means that individuals share meaning and understanding with one another. Communication is the transfer of information and a process involving sorting, selecting and sending symbols and creation of meaning to the listener (Tewari 1997). The scope of communication is very wide and comprehensive. It is a two way process involving both transmission as well as reception. It is a continuous process of exchange of facts, ideas, feelings, attitudes, opinions, figures, and interactions with others. As a social process, it preserves knowledge and passes to the next generation. Habermas (1984) discusses four broad social processes that require communication: reaching understanding, coordinating action, building relationships (socialization), and strategically influencing others.

Communication has two broad categories, one-way and two-way communication. The most common form of communication is one way communication, which includes the broadcasting media like radio, television, print and film, often called as traditional communication (Chafee and Metzger 2001). The new forms of communication are video, text, teletext, cable television, electronic text. Referring to the twenty-first century Castells (1996) observes that it is marked with information which became central to the social interaction and social networking. He emphasizes on two way communication systems where citizens can interact and share the ideas and views. The internet is one of the chief components of a two-way communication process. It is a well-known fact that communication is an important factor in the process of development and it influences the behavior, beliefs and culture of the agency. The issue of access to information and knowledge has always been of importance, especially in the discourse of power. The powerful always have used information and knowledge generated by the joint experience of all societal members to maintain their social hegemony.

Anthony Giddens (1985) observes that modern societies have been information societies from inception. He notes that the societies which are formed into nation-states rapidly turned into information societies laying emphasis on gathering, storage and control of information about population and resources for their operation. Giddens (1990) argues that in modern societies information is mediated by the specialists, and individuals routinely use such information, interpret and act in everyday life. In the light of advances in technology related to information and communication, the information processing is done in a technological paradigm. Castells observes that it is not merely a technological paradigm, but a socio-technical paradigm. World Information Report (1998) defines an information society is one in which information is used intensively as an aspect of economic, social, cultural and political life.

The information society is believed to have originated from changes in the primary sector (i.e., agricultural, forestry and mining) and in the secondary sector (i.e., manufacturing and industry) which later on rapid spread to the tertiary sector (i.e. Service sector). Information as such attained special significance as it is viewed as one of the fundamental

and vital resources for development. The UNDP report (2001) observes that information and communication technology is an important tool for economic development as it conditions power, knowledge and creativity. It is argued that information which is systematically organized, collected and arranged can be retrieved easily and can be made use of rural development. Information technologies serve as the great multiplier in development that could spread the required knowledge and attitudes, more quickly and widely than ever before. An agricultural extension it is being recognized that ICTs has a bigger role to play.

Information and communication technologies

The invention of the computer is one of the pivotal events in the history of human civilization. In the early 1960s computer technology began to have enormous influence on science, mathematics, engineering, business, and commerce. But today's computer technology reaches far beyond the limited scope of early years. Presently it touches virtually every field of human activity (Robertson 1998). The development and proliferation of electronically communicated information have accelerated economic and social change across all areas of human activity worldwide. Internet, considered as new media, is making possible of instantaneous communication across vast distance.

The industrial revolution which was powered by the steam engine, invented in 1712 and electricity harnessed in 1831, had revolutionized production (Zhou 2004). The digital revolution driven by information communication technology and the 'harnessing of light for instantaneous communication' is said to be revolutionizing all aspects of society today (David 1998). The computer and the internet assumed to be the epoch-defining technologies that determine radically new socioeconomic opportunities for individuals and institutions (Gunkel 2003)

Toffler (1994) places knowledge at the centre of the information society that is emerging. Lyotard (1984) highlights that knowledge has become the principal force of production over the last few decades and that knowledge would be transformed into a commodity. Lyotard also suggests that post-industrial society makes knowledge accessible to the

layman because knowledge and information technologies would diffuse into society and break up grand narratives of centralized structures and groups. Bell (1973) observes that the advances in the last two decades of the 20th century in the communication field pushed modern societies in the communication/information age.

Castells (2000) notes that 'we have entered an information age' (or equivalently, a post industrial age) in which economy is largely based on information and not on an exchange of goods. The recent developments in information technology open up tremendous opportunities for human development. As a result, some social theorists have begun to speak about the network society, a new kind of social system that has neither national borders nor centers. Network society is a new kind of social system which neither has national borders nor centers. However, Castells (2000) argues that the idea of society as a network of social relations is false, because society is made up of social, technical networks, consisting of arrangements of linked human and non-human actors. For Castells (1996), the network society is the result of 'informationalism', a new technological paradigm. The process of 'informatization of society' is one in which greater amounts of knowledge and information is incorporated into goods and services.

Fundamental to the growth of the information society is the rise of knowledge industries that produce and distribute information, rather than goods and services (Machlup 1962). Fuchs (2008) defines 'network society' as a social formation with social and media networks, enabling the prime mode of organization at all levels (individual, groups/ organizational and societal). Increasingly, these networks link all units, say, individual or groups/organizations. World Bank (2006b) defines an innovation system as 'a network of organizations focused on bringing new products, new processes, and new forms of organization into social and economic use, together with the institutions and policies that affect their behavior and performance'.

Diffusion of innovation theory, pioneered in 1943 by Bryce Ryan and Neil Gross of Iowa State University, traces the process by which a new idea or practice is communicated through certain channels over time among members of a social system. The model describes the factors that influence people's thoughts and actions and the process of

adopting a new technology or idea. Rogers (1995), who has done extensive research on diffusion of innovation, observes that the diffusion of innovation is a special type of communication, in which messages concerning ideas are diffused. The diffusion of innovations is essentially a social process through which information about a new idea is communicated. Rogers maintains that diffusion of new ideas and practices as a crucial component of the modernization process.

Innovation is a complex social process. It involves people who are influenced by their experiences of participating in that process. An innovation is an idea, practice or object perceived as new by an individual or other unit of adoption. The diffusion of innovations involves both mass media and interpersonal communication channels (Rogers 1995). There are different models of innovation diffusion. Lasswell (1948) presents a well-known model of communication that is analyzed as five parts, 'S-M-C-R-E model' which refers to sender-message-channel-receiver-effect. Rogers (1995) maintains that the S-M-C-R-E communication model corresponds closely to the elements of diffusion. Hence, the sender can be inventors or opinion leaders, message can be a new idea or product, channels can be interpersonal or mass communication, receivers can be members of a social system, and finally the effects can be individual's adoption or social change. In the diffusion theory, 'time' variable is a very important factor. According to Rogers (1995) time variable involved in diffusion is in (a) the innovation-decision process (b) the innovativeness (c) an innovation's rate of adoption.

Rogers categorizes adopters based on the adoption of innovation. They are Innovators (venturesome), Early Adopters (respectable), Early Majority (deliberate), Late Majority (skeptical), and Laggards (traditional) (Rogers 1995). Rogers defines the term 'innovativeness' as the degree to which an individual is relatively earlier in adopting new ideas than other members of his social system *(ibid).* One basic assumption of the diffusion approach is that communication by itself can generate development, regardless of socioeconomic and political conditions.

The perceived characteristics of innovations as identified by the Rogers (1995) are (i) relative advantage, (ii) compatibility, (iii) complexity, (iv) trialability and (v)

observability. Based on these five criteria, individuals perceive an innovation as new or useful and decide to adopt it. Innovations generally trickle across rather than trickle down in the interpersonal structure of a social system because it was found that most of the interpersonal network links connect individuals who are alike or similar in adopter category and socioeconomic status.

Schramm *et al*. (1967) argues that by establishing a wide range of media systems knowledge and skills can be multiplied much more rapidly and inexpensively. The media not only gives information, but in the process of dissemination of information but also attempts to alter people's way of thinking. In this context of agricultural information communication the agricultural extension researchers believe that the media should take the role of change agent.

ICTS in agricultural information communication

Rogers (1969) who has done extensive work on an agricultural extension system suggests that timely and appropriate information is critical in the agricultural process. The United Nations recognized the need for timely and relevant information as a fundamental element of human development and has called for universal access to information and communication services as a basic development need. The last decade has seen exponential growth in information and communication technologies (ICTs) with the advances in computers, digital organizers, mobile phones, internet, and wireless computing. These technologies have unleashed a 'cultural revolution in the way individuals and organizations interact, in terms of time, cost and distance' (Munyua 2000).

ICTs is an acronym for information and communication technologies and it is a term that includes any communication device or application, encompassing radio, television, cellular phones, telephones, computers and network of hardware and software, satellite systems and a wide range of media so on. The term ICTs describes the use of computer based technology and the internet to make information and communication services available to a wide range of users. ICTs is used to denote 'the use of computers and

communication systems' (Rai and Lal 2000).

Sassen (2002) argues that technical attributes of the new ICTs increasingly dominate explanations of contemporary change and development. Flow of information communication and coordination mechanisms are being digitized in many different sectors of society and this process is gradually giving rise to new ways of organizing society and production. While this form of 'digital conduct' is becoming an increasingly global phenomenon the digital world constructs different meanings in communication. There is a need to consider how these social processes are applied for economic and social purposes and how they affect societal, and organizational boundaries (Senapathy *et al*. 2009).

Electronic space

ICTs are embedded in social system as they are shaped by social forces and relations enabling and/or constraining human social action. The relationship between ICTs and society can be described as an endless dynamical evolving loop. ICTs have become a dominant social force in shaping social life (Lyotard 1984). Digital networks are embedded in both the technical features and standards of the hardware and software, and in actual societal structures and power dynamics (MacKenzie and Wajcman 1999). This means that power, contestation, inequality, hierarchy, shape electronic space and shape the production of software.

It is argued that in the context of globalization the ICTs can bypass nation states, thereby opening new terrain for initiatives by historically disadvantaged peoples and groups. The complex imbrication between the digital and social can destabilize the old hierarchies and can lead to a reconfiguration of hierarchies. Considering the use of ICTs at local level they are believed to bypass the authority located in the structure which is traditional in nature. Thus, electronic space is transformed by the values, cultures, power systems, and institutional orders within which it is embedded. Fulk (1993) notes that communication technologies are both a cause and consequence of the structure. This dual role of technology occurs because structuring is an ongoing process that shapes the meanings.

The perspective of the electronic space as embedded one allows us to go beyond the utopian and dystopian understandings of the internet and electronic space. The fact that electronic space is embedded and cannot be read as a purely technological condition, or merely in terms of its technical features (Howard 2004). Sassen (2000) argues that internet reproduces hierarchies of power which does not mean that the old hierarchies would disappear, but rather new hierarchies emerge alongside the old ones. In the case of agricultural information and communication system, the use of ICTs may reduce the hierarchy as different section of farmers can easily access to agricultural information. Kellner (1997) suggests that the rise of the internet has expanded the realm for democratic participation and created new public spaces for political intervention. However, it is also important to note that the internet centralizes and decentralizes information and creates new divisions in the society like information poor and information rich, wherein the information rich always enjoy the hegemony over information poor. The discourse on ICTs and development has stimulated the digital divide as a binary divide that can be fixed technologically and with changes in attitudes of people, to allow technology to succeed (Warschauer 2003). To be sure, the internet is a contested terrain, used by Left, Right, and Center to promote their own agendas and interests (Feenberg and Barney 2004).

ICTs are pervasive, crosscutting and they can be applied to the full range of human activity, from personal use to business and government uses. They foster the dissemination of information and knowledge by separating content from its physical location (Task Force on Science, Technology and Innovation 2005). In the neo-liberal era of governance, technology has come to occupy a central role. It is true that the globalization of today wouldn't have been possible without the ICT's (Castells 1996). It led to a network society which connects people, markets across the globe. It promises to break traditional structural barriers and offers a level playing field to all. However 'network society' creates new forms of hegemony which need to be critically examined (Visvanathan 2001; Wade 2004). For example, the cases of e-governance, e-commerce, e-information which is situated in the 'network society' is to be understood in the third world context.

As Kenneth Keniston (2002) points out, 'unfortunately, the hopes so widely expressed are built almost entirely in an empirical vacuum. We know almost nothing about the factors that make for effectiveness or ineffectiveness of grassroots ICT projects in developing nations'. Critics point out that the cost of creating a working internet connection in a developing nation like India, which is same as that of providing immunization against six fatal childhood diseases to thousands of children. Others argue that the introduction of ICTs into communities otherwise unchanged will merely heighten existing inequalities. Many grassroots projects related to agriculture sector are currently using ICTs for development in India. However, they have not been subjected to critical understanding as they are passed off as tools of development. The social contexts of their operations and social consequences of these initiatives needed to be probed for the fact that the results would help in evolving appropriate measures in the spread of the usage of ICTs in agricultural communication.

Theoretical perspectives on communication

The structure is defined as specific formal and informal, explicit and implicit 'rule play' which establishes distinctive resource distributions, capacities, and incapacities (Frickel and Moore 2006). Structure is also defined as specific constraints and opportunities for actors depending on their structural location. Power and its operation are then understood within this structural context. The rules of the play that define, structure give certain actors advantages over others by endowing them with valued resources or by serving as resources themselves (Kleinman and Klein 2002). Giddens (1976) suggests that human agency and social structure are in a relationship with each other. The 'agency approach' sees the individual as atomized and individual action as voluntaristic. Agency stands for the freedom of the action. They may act independently and in opposition to structural constraints, and may reconstitute social structures through its freely chosen actions. In Giddens theory, people reflexively monitor an ongoing stream of social life and the effect of their (and others) intervening actions upon it. His use of the term agency has a dual meaning for it refers to both the way an agent represents and gets power from organizational affiliation.

Structuration theory provides an account of human agency which recognizes that human beings are purposive actors, who virtually all the time know what they are doing and why (Held and Thompson 1989). At the same time actions of each individual are embedded in social contexts which causally influence their actions. In structuration theory, the structure is implicated recursively in the reproduction of social systems. Structure can be explained in terms of the social/economic/political context in which action occurs. A structural approach views the individual's action as situated in place and embodied. It recognizes that there are specific conditions which produce human actions or behavior and individuals are believed not to be atomized but acting as a result, through the rules and structures in which they exist (Giddens 1976).

Structuration deals with how the parts of something are interrelated. It includes general procedures over a period of time and space. A major component of structuration theory is what Giddens calls 'duality of structure' which means that social structures influence individuals. These same individuals will also be influencing social structures and how social structures get constituted in day-to-day actions and interactions. In the course of their everyday activities, they consciously or unconsciously draw upon the 'rules' and 'resources' afforded by larger social structures and, in so doing, reproduce the same societal structures. Society only has form, and that form has effects on people at different levels and influence upon each other. The structure is produced and reproduced in what people do and cannot really be understood in isolation (Browning *et al.* 2008). According to structuration theory, rules are the written and unwritten rules of social life, such as the techniques or procedures generally employed to carry out expected social and workplace practices. They might take the form of commandments, protocols, how to guides, accounting procedures, teamwork norms etc.

Giddens contends that the macro structural features of society result from the patterned repetition of human interaction. Giddens sees connections between the 'micro' aspects of society, i.e. individual's internal sense of self and identity and the 'macro' picture of the state or multinational capitalist corporations. Giddens's theory of structuration notes that social life is more than random individual acts and is determined by social forces

(Gauntlett 2002). The Structuration theory looks society from micro-features such as an email, a tool of ICT, which can be used to analyze the structural aspect in the applications of ICTs. They study the users, and the organization, and how all this interaction causes change (Giddens 1985). Giddens sees ICTs are capable of lifting out social relations from local contexts and re-articulating them across indefinite tracts of time and space. In fact, this ability has led to a tremendous acceleration of global communication.

Although an organization may appear as a single entity, but it is composed of individuals, who communicate with each other from their own viewpoints and experiences. Allocative resources are hardware infrastructural fixtures of all kinds, physical plants, machines and of course all electronic ICTs. The Structuration theory focuses on how the design of transactions using technology, both constrains and sanctions individual action in organizations (Browning *et al.* 2008). Browning *et al*. (2008) also observe that the users rely on structures (norms, expectations, and rules) for ICT use, and they also have the ability to change those very structures. Structuration theory helps us to understand how individuals/ groups mediate technology. Orlikowski (2000) calls these technologies in practice and argues that technologies themselves change over time, which might explain why people use technology differently.

However, Giddens suggests that ICTs offer face-to-face communication because time, space and repetition are closely integrated and intertwined by replacing the need to travel and minimize the friction of distance. Thus, it reduces the cost and effort of completing a task. ICTs are claimed as a resource, where individuals report using ICTs to communicate with more people, in more diverse networks, on more specific topics, and with quicker turnaround than they ever did before the present array of communication technologies became available.

Habermas' 'public sphere'

Habermas (1984) argues that modern society is characterized by an antagonism between self-determination and heteronomy, inclusion and exclusion, cooperation and competition. Heteronomy, exclusion, and competition are the dominant features of contemporary society. Social relationships are coordinated by the media, money and power. In modern society only few individuals control and accumulate structural resources. The social position and power of an actor depends on the volume and composition of capital (i.e. The relative relationship of the three forms of capital, economic, political, and cultural capital) that who owns and who can mobilize as well as the temporal changing of these two factors (Bourdieu 1991). The main classes of society are a result of the distribution of the whole (i.e. Economic, political and cultural) capital. This results in a social hierarchy.

Modern society functions as economic, political, and cultural capital structure. In modern society's domination is institutionalized for securing the accumulation of power and property. It is shaped by the logic of competition. It is a capitalist society where there is an asymmetrical distribution, of capital, ownership, power, which is the basis for hegemony. Capitalism is increasingly 'organized', by instrumental reason. In capitalist society, where the forces of production are owned by a minority, the ruling class, and the state represents the interests of the ruling class (Held 1980).

The conception of the public sphere is most commonly employed to signify the open realm of rational public discourse. It is conceptually linked with the democratic process in which individuals can freely discuss everyday issues of common concern. There are two public spheres. They are inauthentic public sphere of state authority and the authentic one of private people coming together as a public through the public use of their reason. The public sphere is transformed by the influx of private interests. Private individuals promote and shape the public sphere by communication channels. Members of the bourgeois seek to change society into the sphere of private autonomy in the general interest. Through state, groups of private people (corporate) operate their power over society (Habermas 1989).

Habermas (1984) argues that the public sphere is controlled by the privatized forms of spectator politics in a bureaucratic industrial society in which the media and elites play a critical role. Big economic and governmental organizations took over the public sphere, while citizens content to become consumers of goods, services, political administration, and dedicating themselves more to passive consumption and private concerns than to the issues of the common good and democratic participation. The state begins to play a more fundamental role in the private realm and everyday life. Thus, for Habermas, public sphere is described as a space of institutions and practices between the private interests of everyday life in civil society and the realm of state power.

The transformation of the state into private interests assumes significance in the neo-liberal context wherein powerful corporations control and manipulate the media and the state. In an earlier stage of bourgeois development, public opinion was formed in open political debate concerning the interests of common concern that attempted to forge a consensus in regard to general interests. In the contemporary stage of capitalism, public opinion is formed by dominant elites and thus represents their particular private interests. Horkheimer and Adorno (1947) suggest that in capitalism giant corporations take over the public sphere and transform it from a sphere of rational debate into one of manipulative consumption and passivity. Habermas advocates for a public sphere in which planning is done through widespread of public participation, sharing of information with the public, reaching consensus through public dialogue rather than the exercise of power, avoiding privileging of experts and bureaucrats, and replacing the model of the technical expert with one of the reflective planners (Bolton 2005). In the today's context of agricultural communication, public sphere is dominated by private corporations whose interests lie in the agriculture inputs market. Co-opted to these are scientific institutions which lend legitimacy to scientific knowledge.

Kellner (1995) argues that today's mass media has gained importance in every aspect of life where communication and language have become key elements in achieving desired goals. In the current era of technological revolution, interaction and communication play an increasingly important role in the economy and polity. The media, state, and business

are the major institutional forces of contemporary capitalist societies where the media mediate between state, economy, and social life. For Habermas, the function of the media has been transformed from facilitating rational discourse and debate within the public sphere into shaping, constructing, and limiting public discourse to those themes validated and approved by media corporations.

The social function of contemporary media is to transmit messages which are essential part of the economy or polity, and of the derivative importance of democracy. However, the mainstream broadcasting media have not been promoting democracy or serving the public interest and thus are forfeiting their crucial structural importance in constructing a democratic society (Kellner 1995) . Habermas's account of the structural transformation of the public sphere is relevant despite its limitations. He also points out the increasingly important functions of the media in politics and everyday life and the ways that corporate interests have colonized this sphere, using the media and culture to promote their own interests.

Mills (1956) observes that media act as an agent of manipulation and social control. He argues that the media are increasingly shaping individual aspirations and behavior and are above all promoting values of individual success. In the case of agricultural communication the media appear to be pushing the agenda of corporate bodies. Promotion of productivity, yield through adoption of scientific knowledge has been witnessed in the agricultural communication through mass media.

It is Habermas' contention that the human species organizes its experience in terms of a priority interest, or cognitive interest or knowledge guiding interest. Habermas (1984) defines 'communicative action' as the interaction of social actors pursuing goals by achieving shared understanding and coordinating their plans of action. Truth of facts, rightness of norms and the sincerity of expressions is the validity claims assumed by communicative action. It is important to note that communicative action does not assume a shared goal by the social actors, rather a more realistic situation in which actors pursue their own goals with potentially divergent interest by coordinating their plans of action.

Habermas (1984) states that language enables understanding and thus it is introduced as a mechanism for coordinating action.

Habermas (1984) argues that communicative action is playing a direct role in production and production is governed by the logic of instrumental action. Communication channels are maintained by the capitalists and they are communicating information for their own benefit and thus influence the agency in such a way that the capitalists and private people gain hegemony over the process of communication. In the context of globalization, agricultural information has gained importance for raising agricultural productivity. Over the years, across the globe and in the Indian context as well, a few private organizations captured the agricultural communication sphere using modern technology like ICTs. They appear to be gaining a monopoly over the total agricultural process. The problem with the ICT based agricultural communication is that the services offered are tailored to the needs of the progressive farmer.

Gramsci and Hegemony

Antonio Gramsci uses hegemony in relation with the ideology of ruling class over the society. Hegemony emphasizes the domination of certain classes or certain groups (ruling) over society (economic, political, culture) constituting the structure. Hegemony can be seen in accordance with Gramsci, as the 'spontaneous' consent of the masses who must 'live' by those directives of a certain class. Modifying their own habits, their own will and their own convictions, to conform with those directives and to the objectives which they propose to achieve (Gramsci 1971). Hegemony is formed in the framework of the complex relationships between politics and culture. It can only work in and with ideology. The hegemony of the ruling class over society as a whole is produced by a justifying ideology. An ideology is a system of ideas and beliefs that dominates the consciousness of a human being or a social group (Althusser 1971).

Gramsci's concept of hegemony helps us to explain the role of intellectuals in constructing the social consensus. Williams (1983) suggests that hegemony is not limited to matters of direct political control, but seeks to describe a more general predominance

which includes, as one of its key features, a particular way of seeing the world and human nature of relationships. It is seen to depend for its hold not only on the expression in the interest of the ruling class, but also on its acceptance as 'normal reality' or 'common sense'.

The hegemony of developmentalism is well exemplified in the realm of agricultural modernization, where the objectives of the state merge with the sense of urgency surrounding issues of hunger, malnutrition and poverty (Yapa 1993). Society has been subjected to the forces of 'globalization', which is but a euphemism for the attempted re-colonization of the developing world by the advanced countries, using new forms of control through the global financial institutions, through a new global trade and investment discipline and intellectual hegemonization (IIahiane 2004). The issue of access to information and knowledge has always been of importance, especially in the discourse of power. The powerful always have used information and knowledge generated by the joint experience of all societal members to maintain their social hegemony. To perpetuate their hold on others, and worsen the matters further, they always tried to deny the underprivileged further to access this social wealth.

In the case of green revolution the rich landed class belonging to upper castes has fortified their hegemony in the villages by realizing surplus value by adopting new technology. To promote green revolution the ruling class has created a justifying ideology, that is, adoption of scientific practices is necessary to meet the food needs of the growing population and to overcome poverty. The story of green revolution provides us an example of the claims made by critical social theorists that science and technology as 'social processes' embedded in the power relations of the society, serving to strengthen and reproduce those power relations (Aronowitz 1988; Foucault 1980). Improved seeds were not just a technology to feed people by increasing food production, but it was also an instrument designed to serve the economic interests of a particular class of people (Yapa1993). It is argued that intellectuals in the field of agriculture, say agricultural scientists, have been working for the benefit of those forces which influence structure rather than empowering the agency to overthrow the existing structure.

Frickel and Moore (2006) focus on various questions such as who benefits from new knowledge production, what knowledge gets produced, who gains access to knowledge, what kind of knowledge is left to be undone and who takes the decisions about the research agenda. These questions throw light on the power relations involved in the new knowledge production. This is what has largely called as the politics of science.

Proctor (1991) notes that it is also important to observe whose economies have benefited from the new modern technologies. Critical examination of the ideas, assumptions, models, methods, and language function reveals that they serve the interests of a particular class i.e. capitalist class (Aronowitz 1988). Ranjit (1973) argues that the dominant social group or ruling class controls the forces of production. This class largely monopolizes political power and its position will be supported by laws which are framed to protect and further its interests. Bureaucracy plays an important role in protecting the ruling class interests and it is also a system of control.

Horkheimer and Adorno (1947) suggest that industry plays a major role in the reproduction of capitalism. It produces a mass society of passive consumers without any critical faculties through use of the mass media. In fact, studies from a political-economy standpoint emphasize that, although most people in industrialized societies have gained access to a growing variety of means of communication, significant inequalities remain. Technology is the larger capitalist construct that makes the world more and more exploitable. It ruptures the values of science as public good and shifts science from public mobilization to science for private utilization.

Science and technology in India

There are a number of studies in Indian science and technology, which attempt to expose the centre-periphery model in understanding the power relations and why the Indian knowledge production is unable to solve the social and economic problems of the country. One needs to have a deeper understanding of the influence of Western science in India. Chakrabarti (2004) argues that Western science as a hegemonising device influences knowledge production in India. Various scholarly works, on social studies of

science and technology, criticize that the Indian science and technology is highly integrated into the Western paradigm. It is suggested that the national system of science and technology in the Third World countries is always influenced by the networks of relations and power (Prasad 2006).

Sociology of science attempts to examine how and to what extent various socio-cultural factors influence and shape the interface between science, technology and society. Sociology concerns itself with understanding the historical development of technology and the relationship between the society and technology (Abrams 1982:16). In the Indian context, according to Visvanathan (2011: 290-312), sociology of science (and technology) has been yet to achieve its body of knowledge. He articulates three reasons for the underdevelopment of sociology of science in India: one, the larger discipline of sociology in India mainly focused on certain issues such as development, modernization and state; two, the practice of sociology of science is limited to the transfer of technology model; and three, the number of scholars engaging in STS is highly fragmented in nature. The articulation ignored its epistemological and ontological questions about the way science has been practiced.

Science and Technology are inextricably related to development, but there has been little appreciation of the complex relationship between them. Ocampo (2010) from Harry Truman's Four Point Program, 1949 and the UN Millennium Project Task Force on Science, Technology and Innovation (2005) views that science and technology have earned the status of global development mantra. In the process, they have manufactured and cultivated concepts and ideas, like take-off from 'traditional society' to a 'drive to maturity', finally to the 'age of mass consumption' (Rostow 1960). Transfer of technology from 'developed' to 'underdeveloped' countries, leapfrogging as the only way to reconcile the aspirations of developing countries for modernization (Goldemberg 1992).

India has long been on the receiving end of technological imperialism (Headrick 1981), initially by the colonizers and later by the colonial ideas left behind, which includes our identification as a Third World country and the baggage that comes with it. The deeply

historical belief of ‘cultural neutrality’ of science and technology in India continues to grant validation, to technological interventions for development (Prakash 1999; Sarukkai 2008). For ICTs, in particular, this validation is even stronger. Because of the role of the market, which has prospered in the last twenty years due to the IT revolution, and the urban, upper caste middle class that it has reproduced (Upadhya 2011).

Hamilton (1958) argues that earlier, farmers used to cultivate for subsistence. Over a period commercialization has taken place as farmers started to produce for the market and for profits. Traditionally, farmers cultivated crops, according the geographical, climatic and economic conditions. In the due course, commercialization gained prominence with the introduction of green revolution technology. Introduction of green revolution technology attracted many small and marginal farmers who started cultivating for a market rather than for subsistence. The new technology made farmers to depend on the market for seeds and fertilizers and enforced farmers to carry out agricultural activities according to the directives given by the state agricultural extension functionaries and agricultural scientists.

Liberalization of agriculture has opened the scope for multinational companies to enter into agricultural input market. When the private interests started to claim their power through public authority, farmers’ choices were reduced and farmers begin cultivating crops as directed by the market. In the name of efficient delivery of services, the private participation in the agricultural inputs market was thirsted upon Indian farmers. It was hoped that private participation opens up market choices for farmers and farmers can choose the best.

However, what we witness today is the hegemony of few agricultural corporate companies over input market. As the state withdrew from the agricultural input market farmers have been forced to source the inputs of cultivation from private players. The multinational companies work for profits and strive to maintain their market share by any means. Thus, these companies started to encourage farmers to cultivate for market, to make use of inputs purchased from the market and to adopt aggressive cultivation strategies of high yields and high productivity. In this process the private players have

shown utter disregard to the issues of sustainability, economic viability, and socioeconomic conditions of farmers.

Sen (2000) argues that providing 'choices' is one of the basic principles of development. Enhancing choices for farmers in making decisions regarding agriculture is a positive step in the direction of development. Going by the logic of the state in opening up of agricultural input market for private players, the choices of the farmers should have increased. This situation should have enabled farmers in making appropriate decisions and chose appropriate inputs for cultivation. The present study looks at the participation of private players and critically examines their role in enabling choices for farmers.

In development literature, ICT is created as a monolithic and homogeneous entity. Kling (2000) states that a monolithic view leads to overestimating the generalizability of specific information technology applications from one context to another. Orlikowski and Iacono (2001) point out that ICT is anything but a monolithic entity. It has many facets, it is fragmented and undergoes constant change. ICT use is contextual and its consequences are intended as well as unintended. Markus (2000) observes that the unintended consequences of ICT are far more prevalent. Sein and Harindranath (2004) in a review and conceptualizing the ICT's use in national development identify four views. They are i) ICT as a driver of the economy, and ICT directed at specific development activities. ICT is seen as a commodity or product to be used to earn foreign currency through export. Prime examples are manufacturing computer and related products. ii) ICT as supporting general development activities. This view suggests that ICT helps in activities related to development, that is, development planning and the management of development projects, development training, and as support for agencies engaged in development activities such as nongovernmental organizations (NGOs) (Madon 1994). It is a widely accepted fact that one of the most important problems facing developing countries is the problem of 'information poverty' (i.e. The scarcity of the reliable information essential for the efficient and effective functioning of both governments and firms). iii) ICT is viewed as force to have a macro-level influence (e.g., In infrastructure development, education, in the development of the private sector). ICT can help enhance

the working of markets and reduce transactions and coordination costs within and across organizations. iv) ICT is directed at specific development sectors or projects. This view suggests that ICT is conceptualized as having a developmental impact when it is used within the context of targeted developmental initiatives.

Further Sein and Harindranath (2004) while presenting the different perspectives which locate ICT in the national development agenda argues for using the 'ensemble' view. The ensemble view conceptualizes ICT beyond the technology (i.e. Hardware and software) extending to the social and cultural contexts where ICT based initiatives are situated. In this view, the social and contextual aspects determine how ICT is conceived. The ensemble view allows us to examine the socio-technical components of ICT which in turn help us to understand the design and its functioning.

The functioning of ICT based non-state initiative in agricultural extension is examined in the thesis through empirical observations in the field site where such initiative is functioning. The findings from the field site are compared with that of the field site where state led conventional agricultural extension services are in operation. In this attempt the thesis critically analyses the findings against the theoretical perspectives discussed so far in this chapter. How the social structure operates in the functioning and design of the non-state ICT initiative is examined along with an understanding of the farmers' responses (which form part of the agency). The social embeddedness of technology is brought out in this discussion. The scientific knowledge which ICT based initiative proposes to disseminate to farmers is critically explored as how the technology is used as a medium to promote the interests of corporate groups as reflected in the arguments of the Habermas' public sphere. By raising questions like, had the initiative being promoted by the state would the design and functioning be different to what is observed now, had the initiative increased choices for farmers, the thesis argues for the importance of understanding the social embeddedness of technologies. The next chapter provides an account of introduction of agricultural technologies and the changes that occurred in the Indian agrarian social structure since their introduction in the country. It also discusses the agricultural extension services in the country.

Chapter - 3

Indian agriculture and its tryst with green revolution

Introduction

Agriculture is the key sector in most developing countries. The economic growth of the third world countries directly depends on the development of agriculture sector. Agriculture has played, and will continue to play a major role in the process of development. To achieve self-reliance, growth, equity and to achieve overall development of the country, developing countries introduce modern technology in agriculture (Gupta 2012). Mellore (1976) observes that a number of schemes have been formulated specifically for the development of agriculture to maximize production in order to eradicate poverty and hunger. The introduction of the green revolution is one of the significant technological breakthroughs in agriculture, which enabled nation-states to regain sovereignty. The long term objective of green revolution has been to overcome the problems of agricultural production, rural poverty, and to satisfy the food requirements of the population through raising local production.

Green Revolution

The name ‘green revolution’ is given to the technology associated with the new seeds in terms of a package of agricultural inputs and new practices. Large scale application of modern sciences and technology in agriculture to improve productivity is described as green revolution. In short extensive and intensive use of improved production technology and high yielding variety (HYV) seeds has been the essence of the green revolution (CSSC 1974). One of the important characters of HYV seeds is that they are more responsive to fertilizers which result in higher yields per unit of fertilizer. Sometimes they can give two to four times of the yields of the indigenous varieties. These seeds have a shorter maturing period, which allows farmers for double cropping.

The term green revolution was first used during the late 1960s to refer to the effects of

the introduction of high yielding variety seeds of wheat and rice in developing countries (Fujita 2010). William Gaud of the United States Agency for International Development used the term green revolution for the first time in reaction to the communist revolution associated with colour Red in his speech to the Society for International Development in March 1968 (Spitz 1987). In December 1969, the idea of green revolution was presented to the US Congress as a major tool of American foreign policy that provided bright market prospects to the pesticide, fertilizer, seeds and tractor industries (Yapa 1993).

India adopted the green revolution technology in the mid 1960's. The state support to green revolution went beyond mere propagation of new technology. It provided credit support and direct supply of inputs like fertilizers, seeds, machinery to select farmers in select regions. The main focus was to transfer institutionalized knowledge to farmers through extension system and by using the external inputs efficiently. Green revolution was aimed to enhance agricultural production and to improve income of the poor agricultural workers by increasing employment. The adoption of the HYV seeds was facilitated by the 'intensive agricultural district programme' (IADP). The success of the high-yielding variety seeds in IADP districts has spurred rapid diffusion (Alavi 1975).

For decades Indian agriculture remained traditional in character. Indian agriculture has been witnessing in low yields, limited income, and lack of capital to invest and has been a prey to the unpredictable monsoon. Climatic factors like rainfall have shown a drastic impact on the yield variability. Traditionally, agriculture in India has been characterized by subsistence farming, primitive techniques, and low yields. The agricultural situation prevailing during the freedom struggle has to be seen in the context of the British colonial rule. The colonial period from 1891 to 1946 witnessed the neglect of the agricultural sector. Since the inception of National Economic Planning in India in 1951 sustained efforts have been made by the planners to accelerate the pace of agricultural development in the economy. It was only in the mid-sixties, when the economy suffered a major setback due to two consecutive years of drought, that a shift in the development strategy focusing on rapid agricultural development became necessary (Chakravarthi 1970). During this period the new strategy of agricultural development, i.e. green revolution

focusing on modernization of agriculture and improvement in farm productivity was launched. The state adopted the policy of providing a wide range of incentives to farmers in the form of specific subsidies on modern agricultural inputs (Gupta 2012). Thus, subsidies have been provided to farmers to encourage the use of chemical fertilizers, irrigation facilities, electricity and also to avail credit facilities.

Historically, the agrarian structure in India was characterized by large landholdings held by the zamindars, who were intermediaries between the state and the peasants. They gave support to the colonial state in the process of extracting surplus from the peasants. Lack of adequate productive investment by the zamindars since the end of the 19th century onwards underlined the slowdown in the food production (Roy 1990). After independence the country was heavily dependent on food imports from the United States, for which India had to pay a heavy political price. Besides, there was uncertainty about the ability of the food surplus countries in the world to continue to supply the needs of the food deficient countries (Dasgupta 1977). During this situation green revolution has shown a way to overcome poverty, starvation and unemployment and to feed large and fast growing population (Paddock and Paddock 1968; Hopper 1976).

India became self-sufficient in food production within a short span of time after the introduction of the green revolution. The grain output increased from 50 million tons in 1951 to 150 million tons by the mid 1980's (Walker 2009). Green revolution led to a substantial increase in agricultural output and it almost solved India's food problem. In purely economic terms, the agricultural sector experienced growth at the rate of 3 to 5 percent per annum, which was many times more than what the rate of growth had been during the colonial period (less than 1 percent) (Byres 1980). Even though there was a growth, the agricultural production in India was virtually stagnant during the 56 years preceding independence (Blyn 1966).

Green Revolution and imperialism

After independence, fundamental changes in agriculture have occurred and primarily after the green revolution, capitalism has become the dominant form of agrarian relations.

The developing countries which got independence during the 19th century have formed into nation-states very quickly (Giddens 1985). The underdevelopment already prevailing in these countries due to colonial rule became a challenging task for newly formed states. Such countries were compelled to import science and technology from developed countries in order to achieve development. Science and technology is an important feature of the global economy and plays a key role in the process of establishing hegemony. It has become compulsory for the Third World countries to depend on developed countries for importing science and technology.

Green revolution carried the conviction that 'agriculture was being peacefully transformed through the quiet working of science and technology and reaping the economic gains of modernization by overcoming the disorders of the society' (Frankel 1971). The US played an active role in the conception and implementation of green revolution in Third World countries. However, it is argued that because of the strategic, geopolitical interest that the US had at the time in the changing social and economic conditions in the Third World countries it offered green revolution technology to them (Harriss 1987).

Other analysts argue that external actors, in particular the United States government, the World Bank, and private US agencies such as the Ford and Rockefeller Foundations, were largely instrumental in influencing and pressurizing India's policy (Goldsmith 1998). It is also argued that new technology is the result of 'imperialist and neo-colonial domination' of India's political economy, facilitated by the organized class power of the landlords and emergent kulaks (rich peasant farmers). The adoption of the green revolution strategy was the logical outcome of the alliance between the bourgeois landlords and foreign capital, committed to rapid capitalist development (Byres 1998). The adoption of the new technologies has been projected as a rational choice by farmers, and adopters are viewed as progressive or gentlemen farmers.

India was among the first developing countries to adopt farming strategies under the green revolution in the mid-sixties (Tripathi and Prasad 2009). Improved seeds, one of the key components of green revolution arrived in the villages of India carrying the

authority of science and modernity. The new seeds sponsored by the international aid agencies, developed by crop-breeding science, backed by multi-national agro business capital, approved by the government of India, and promoted by an army of trained extension workers presented a formidable power that challenged peasant farmers living in their 'traditional culture of poverty' (Peet and Watts 1996).

Intensification of inequality

The new agricultural strategy of the 1960s, namely green revolution had a selective approach. It was extended to only some areas which were endowed with favorable infrastructure like irrigation, transport, communication and credit facilities. Even within these areas only the progressive farmers (who are usually the large farmers) were selected for the distribution of inputs. The allocation of inputs at each level of administrative hierarchy of the state, through district to block was dependent on its resource endowments and fulfillment of other criteria adopted by the state. At the village level, the allocation was done on the basis of a list of farmers prepared by the Village Level Worker (VLW) (Dasgupta 1977). Joan Mencher (1978) observes that the concerned agriculture officers were far from neutral and they forget about small farmers because of the assumption that the latter could not really contribute to increased productivity. To these officials, progressive farmers are those who have viable farms and who are fairly well-off (Mencher 1978). The most distinctive feature of the 'progressive farmers' is that they combine ownership of land and capital with skills in manipulating both 'traditional and modern' institutions (Beteille 1974). The logic behind the focus on progressive farmers was that the new technology would percolate down to small farmers over a period. However, in practice this never happened. In fact, it had accelerated the inequalities.

Adoption of any kind of new technology depends on the type or design and cost of technology. When the degree of uncertainty and fixed cost is low, farmers tend to adopt such kind of technology. In case of green revolution the adoption of technology took place only among few large farmers because of its cost. For large farmers' adoption of new technology is nothing but investment, whereas for small and marginal farmers the

additional dependence on informal sources and high productivity entails more risk.

However, over a period, medium and small farmers started partial adoption of new technology, whereas large farmers increased their rate of adoption and eventually applied to the whole field. Large farmers were the early adopters of the new innovation because they enjoyed political power which ensured them to obtain additional economic advantages (priority in access to credit and inputs, preferential prices, and social capital etc.). The late adoption of new technology among the small and marginal farmers widened the inequalities (Mara and Gershon 1981).

Rapid changes in agriculture due to the adoption of green revolution have caused greater economic imbalances, inequality and inter-regional disparities. The growing inequality in the country is attributed to the unequal focus on all types of farmers. Large farmers could benefit while the small farmers were caught in the institutional bottlenecks which prevented them from participating in the programme. It was expected that with better access to credit and information, the small farmers would succeed in overcoming their initial disadvantage (Dasgupta 1977).

The agricultural policies adopted by the government from the 1960's onwards have also tended to increase the degree of inequality between perpetually irrigated regions and those regions which have to depend mainly on rainfall for cultivation. It is a known fact that farms in the wet areas are better served and supported by the development programmes of the state bureaucracy as compared to those in the dry areas (for e.g. agricultural extension services are largely concentrated in the wet region or command areas than in the dry areas). Production of high yielding varieties of grain with heavy doses of fertilizers has mainly affected irrigated areas which are already favored (Bagchi 1982). In the wet area a poor peasant household's agricultural income is four times more than the average income of a corresponding household from the dry areas (Dhanagare 1984). Even though dry crops and drought prone regions have shared the gains of agricultural growth but this growth has been accompanied by increasing yield instability and production costs. It is stated that adoption and non-adoption occurred simultaneously in the same geographic space at different levels of society (Blaut 1987). Advocates of

green revolution technology argue that it is scale neutral, hence could be used by small as well as big farmers. However, in the actual implementation, small holdings were neglected assuming that they are unviable.

Environmental degradation

The introduction of HYV seeds opened a new era in Indian agriculture, leading to a rapid increase in the usage of fertilizers. A mode of chemical agriculture accompanied the new hybrid seeds. In fact, it is suggested that the mission of the US during the introduction of green revolution was to push its products to the Third World markets. The HYV seeds have been developed through selective breeding so as to be highly responsive to ammonia fertilizer input. The vulnerability of the new seeds (particularly of rice and wheat crops) to pest attacks and the fertilizer induced growth of weeds, have led to increased use of pesticides and weedicides (Dayal 1984). With the introduction of green revolution technology traditional and sustainable agriculture knowledge has been abandoned. Synthetic fertilizers and pesticides are applied to mono crops of HYV wheat, rice, and cotton (Newman 2007). Fertilizer consumption in India rose from 1.0 kg. per hectare in 1956-57 to 7 kgs per hectare in 1966-67. Subsequently, it reached 46.4 kgs per hectare in 1984-85. The use of chemical fertilizers shifted from non-food crops to food crops (Roy1990).

Table 3.1: Consumption of chemical fertilizers in India

Consumption of Fertilizers (Lakh tonnes)	1991-92	2000-01	2005-06	2009-10	2010-11	2011-12
Urea	140.04	191.86	222.97	266.73	281.12	295.65
DAP	45.18	58.84	67.64	104.92	108.70	101.91
MOP	17.01	18.29	27.32	46.34	39.32	30.29
NPK complex	32.21	47.80	66.94	80.25	97.64	103.95
SSP	31.65	28.60	27.56	26.31	38.25	47.46

Source: Government of India 2013.

Table 3.1 explains that the consumption of urea has increased from 140.4 in 1991-92 to 295.65 lakh tonnes in 2011-12. Consumption of DAP, MOP, NPK complex and SSP

have also increased significantly over a decade. Consumption of nitrogenous (N), phosphatic (P) potassic (K) fertilizers have increased from 1.1 million tons in 1966-67, the year preceding the green revolution to 27.7 million tons in 2011-12. The all-India average consumption of fertilizers has increased from 105.5 kg per ha in 2005-06 to 144 kg per ha in 2011-12 (Government of India 2013).

As a result, arable land has been degraded through soil erosion, salinity, alkalinity, and chemicalization. The productive capacity of land has declined due to nutrient mining, imbalances in the application of soil nutrients, neglect of micronutrients and inadequate application of organic fertilizers. Indeed the department of land resources in the Ministry of Rural Development estimates that only one-third of India's agricultural land is still in good condition, the other two-thirds being degraded or sick to some extent (Planning Commission 2007:15). As a result, according to the Ministry of Agriculture the net sown area of land has fallen from 143 million hectares in 1990-91 to 140.9 hectares in 2003-04.

Changes in cropping pattern

Pingali (1997) argues that commercialization of agriculture taken place when household product choice and input use decisions are made based on the principles of profit maximization. Farm household is assumed to be commercialized if it is producing a significant amount of cash commodities, allocating a proportion of its resources to marketable commodities, or selling a considerable proportion of its agricultural output. Commercialization of agriculture is used to describe two related processes, first a shift in the agrarian economy from production for consumption in production for the market and, second a process where land starts acquiring the features of a commodity and begins to be sold and purchased in the market like other commodities. Production for the market was not an entirely new phenomenon for Indian agriculture. However, green revolution increased the pace of commercialization of agriculture very quickly.

The changes in the economic policies which emerged, particularly after the introduction of green revolution reflected a trend of transition from colonial feudal formation to the emergence of capitalist relations. The capitalist tendency started in India with the

disintegration of the old system during colonial rule. The process of accumulation gathered momentum after independence (Patnaik 1990; Thorner 1982). Modern agricultural technological innovations have established their superiority over the traditional ones. Unlike the traditional cultivation, where the farmer largely uses the previous year's seed, manure produced by farm animals, homemade tools, family-owned bullocks, and family labor as the major inputs, the new mode of agriculture made farmer dependent on the market for the supply of new seeds, chemical fertilizer, pesticides and herbicides, hired labor and hired agricultural machinery (Rudra 1992). Today, farmers are highly depending on machinery for ploughing and harvesting. To have multiple crops in a year, farmers are ready to bear the risk and raised input cost. The process of agriculture is highly bounded with a market where farmers are seeking advices from input dealers.

Bhaduri (1984) argues that landlords cum money lenders continue to dominate the process of agricultural production. Peasants and laborers are tied to them through the mechanism of debt that is leading to 'forced commercialization' of labour and agricultural yield. This produced a self-perpetuating stagnant and exploitative agrarian structure that could be at best described as 'semi-feudal'. The capitalist mode of production in agrarian economy is certainly experienced in the green revolution regions (Thorner 1982). The use of tube wells and tractors among the small farmers made them dependent on rich farmers because they could not purchase the machinery. In exchange of this they had to sell their crop, which was mainly meant for family consumption, to landlords and commercial monopolists (merchants who control the purchase of particular crops) (Dhanagare 1984).

Griffin (1974) contends that capital intensive innovations in the package of high yielding seeds soon acquired a landlord bias in the fragmented markets of India. The privileged farmers accessed the resources and adopted innovations. Farmers moved from traditional to commercial crops to reap more profits. The technological development rather than being need based became market oriented. As the other trade policies have changed, even the production and produce have become market oriented. Only those technologies which can be effectively marketed were developed by the researchers in both public and private

sectors. This made the poor farmers depend more and more on the external markets. As the market dependency has increased agriculture has become more capital intensive. To cover up the costs and to meet their other needs farmers started growing only those crops and varieties which markets demand. Thus, farmers have lost control both over inputs and outputs (Baskaran and Boden 2004).

Green Revolution and co-operatives

Credit is the chief contributor in adopting green revolution technology. Institutional credit through co-operatives are meant to help the marginal and small farmers who are afflicted by indebtedness. Money lenders as a distinct social category have always been a part of village social life. In most regions, they exist as a separate caste group. Whenever a farmer needs credit for cultivation and for other social rituals like marriage, death ceremonies and other social functions, s/he goes to the sahukar (money lender) for a loan of grain. The moneylender is more of the functional category as s/he gives credit at critical situations (Jodhka 2012a). The money lender evaluates the credit worthiness of a particular peasant on the basis of his/her ability to pay back, and decides on how much credit could be given to a particular peasant. The system of credit is perhaps close to what Weber conceptualized as 'neighborhood help' (Weber 1978). When small farmers purchased the HYV seeds and other modern inputs from large landowners, they were charged higher prices. To meet these expenditures farmers took credit from traders and informal sources. They had no choice but to sell the farm yields, which were primarily meant for their own consumption, to the large landowners immediately after the harvest when the prices were relatively low. This is termed as 'distress sales'. They also had to sell their farm to meet their expenses.

The process of 'land alienation' is attached to credit. Landowners, who are also the main source of credit for small and marginal farmers in villages give loans with the intention of grabbing the lands of smaller peasants rather than earning interest over it. They tend to lend loans to farmers beyond the latter's payback capacity by mortgaging their land. The professional money lender generally did not remove the peasant from his land. If the peasant could not pay back his loan, the money lender asked for the transfer of ownership

of land while the peasant continued to work as a tenant of the money lender. In cases where the money lender was also the landlord, the indebted peasant ended up as a landless laborer under him/her. By 1999-2000, the proportion of landless rural dwellers had reached 41 percent, while that of the landless and marginal combined had risen to 63 percent (Research Unit in Political Economy 2005). After the introduction of green revolution the capitalist penetration has grown throughout the country, the process of de-peasantisation has been accelerated and consequently large numbers of small and marginal farmers or poor peasants have been pushed into the ranks of landless laborers (Oommen 1984). Some later Marxists have argued that high indebtedness of the peasantry, forced commercialization of agricultural produce, land alienation, and increasing domination of rich landowners and money lenders over tenants and peasants led to 'the primitive accumulation of capital' (Cox 1987). Credit needs of cultivators have been largely met by informal sources like money lenders and traders. Much of this available at the village level came from spurious money lenders. It was in recognition of this fact that the Indian state expanded the network of cooperative credit societies.

At the village level, the primary co-operative societies are responsible for allocating credit. As bureaucratic formalities are associated with their functioning, a large part of the modest amount is not disbursed to the farmers. Many farmers, particularly the poor landless tenants, have faced institutional difficulties in gaining access to the benefits being distributed by the co-operatives. The rigid lending practices followed by the land mortgage banks and commercial banks, who insist on security have made it almost impossible for the poor farmers to get financial support. The co-operative societies, particularly credit societies, serve the wealthy farmers better than the poorer ones. The rich are easily able to get loans from the co-operative societies at the official rate of six percent interest, which is just half the rate which private money lenders charge. The rich peasants are also reported to be in a much better position to buy large quantities of fertilizer on credit and thereby ensuring a good harvest (Epstein 1978). Moreover, the rural elite's dominance of the local co-operative societies, as well as the district and state political and economic institutions allow them access information on new technology and institutional credit. Officialdom has been lukewarm to serve to small and marginal

farmer's needs.

Over the years, the dependence of rural households on informal source has come down significantly. While in 1961, an average of only 18.4 percent of the total credit needs was being fulfilled by institutional sources of credit, in 1981 the corresponding figure had risen to 62.6 percent (Gadgil 1986). The assessment studies on the cooperative credit societies show that the benefits of credit from co-operatives reached the better off sections of rural society, and the poor continued to depend on the more expensive informal sources. Although banks were never controlled directly by the rural rich, the benefit of their credit has largely gone to those who had substantial holdings (Jodhka 1995; Thorner 1964; Oommen 1984). Cooperatives hardly helped small and medium farmers because the village panchayats, or councils are controlled by local dominant castes indirectly. Cooperatives became political institutions rather than developmental bodies. Vasavi (2012) observes that post 1990's integration of Indian agriculture into the world market has led to increased costs in agricultural production. Lack of institutional support from government, lack of availability of credit, decline in agricultural growth and real income, growing indebtedness and frequent loss of crops and unemployment due to mechanization have made agriculture more risky and burdensome for small and marginal farmers.

Demand for labor

Green revolution is closely associated with mechanization of agriculture. Although mechanization increased productivity the cost of cultivation increased drastically. The tractor density in India is about 16 tractors for 1,000 hectares. Small and marginal farmers who cultivate about 85 per cent of the holdings cannot afford the high cost of agricultural machines. High cost of mechanization and lower credit worthiness results in the 'exclusion' of majority of small and marginal farmers in India from the benefit of farm mechanization (Government of India 2013).

On the other hand, it is argued that green revolution made it possible for rural workers to obtain employment for a whole year by multiple cropping practices. The income levels of

the poor and landless workers increased at peak periods such as harvesting. Labour demand becomes more critical because of the immediate need to clear land and prepare it for the next crop. According to one estimate the proportion of agricultural labour to the total population dependent on land experienced a significant increase. According to Registrar General of India, New Delhi (2001) agricultural labourers has increased from 19.5 in 1951 to 26.7 in 2001.

While the new technology has expanded employment in the short run, in the long run, with further advance in mechanization, there has been a negative employment. The introduction of sophisticated technology such as tractors and pumping sets led to a remarkable decline in manpower requirement. When pump sets, threshers, and tractors were introduced the average demand for labor dropped down to 25.6 man days. Green revolution has led to replacement of manual laborers by the machines and other modern equipment (Bhalla 1976). Agricultural real wages had declined mainly because of an increase in the number of labor households, and steady price rise, resulting in the rise in cost of living (Epstein 1978). Usage of modern equipment like tractors, threshers and weed cutter etc., are used for double cropping. Critics argue that the green revolution encouraged unnecessary mechanization, thereby pushing down rural wages and employment. Use of modern technology led to a subsequent decline in the full time employment which resulted in the exclusion of share croppers and small and marginal farmers. These sections of farmers were left with no option but to sell their small holdings (Mishra 2006).

Brass (1990) observes that mechanization had a drastic impact on the Dalit agricultural laborers since many of them are attached laborers. The use of machines reduced the need of attached labor. As a result, landlords opted for free wage labor. Mechanization of agriculture has led landlords to hire laboures who could work with machines (Bardhan and Rudra 1978; Dacorta and Venkateshwarlu 1999). Due to the mechanization of agriculture the demand for labor diminished and deteriorated the economic condition of the poor peasantry and agricultural workers. NSSO (2001) data on migration suggests rising migration out of rural areas. A large number of youth, close to 30 percent,

commuted to nearby towns or villages daily for work. Most of them work as agricultural laborers. NSSO (2005) findings about people wanting to quit farming show the growing disenchantment with the profession which has led to increased withdrawal from this profession.

Role of small farmers

Green revolution has become a ray of hope for many Indian farmers. However, the adoption and diffusion of the green revolution is not uniform throughout the country and occurred only in small pockets of India. It is successful only in the irrigated areas, whereas in India only twenty percent of the area is irrigated. Over 70 percent of the Indian's cropped area remains non-irrigated for which new technology has failed to provide viable high-yielding varieties and whose production hence remains disproportionately small. It is argued that improved farm production and income will solve the perpetual problems of rural poverty. But green revolution has shown a positive impact on few farmers only. It is proved that green revolution is meaningless for the poor farmers whose access to credit is limited. In addition to this small and marginal farmers have their prejudices about the new technology due to their illiteracy and they choose to avoid any risk. It is viewed that the green revolution technology is capital intensive. It suits rich farmers because the rich farmer alone had adequate resources to afford that technology. Thus, it is agreed that green revolution increased the polarization between rich and poor (Bhalla and Chadha 1983).

Poor farmers who could not afford to respond and intelligent farmers who actively rejected the new seeds for ecological reasons were labeled as 'backward farmers' or 'laggards' through the language of the sociology of innovation diffusion (Rogers 1995). There were neither serious discussions of the structure of social relations and systems of social practices through which innovations filter nor of the consequences of the adoption of an innovation (Gregory 1985). Chambers (1983) describe green revolution as an intellectual construction which reflects the dominant world view of capitalist culture. Knowledge flows from one direction, i.e. from top to down. Those who are strong and educated get enlightened with this knowledge. In the name of development, green

revolution has spurred rapid diffusion throughout the country, but the process of actual implementation of such technology has become superficial for rural poor because their farm size is small.

Green revolution and caste intensification

In the early phase of green revolution policy makers have concentrated on increasing production and they have overridden the issues like equity and redistribution. Most of the policies are in favour of well-endowed region and rich farmers. This resulted in widening of interpersonal and regional inequities and also led to sectoral imbalances within the agricultural sector (Government of India 1976). Despite being the key source of economic modernity the benefits of new technology have not been shared equally among different classes in rural India. Green revolution has not initiated any significant rupture of the existing caste based social structure rather reinforced it. Upper castes and the predominantly established dominant castes continued to reap the benefits of the new technology. It increased the profit and assets of the particular castes and they have become politically and economically strong. Their economic, political and social success, in turn, has facilitated their emergence, or strengthened their position as the 'dominant castes' (Bardhan 1984). The locally dominant castes consolidated their position in the regional power structure and acquired a new sense of confidence.

Green revolution has thrown up serious problems to policy makers like how to attain optimal yields and to extend the green revolution to the crops, farms and regions where it has not reached so far. Green revolution has also thrown foremost issues like removing the disparities and imbalances and to provide irrigation facilities. Growth disparities among regions have resulted in complex socioeconomic strife of a serious nature. The increased inequality has led to a sense of deprivation among the weaker and poorer agrarian classes (Das and Tripathi 2014). The policies formed by the state were in favour of rich farmers rather than small and marginal ones. These farmers became more prosperous with the help of government policies such as repayment of credit and low rate of interest and other subsidy policies. They no longer continued agriculture for subsistence as their aim was to gain maximum profits.

Importance of market

The role of the market has increased with the introduction of the green revolution. Farmers now produce surplus and for profit, whereas earlier farming was subsistence and the role of the market was minimum (Fujita 2010). White (2005) observes that while every agricultural product has its own distinctive attributes in general, agricultural supplies are characterized by being seasonal, decentralized, sporadic and often perishable. The marketing of agricultural produce needs specialized attention due to the perishability and the bulkiness of the products involved. Basically Indian farmers move to mandis (regional market yards) to sell the produce where agricultural produce is auctioned in an open method.

In the context of developing countries, markets may be too thin leading to market power by one or other agent, or the risks and costs of participating in the markets may be too high (Hussain 2003). Social or economic barriers (market power, economies of scale, asymmetry or costly information) may mean that the poor are excluded from certain markets. A market failure can result in the increase of transaction cost and decrease in farmer's total revenue. The high transaction costs may keep many farmers away from participating in markets, since inadequate means of transportation (bad roads) and lack of access to telecommunications (high cost of gathering market information) make transactions more risky. Social networks continue to be an important means of acquiring information in rural communities and play a decisive role in the social and economic organization of farmers. However, they have been on the decline due to the growing importance of the market economy (Escobal 2001). In the market, price formation at the point of exchange with the producer is segmented not only by the specifics of class but also by custom. Prices are also affected by the association of each end product with a subset of trading firms, by territoriality or spatial network.

Role of agricultural extension

Aker (2011) observes that green revolution made farmers extremely dependent on the bureaucracy for information. In the early phase of green revolution, state approached farmers to disseminate the agricultural information. State extension services supported farmers in providing seeds, fertilizers, agricultural information and credit. A detail, note on the agricultural extension services is provided in Chapter Four. A watershed in the agricultural extension services is the withdrawal of state in the post liberalization period of agriculture, which paved way for the entry of private and non-state initiatives into agricultural extension services. Over a period, private multi-national organizations which gained prominence in the seed sector entered extension services as well. It is quite important to note that the state has become paralyzed in administrating the agricultural sector due to the liberalization policies. At the same time, on the other hand, access to 'information' has become one of the important factors to raise the productivity in modern agriculture process.

Vasavi (2012) observes that many small and marginal farmers are very much passionate in adopting new technology. These sections of farmers are strongly influenced by the landlords and their aspiration for upward mobility made them to try out new technologies. However, lack of state support, lack of availability of capital, resulted in the haphazard application of new technologies resulting in serious crisis. Meera (1995) argues that after liberalization Indian agriculture is treated as a major source of increasing export earnings rather than a source of subsistence. New agriculture policy concentrates on the export led development and it can be understood as the end of the import substitution model of agricultural modernization associated with the green revolution. The policies are mainly towards accumulation of capital and profit making. Green revolution seems to have intensified the external technology and science driven models which facilitated the entry of corporate groups into the agriculture sector. The GATT **(**General Agreement on Tariffs and Trade**)** agreement was made for 'survival of the collapsing capitalist system'. This is because, unlike the industrial sector, agriculture is the only one sector, which does not face any recession. Multinational companies try to

gain control over the food sector and practices of the village communities. 'When they start controlling the seed, they control, the farmer and gradually they control the food grain trade. And once multinational companies control food grain trade it means they control the nation' (Shiva 1991). Although new technology was designed to raise agricultural output and to benefit particularly small and marginal farmers and for the well-being of the rural inhabitants, but green revolution is captured by large and capitalist farmers due to their knowledge level and 'social network' within society (Servaes 2008).

Conclusion

Science and Technology have increasingly been used as tools in the development process carried out after independence. Within the larger frame of ideological state apparatus science and technology have played an uncritical role leveraging little hope for reflexivity. Science and technology, thus provided legitimacy for the skewed structure of development. Shiv Visvanathan, Ashis Nandy and Amita Baviskar provide a sociological critique of modern science and technology in India, which exposes the lapses of techno-science based and technocratic projects pursued by the state in the name of development and economic growth. They critique the modernity and development based on techno-science that institutionalizes violence as part of the development process. Although some Indian scholars have critiqued the hegemony of science (e.g. Nandy 1988), and technological determinism and optimism (Saith and Vijayabaskar 2008), still critical questioning of the role of science and technology in development, specifically in agriculture remains elusive. The critique on the role of development in shaping 'technology', i.e., how the politically and culturally loaded agenda(s) of 'development' influence the concept, design and access of 'technology'; is negligible in the public sphere and inappreciable in academia.

In the globalized context, relations of production are framed and constructed within the pragmatic point of market. Thus innovations are institutionalized in the hegemonistic capitalist economic development agenda (Habermas *et al* 1964). According to Ravetz (2003), hence, the priorities of research aimed at new technologies are not set by the scientific community, but by the external interests that supply funds. Economic factors

play a predominant role in new knowledge production that creates close relation between science and market. A science which does not fit into the category of market mechanism and the low level of returns, doesn't find a place in the research agendas of the scientific community. It is argued that development based on modern technologies focus on enhancing economic goals and ignores the social goals of poverty eradication and building of an egalitarian society. Planned development pursued by the state after independence is believed to have interstate and inter-regional economic and agricultural imbalances. Green revolution said to have exacerbated socioeconomic disparities between the large landowners and the small and poor peasant farmers.

The new regime of commercial agriculture triggered by green revolution paradigm caused distress and loss of livelihood for many small and marginal farmers. Green revolution has been seen as representing the convergence of interests of power groups formed by the rural elite at the local level, and the industrial elite at the national level. It is argued that it suits the interests of a large section of the international market, particularly the multinational firms, which specialize in producing petro chemicals and farm machinery. Modern technologies have succeeded in producing enough food for people, but there are dramatic failures at various levels of food production. After implementation of green revolution technology, it came to be known that it is not a runaway success due to deficiencies in itself and constraints peculiar to the Indian farms. With the adoption of the new technology majority of the small and marginal farmers are facing multiple problems like indebtedness, loss of production, unviable livelihoods, food insecurity, and continuous loss of their capabilities. Green revolution technology led to erosion of localized, heterogeneous forms of agriculture, the promotion of capital and external knowledge-based agricultural models for commercial purposes and corporate agribusiness interests (Schultz 1965).

In the present context of globalization and market economy information has become essential in agriculture for the fact that expensive, imperfect and asymmetric information generates several problems for farmers like increasing of risks associated with marketing, inefficient allocation of resources, higher transaction costs and poor decisions about

marketing (White 2003b). Overcoming information constraints to make markets work more effectively for the poor is one of the important challenges (Ferrand *et al.* 2004). However, it may be stated that in India, farmers are not properly organized due to lack of awareness, education and social barriers. It is also a fact that due to ineffective information dissemination facilities and lack of government monitoring numerous private players are seen promoting agricultural information of their choice. The next chapter discusses the issues pertaining agricultural extension services in India in detail.

Chapter - 4

Review of agricultural extension services in India

Introduction

Agricultural extension services in India evolved with the introduction of the green revolution. Dissemination of agricultural information is one of the key elements in promoting the adoption of new technology for increasing crop production. To meet the challenges of the food needs of an increasing population, acceptance of new technologies had become crucial for developing countries (Umali and Schwartz 1994). The economic performance of the agricultural sector is largely determined by the organized research and extension activity. The holistic approach of agricultural extension today goes beyond mere technology transfer, thus, includes sustainability of agriculture, development of human capital, enhancing the management of agricultural activities and improving technical skills of farm households and post-harvest technology (Swanson 2008). In the light of rapid changes in agriculture in India, as discussed in Chapter three the present chapter critically examines the transforming nature of agricultural extension in India.

History of agricultural extension

Globally, the first agricultural extension service of a modern kind came into existence as a result of the crisis of potato blight in Europe in 1845 AD. In Ireland potato blight caused severe distress as its population relied on potatoes for their diet. This crisis led to search for new methods and practices of cultivation of potato (Swanson *et al*. 1997). Otherwise, by the mid-eighteenth century, throughout Europe, progressive landowners (frequently aristocrats) and their agents and a few similarly minded farmers known as ‘improvers’ joined with ‘men of science’, and formed into agricultural clubs or societies. They organized regular meetings and demonstrations, locally and regionally, to exchange their ideas and information and discussed farming improvements. Many landowners were eager to learn the new ways of improving the production in order to increase the value of their estates and their rental incomes. By their initiative progress was made in science on agriculture, especially in agricultural chemistry and plant physiology (Russell 1996).

Lord Henry Brougham, an influential advocate of formal education for the poor and of mass adult education, founded the Society for the Diffusion of useful knowledge in 1826. Its objective was imparting useful information to all classes of the community (Society for the Diffusion of Useful Knowledge 1827). The earliest known Renaissance agricultural text was written in Latin by Pietro de Crescenzi in 1304 and was translated into Italian and French. This became the first book on agriculture to be printed in the mid-fifteenth century. Agricultural extension has been in vogue even prior to the emergence of modern forms of agriculture extension services.

In the Indian context, the seeds of agriculture extension were sown during the British administration. The Royal Commission on Agriculture made the first reference to the role of extension in the form of demonstrations and propaganda. It stated that, agricultural research can be of no help to the cultivators until its results are given to them in a form in which they may become a part of agricultural practice. Rao (2005) observes that the Famine Commission Report of 1880 led to the creation of the Departments of Agriculture at the Center as well as in the Provinces with the primary duties of undertaking scientific enquiry and improvement in agriculture apart from famine relief. A central department of agriculture was established by the British after the 1886 Orissa famine. Dr J.A. Voelcker, consulting chemist to the Royal Agricultural Society of England, laid the foundation for agricultural research in India in 1890s. The British administration also established agricultural departments in each of the provinces in India. In 1905 a full time director was appointed in every province to Demonstration Farms with staff to advise farmers (Mook 1982). On the recommendation of the Royal Commission on Agriculture (1928), the Imperial Council of Agricultural Research (ICAR) was established as a Registered Society in 1929. After independence, the Council was renamed as the Indian Council of Agricultural Research (ICAR) on June 10, 1948. In addition to the ICAR, a number of Central Commodity Committees were established to deal with research in respect of particular crops or commodities.

Generally, extension is associated with agricultural education and home economics for rural people. This education is practical, aimed at improving farm (Blackburn and

Flaherty 1994). According to Ensminger (1975) extension is a type of education whose purpose is to change attitudes and practices of the people with whom the work is done. Leagans (1961) conceptualized extension education as an applied science consisting of content derived from research, accumulated field experiences and relevant principles drawn from the behavioral sciences synthesized with useful technology into a body of philosophy, principles, content and methods. It focuses on the problems of out-of-school education for adults and youth. The word 'extension' is derived from the Latin roots 'ex' meaning 'out' and 'tensio' meaning 'stretching'. Extension thus means 'stretching out' implying a type of education which is stretched out to people in the rural areas. Extension evolved into science of developing capability of the people for sustainable improvement in their quality of life. According to Swanson *et al*. (1997), agricultural researchers had no time to interact with local farmers and as a result, they failed to create awareness about scientific methods among farmers. Similarly, it was difficult for all the farmers to visit the research stations and obtain first-hand information. Thus, there emerged the need for an agency, which was later named as extension agency, to disseminate the findings of research to the farmers and to carry their problems to research for solutions.

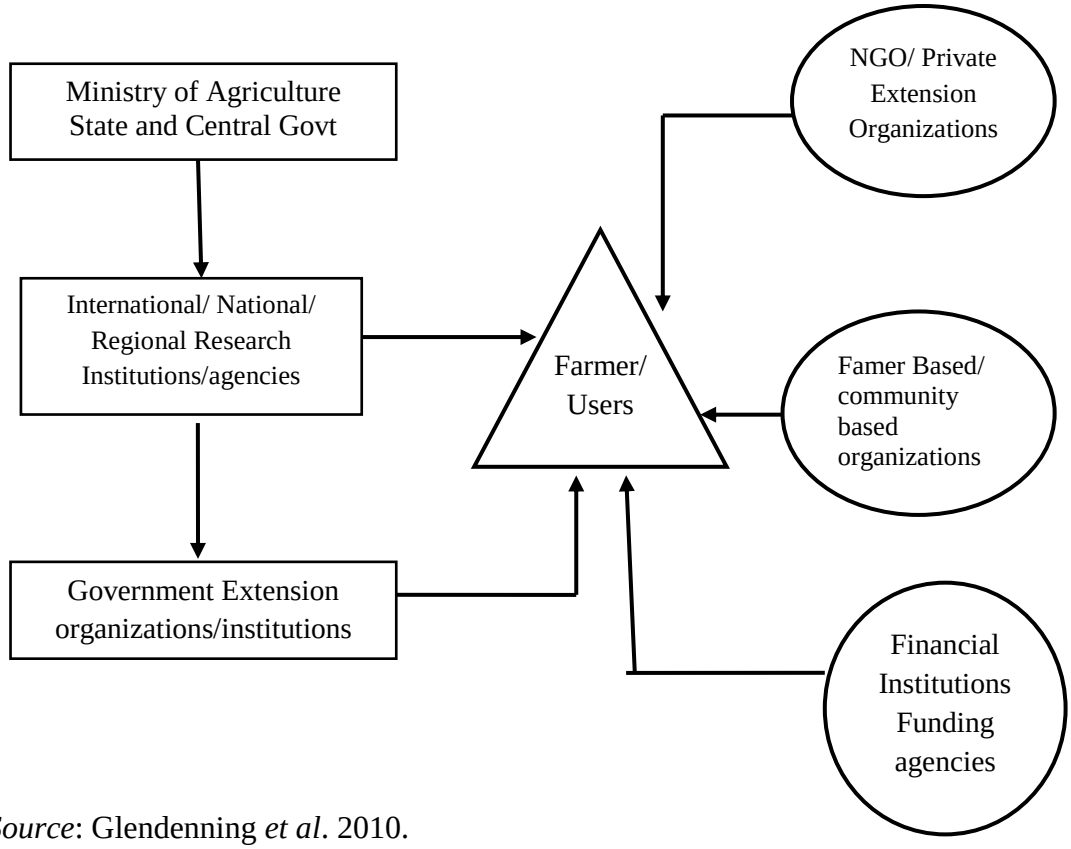
Agricultural extension comprises of professional agricultural experts, government employees, who are employed to teach improved methods of farming and demonstrating innovations (Davis 2008). National Commission on Agriculture 1976 refers to an extension as an out-of-school education and services to the members of the farm family and others directly or indirectly engaged in agriculture, and to enable them to adopt improved practices in production, management, conservation and marketing. Agricultural extension is not only about imparting knowledge and securing adoption of improved practices, but it also aims at changing the outlook of farmers to the point where they will be receptive too, and on their own initiative, continuously seek means of improving their farm occupation, home and family life in totality (Paul and Singh 1997). However, the common meaning for the term is that extension involves the dissemination of information to help farmers to form sound opinions and make good decisions. In agriculture, knowledge and decision making capacity influence the efficient use of soil, water and other inputs. Agricultural extension is primarily concerned with enabling farmers to make

informed decisions. Agricultural extension assembles, systematizes the information suited to a particular environment, and makes such information and new agricultural practices available to farmers.

Critical situations after independence such as famine, crop failure, soil exhaustion and heavy dependence on external markets for food grains, created an immediate cause for initiating an appropriate administrative or organizational structure of extension. The broad mission of the independent India's First Five Year (FFY) plan was to increase productivity, and reduce inequality. Both the objectives had extension implications. Increasing productivity alone was feared counterproductive as newly generated wealth may get concentrated in the hands of a few, leading to higher incidence of poverty. The need for rural extension service was widely emphasized by the FFY plan (Goyal 2010). India's 10^{th} and 11^{th} five-year plans emphasize agricultural extension as the key to increasing agricultural growth by reducing the yield gap and therefore stress the need to strengthen agricultural extension in India (Planning Commission 2005).

Recent attempts at understanding agricultural extension point out two major extension approaches. They are, farmer led extension and market led extension. Farmer led extension emphasizes on working with farmers and groups within a given locality to discover or develop and apply improved ways of managing the available resources, building on and expanding boundaries of their indigenous knowledge. It facilitates learning about new methods and techniques and encourages farmers' participation in agricultural decision making. It concentrates on access to information and building human and social capital. This type of extension is not necessarily technical in nature, but rather concerns about socioeconomic and institutional aspects (Kokate *et al.* 2009). Market led extension focuses mainly on raising agricultural production by using modern technologies. Here farmer is treated as entrepreneur or 'agripreneur'. Agriculture is viewed as an enterprise to understand cost benefit ratio and emphasizes on profit generation. It is not concerned with social and economic consequences. Market led extension services are beneficial to a particular section (large farmers) of the society (MANAGE 2008).

Figure 4.1: Integrated agriculture research in India



Source: Glendenning *et al*. 2010.

It may be ascertained from figure 4.1 that there are many organizations working for the development of agriculture and in dissemination of agricultural information to the farmers. Agriculture is a primary occupation in India and majority of the people depend on agriculture for their livelihood. To increase agricultural productivity and to make agriculture more sustainable and profit oriented many initiatives have been launched by the Government of India. India has one of the largest agricultural research systems in the world with a large pool of scientific personnel. Agriculture is a state subject under the division of powers between the centre and the state levels. The central government provides financial resources to states and works together with them. The state's administrative machinery is divided into districts, districts into subdivisions, subdivisions into blocks. A block[2] is a group of villages and is the basic unit for the administration of an agricultural extension programme. The present agricultural research system comprises of essentially two main streams, viz. The ICAR (Indian Council of Agricultural Research) at the National level and the Agricultural Universities at the state level. Besides, several other agencies such as the conventional or general Universities, Scientific institutions, and various Ministries/ Departments in the Center, and also private or voluntary organizations participate directly or indirectly in research activities related to agriculture (Sulaiman and Holt 2002).

There are 26 state agricultural universities, over 120 zonal research institutes and stations and 64 ICAR research centers. Indian scientists have created over 500 high yielding varieties of food crops. The National Agricultural Research System (NARS) primarily deals with educating farmers and in disseminating appropriate information through extension systems. The NARS employs about 125,000 people. The NARS includes approximately 30,000 scientists and more than 1,00,000 supporting staff actively engaged in research related to agriculture. Broadly, there are four major components of the Indian extension or transfer of technology system. They are

(i) Agricultural extension service with the state governments

[2] In Telangana, one of the field sites of the study, mandals were set up in place of blocks, which are much smaller than the agricultural blocks found in the country.

(ii) Extension programme of input industries in public and private sectors and NGOs

(iii) Extension education service with the state governments

(iv) Special rural development programmes of the central and state governments (Indian National Science Academy 2001; Jayade and Khot 2013).

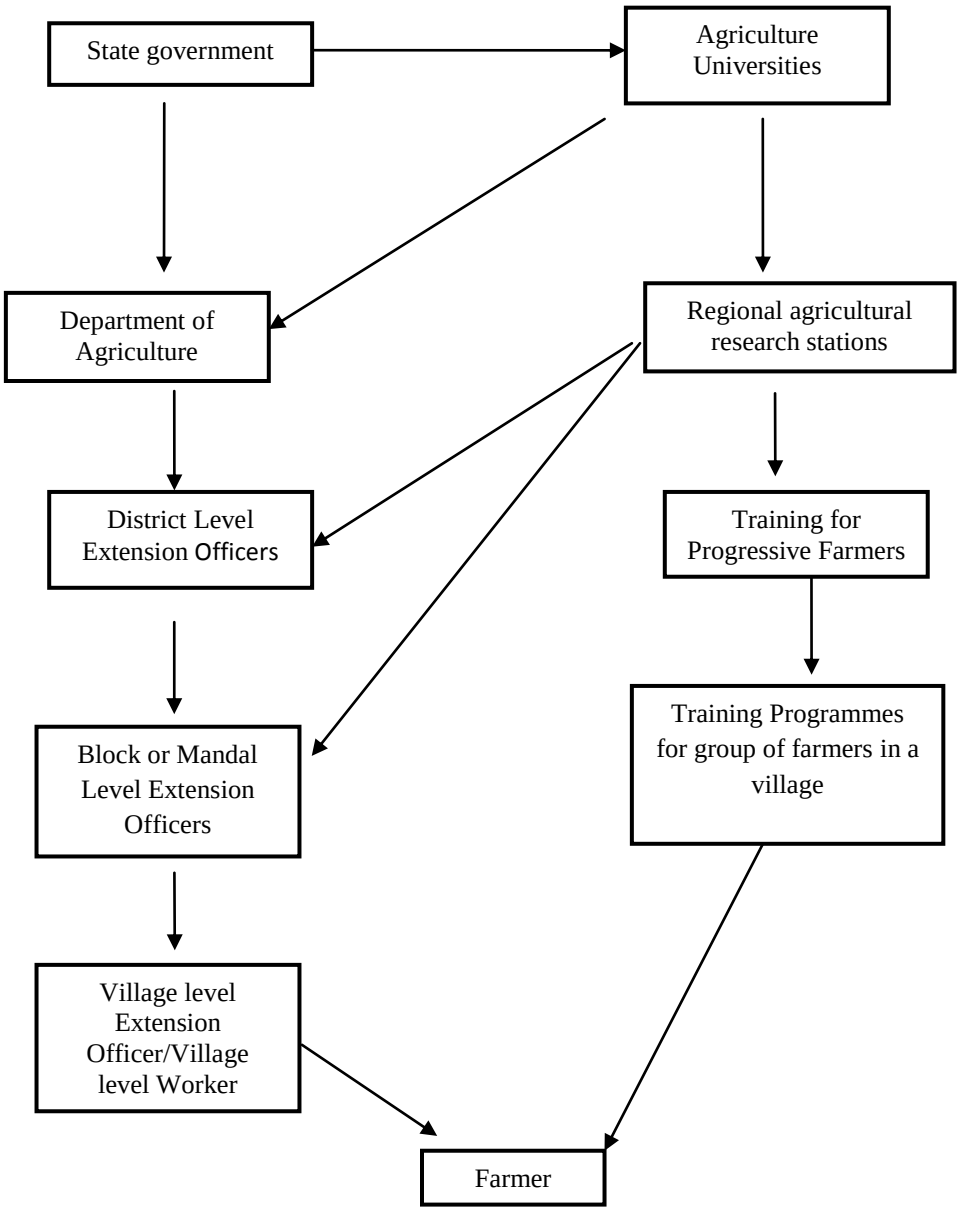
Review of agricultural extension approaches

The basic objective of agriculture extension is to transfer agriculture technologies developed by the researchers and scientists to the farmers. The extension worker acts as a bridge between farmer and the scientific community. Extension workers find information needs of the farmers and offers solutions in close cooperation with the scientists. In the following part a brief overview of the different agricultural extension approaches operating in the country is provided.

Extension with the state department of agriculture

Agriculture is a state subject. Hence, agriculture extension services are under the control and guidance of the state governments. The performance of agricultural extension varies from state to state. Every state Department of Agriculture (DOA) is the nodal department of agriculture at the state level. The personnel under extension work under the guidance of DoA. The district and Block level (in Telangana at Mandal level) are the key divisions of extension at the state level.

Figure 4.2: Agricultural extension at the state level



Although policies on agriculture are made by the central government, every state is free to formulate its own policies according to its needs and requirements. The state level agricultural departments play an active role in developing and transferring the technologies. DoA receives information from various sources, including the research stations of the Indian Council for Agricultural Research (ICAR). Typically, in agriculture

extension, information flows from top to bottom. The state agricultural university[3] (SAU) works in close tandem with the state governments. Under the umbrella of the SAU several regional agricultural research stations (RARS) have been set up to research on the local requirements. Thus the RARS also work in close coordination with the district and block level functionaries of the state DoA. Apart from this, the SAU and RARS conduct extension programmes on their own. Several central agricultural research institutes located in different states also take up the extension activities. .

To a great extent, the information that DoA provides relates to the transfer of technology to bridge the yield gaps between farmers' fields and research stations' relating to crop production (Sulaiman and Van den Ban 2003). Information from the state DoA is transmitted to district level officials who in turn transfer it to the Block/Mandal level. The Block/Mandal level officials take the information to the farmers concerned. However DoA and Agricultural Universities function independently to transfer the technology to the farmers. Asides Krishi Vigyan Kendra (KVK) of each district works in close association with the SAU and other functionaries of agriculture at the district level. Apart from agricultural extension, the functionaries of DoA also have to look after the agricultural input supplies in the market and subsidies. Over the years the state and central agencies of agriculture have evolved a number of agriculture extension programmes. They are discussed in the following part of the chapter.

Agricultural Technology Management Agency

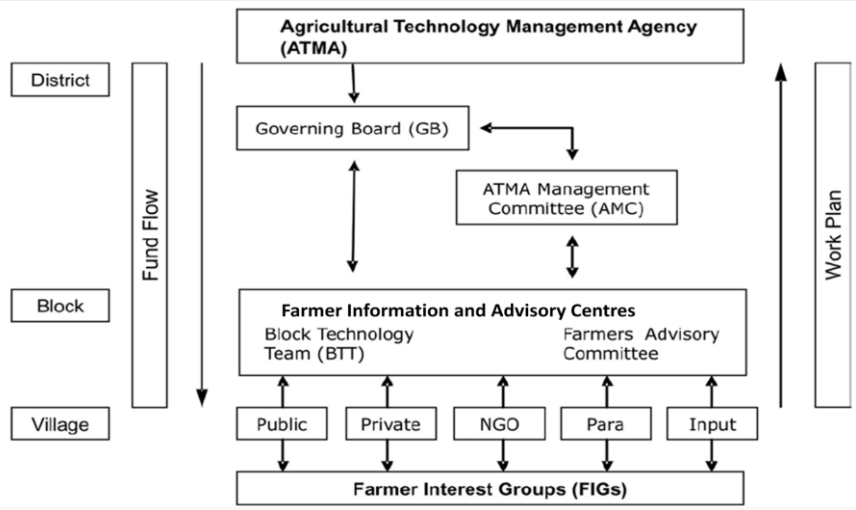
The Agricultural Technology Management Agency (ATMA) is a central government initiative launched in 2005-06 under the Support for State Extension Programs for Extension Reforms (SSEPER) scheme, which is implemented by each state. It is a semi-autonomous decentralized participatory and market driven extension model set up at the district level to transfer technologies of major crops. The pilot test was conducted in 1998 under the Innovation in Technology Dissemination (ITD) component of the National Agricultural Technology Project (NATP) with the support of the World Bank in 28

[3] Every state in India has at least one or more SAUs.

districts in seven Indian states. In 2005 the Government of India expanded the ATMA model to 252 districts under SSEPER, and then in 2007 to all the districts in the country (Glendenning *et al.* 2010).

The ATMA extension model is an attempt to bridge the link between research and extension units at the district level and to make farmers, state, private, and NGOs partners in the improvement of agriculture in the district. Personnel form these different organizations meet to discuss, plan, execute and organize extension programs at the district level. ATMA provides a platform for integrating extension programmes and the public research.

Figure 4.3: Organizational structure of the ATMA



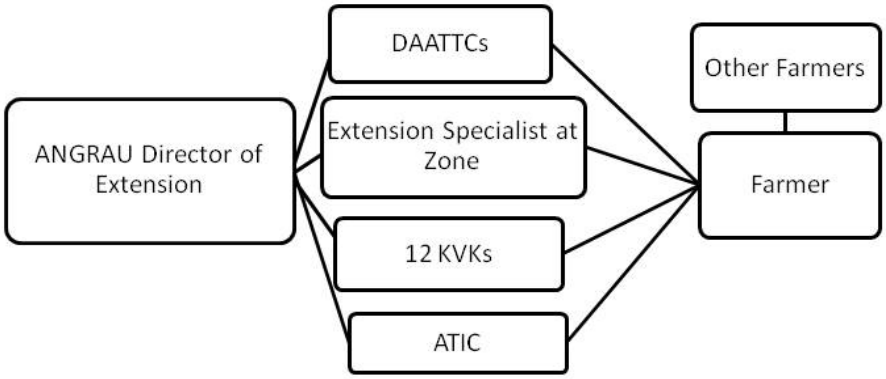
Source: Ferroni and Zhou 2012

Recognizing that there is a lack of local ownership at the block level and communication gap between local leaders and extension, ATMA strives for greater collaboration between Farmer Interest Groups (FIGs) and Self Help Groups (SHGs) with local NGOs and KVK. However, ATMA model has been criticized for making the extension system more bureaucratic because the chairman of the ATMA is the magistrate of the district (administrative head). ATMA also has been criticized for lacking accountability on its functionaries as, for example, the staff of state- extension departments cannot be held responsible, as they do not report to the district magistrate.

State Agricultural Universities

Over a period state agricultural universities have become key partners in agricultural research and development and transfer of technologies. Every state in the country has set up more than one agricultural university which serves the interest of farming community by taking up need based research specific to each state. State Universities act independently and act according to the needs of the farmers in the region. The research stations under the state agricultural universities directly or indirectly meet the demands of the local farmers. The research and technologies developed by the agricultural universities are transferred to farmers through agencies such as KVKs, DAATTCs and AITCs which have direct linkage with farmers. These organizations conduct demonstrations and trainings for the implementation of new technology produced by SAUs. Every university has specialized department in extension which conducts research in extension. These departments work in close tandem with the state department of agriculture. For example, in Telangana state, there is a unique model by name DAATT (District Agriculture Advisory and Transfer of Technology) centres. DAATT centers concentrate on generating new variety of seeds suitable for the district. DAATT centre works with the particular agenda of providing mini-kits to the farmers and conducting field trials. Scientists visit farmer's field once in a week to know the status of crop growth. DAATT centre conducts meetings twice a year, once in Kharif (June-November) and in Rabi (December-April) season. The DAATT Centre model is criticized for its emphasis on developing new crop varieties and on those farmers who are ready to accept the field trials. It is pointed out by the critiques that DAATT centre promotes 'pushed technology' rather 'demand technology'.

Figure 4.4: State Agricultural Universities – Example (ANGRAU)

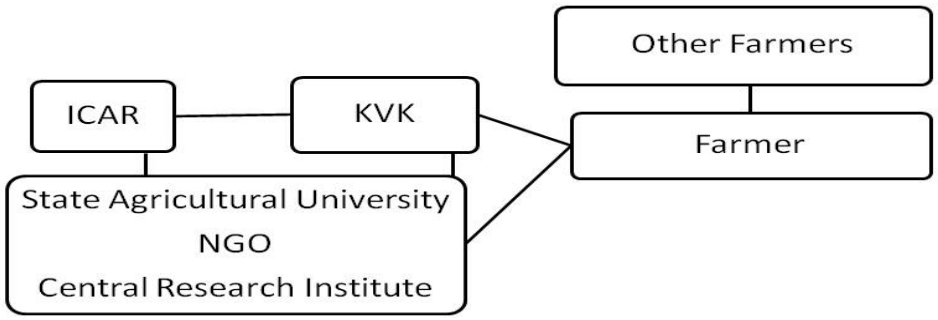


Source: Glendenning *et al*. 2010
Note: ANGRAU = Acharya NG Ranga Andhra Pradesh Agricultural University,
DAATTCs = District Agriculture Advisory and Transfer of Technology Centres
KVK= Krishi Vigyan Kendra, ATIC = Agriculture Technology Information Centres.

Krishi Vigyan Kendra

The Krishi Vigyan Kendra (KVK), or farm science center, is a multidisciplinary educational institution situated at the district level, with funding and technical supervision from ICAR. Currently there are about 569 KVKs set up in as many districts in the country. Each KVK is under the administrative control of a state agricultural university or an NGO, or a central research institute. Each KVK has about 20 scientists belonging to different disciplines like crop production, plant protection, agricultural engineering, and home science (Glendenning *et al.* 2010). Each scientist is expected to carry out two frontline demonstrations and two farm testing demonstrations every year.

Figure 4.5: Krishi Vigyan Kendra (KVK)



Source: Venkatasubramanian *et al*. 2009

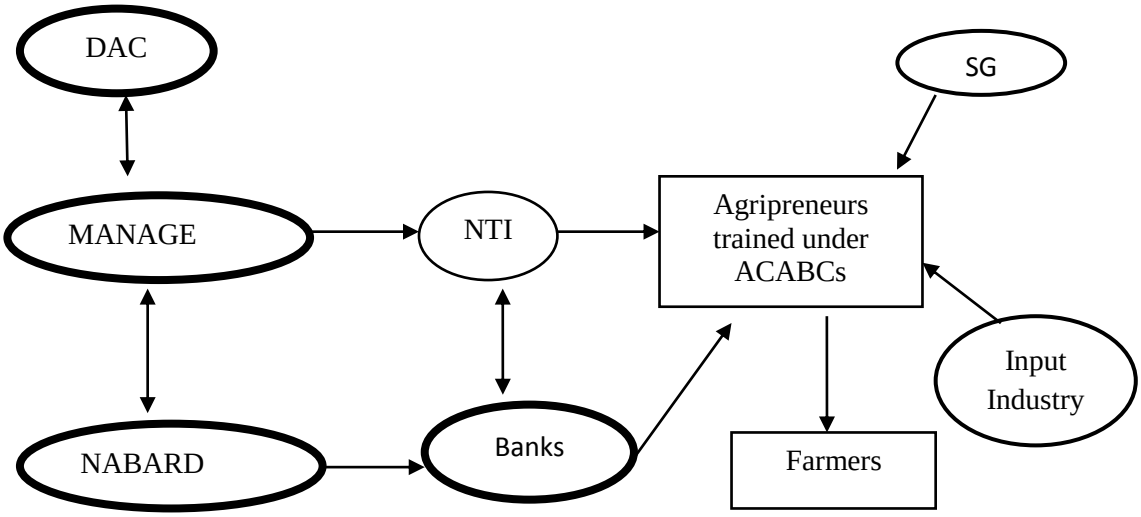
KVKs provide direct linkage to the farmer. They concentrate on transforming information generated at the state agricultural universities and ICAR. KVKs maintain close relationships with farmers and encourage sustainable agriculture. It creates a platform for farmers to discuss various issues on agriculture like pest control and usage of pesticides. This extension agency mainly concentrates on implementing new technologies at farm level. KVKs take up assessment and refinement of technologies through learning programs and field demonstrations. KVKs performance is measured by the number of participants attending workshops, the percentage of participants that adopt the technology/skill after the workshop, and changes in the participants' income etc.

The Agri-clinics and Agribusiness Centers (ACABC) Scheme

The agricultural landscape in India is gradually expanding to embrace the business mode. With a view to supplement the efforts of the government extension system, to make available supplementary sources of input supply and services and provide gainful employment and entrepreneurial opportunity to unemployed graduates by making them entrepreneurs. The Agri-clinics and Agribusiness Centres (ACABC) scheme was launched in 2002. Agri-clinics are envisioned to maintain close link between universities and farmers. ACABCs are supported to fill the gap in the public sector extension system by providing inputs as well as agricultural information and advices regarding the input

use. ACABCs have been set up to supplement the public extension system and increase the availability of inputs and to provide information services for farmers. This programme is also aimed at providing employment to agriculture graduates at the town and village level (Global Agri System 2008). ACABCs envisage providing agricultural advisory services to farmers through technically trained agricultural graduates known as 'agripreneurs'. Presently every state has been adopting this scheme to overcome the limitations of public extension system. There are currently 41 agri-clinic and agribusiness training centers working throughout the country.

Figure 4.6: Agricultural information and communication through ACABC



Source: PGDTMA (Post Graduate Diploma -Technology Management in Agriculture) Text Book

DAC: Department of Agriculture and Cooperation; MANAGE: National Institute for Management of Agricultural Extension; NABARD: National Bank for agricultural and Rural Development; NTI: National Training Institute; SG: State Government.

Farmer Field Schools

Since 1990s, Farmer Field Schools (FFSs) have been established by the Government of India with the assistance from Food and Agriculture Organization of the United Nations (FAO) and European Union to provide integrated pest management (IPM) for cotton farmers. It is implemented in the states of Maharashtra, Karnataka, and Telangana. The

National Policy for Farmers provides guidelines for FFS, which involve farmer-to-farmer learning from the fields of progressive farmers. The FFS are linked to KVKs to strengthen technology dissemination (India, Commission on Farmers' Welfare 2005). The FFSs is a participatory training method that involves learning by doing. Participants in the FFSs are selected with community involvement and are expected to contribute to the community after learning and training at KVKs. Global impact study of FFSs states that the use of toxic pesticides was reduced from 14 to 4percent (Mancini 2006; Davis 2006)

Critique of traditional extension services

Agricultural extension has been recognized as an essential mechanism for delivering information and advice as an important input into modern farming. A number of studies report that appropriate, continuous, and timely advice about farming is not reaching farmers thus hampering the productivity. Agricultural information in traditional extension system flows from top to bottom and is supply-driven rather than demand driven. This is one of the important shortcomings of the information provided by the public extension.

After liberalization the state has withdrawn its major support of agriculture. Since 1998 there has been no recruitment of the staff because of which extension services are not reaching the farmers. Umali and Schwartz (1994) report the shortage of agricultural extension across the country. Due to lack of funds many extension activities, such as training for the staff, capacity building and other operational activities have been curtailed. Government dominated extension bureaucracies are no longer financially viable. The problem with the traditional agricultural extension services is that they have become more bureaucratic with rigid hierarchical structures. Also the fact that the extension organizations concentrate on raising agricultural production without identifying the information need of small farmers and resource poor farmers. In traditional system information is pushed to the farmer and lacks the feedback mechanism (Maru 2004). Moreover, the existing models of technology transfer have been found to be of little relevance in the present context of agriculture which is highly knowledge driven. There is a growing technology-knowledge gap which is threatening to make agriculture more

vulnerable.

It is viewed that the weak linkages between the extension and research systems is one the important factors contributing to the failure of the traditional extension system. Lack of accountability and political commitment are also reasons for the ineffective functioning of the traditional extension system (Zijp *et al.* 2001). However the traditional channels of communication (extension system) still remain important because majority of the small and marginal farmers depend on them. It is argued that the public extension system which responded adequately during the green revolution era has not been able to keep pace with the contemporary challenges emerging from domestic as well as an international agricultural market (Patil *et al.* 2001).

Private-sector initiatives in agricultural extension

The Policy framework for agricultural extension notes that public extension by itself cannot meet the specific needs of various regions and different classes of farmers (Department of Agriculture and Cooperation 2000). Private-sector extension in agriculture is becoming more important and is seen as a substitute for the public extension system. Different private sector approaches have been growing over a period and they are considered to be reaching a greater number of farmers. Chandrashekara (2001) argues that many private initiatives are providing different kinds of agricultural services like providing farm inputs, technical information and supply of specific commodities and credit, etc. Private initiatives have gained prominence in a short period of time because they claim to be providing a variety of services through single window approach. Some of the notable private extension initiatives are e-Choupal of ITC, Haryali Kisaan Bazaars of DCM Shriram Consolidated Ltd (Farming First 2009). Other private extension services are operated by big houses like Tata, Rallis, Mahindra and Mahindra, Godrej, and Reliance. Microfinance institutions like BASIX, which operates in 16 states in India has also began agricultural extension initiatives. BASIX provides not only farm related information to increase productivity, but also informs farmers about post-harvest aspects such as market trends and value addition to commodities. However, private extension services are strongly criticized despite the services they provide. Critiques

argue that such services tend to be crop-specific, do not work towards an integrated farming system and rarely rely or build upon the traditional knowledge of the farmer. Private extension services mainly work to a profit motive and they raise the productivity without bothering about sustainability.

Over a period there has been a drastic increase in the number of small land holdings. About 81 percent of Indian farmers cultivate an area of less than 2 hectares (NSSO 2006). The majority of these holdings is located in rain-fed areas. The information needs of these resource poor farmers operating mostly under rain-fed conditions differ substantially from those of irrigated areas. Due to higher levels of poverty in rain-fed areas, improved access to agricultural information is essential to increase the productivity and profitability of these farmers (Planning Commission 2006). It is viewed that there should be a stronger and effective information delivery system that can facilitate information access for the small and marginal farmers.

It is viewed that public extension service is only the affordable source of information for small and marginal farmers. However, due to the inadequate state extension services information to these sections of farmers has not been accessible. Moreover, prejudices on the part of the extension staff who favour visiting progressive farmers keep small and marginal farmers away from the state extension services. Due to lack of political voice and social status these sections of farmers cannot demand appropriate information (Suresh 2005).

Access to quality information by different category of farmers is uneven and the content of the information provided by conventional agricultural extension approaches appears to be irrelevant. Inappropriate or poor quality information has been a key hindrance to farmers' use of state extension services. The information provided by the extension organizations should have value addition and the content must be location-specific and useful to the farmers (Bheemick *et al.* 1999). Therefore, a need has been felt that agricultural extension must create alternative structures that are both politically and economically sustainable, and help farmers in accessing information. The National Sample Survey Organization (NSSO 2005) survey shows that 60 percent of farmers had

not accessed any source of information on modern technology in their farming practices. Of those who had sourced information, 16 percent received it from other progressive farmers, followed by input dealers. There is a large network of about 2.82 lakh agri-input dealers in the country, who have become the major source of agricultural information. However, nearly 90 percent of the agri-input dealers operating in the country do not have any formal agricultural education. They are basically traders who operate with a profit motive (*ibid).*

Need for alternative models of agricultural extension

The contemporary agricultural scenario presents a picture of multiple challenges. These include (a) globalization which makes small and marginal holdings vulnerable, (b) liberalization leading to the removal of trade barriers and entry of private players into agricultural information dissemination, (c) emphasis on privatization, leading to the withdrawal of a state from extension services, (d) commercialization of agriculture, (f) concern for sustainability and ecology and environment degradation and (h) onslaught of genetically engineered agricultural inputs. Other challenges include limited land and water availability, degradation of natural resources, climate change, the promotion of high-value agriculture, and increasing population pressure (Murphy 2012).

As a result, Chang (2009) observes that, agriculture scenario has become more complex and farmers' access to sources of reliable and relevant information has become increasingly important. To face these challenges, there is an urgent need for an effective extension system which can help farmers overcome the difficulties in agriculture. Farmers need timely and appropriate information at minimum cost. Continuous two-way interaction between farmers, agricultural scientists and extension personnel is the critical missing component of present day agricultural extension. Richardson (1996) contends that there is the emergence of knowledge workers in place of extension worker and there is a need for bottom up and demand driven extension approaches.

In the contemporary agricultural scenario, farmers need a wide range of information regarding best practices, production technologies for crop production and also on post-

harvest processes. Farmers also require market price information, storage, handling, etc. (Sulaiman and Van den Ban 2003). Farmers need a diverse range of information such as access to credit, technologies that suit the agro-climate condition and reliable source of knowledge and information. To make appropriate decisions, farmers need constant information about appropriate agricultural technologies, availability of inputs, etc. from different sources (Sadamate 2000).

Need for ICTs in agricultural extension

Sharma (2012) observes that modern communication technologies when applied in agriculture can help farmers in active participation, reducing the input cost, increasing the output, enabling further dissemination of information and sharing of knowledge between farmers and scientists. It is being recognized that ICTs could be the tools in agricultural extension as they enable information resource development and help in connecting new information channels to the farmer's in need. ICTs can be powerful tools in removing information asymmetries that often prevent the poor farmers in remote areas from accessing information (Maximo and Von Braun 2005).

ICTs have three defining characteristics, convergence, speed, and comparatively low operating costs. These characteristics offer a broad range of possibilities for agricultural information collection, manipulation, transmission, storage, and presentation, which can be effectively applied in rural contexts to improve farmers' income. ICT's can allow farmers to access new ways of networking and communication (Aker 2011).

Application of ICTs in the Indian context

According to the UNDP (2001), 'information and communication technology (ICT) has become an indispensable tool in the fight against world poverty. Since the majority of the poor is located in the rural areas, use of information technology for enhancing agricultural production and productivity could have immediate impact on the poverty situation. ICTs are believed to overcome the barriers of the traditional extension system to a greater extent. ICT based agricultural extension is seen as a more reliable medium to deliver timely information on new agricultural technologies. It is suggested that the usage

of ICTs can deliver speedy and appropriate information to the farmers on cultivation, cropping patterns and labour inputs. The role of ICTs in agricultural development can be viewed in terms of the role of information provision and its use in decision-making at the farmer level (Streeter *et al*. 1991).

Yadav (2003) and Chandra *et al*. (2011) observe that e-Agriculture is an emerging field focusing on the enhancement of agriculture and rural development through improved information and communication processes. e-Agriculture involves conceptualization, design, development, evaluation and application of ICTs in the rural domain, with a primary focus on agriculture. World Summit on the Information Society (WSIS) identified and declared e-Agriculture as one of the important initiatives in agriculture that can connect the rural poor and farmers globally.

It is argued that the Indian agricultural sector can make use of ICTs to disseminate the right information at the right time as ICTs can help in disseminating information within less time and effectively (www. e-agriculture.org). Wireless communication networks and GIS-based Agra-software technology has potential to cater to the broader information needs of the farmers. Updated information on weather, farming technologies, latest agricultural practices, commodity prices, market trends, international trade, etc. may be provided through ICTs (Mangstl 2008). ICTs have the potential to share and store the information of farmer's crop database which is most useful because it includes the kinds of crops, the size of the cultivated area, time of harvest and yield, etc.

It is believed that ICTs can play a critical role in sustainable agriculture and meet information needs of a large disadvantaged farming community at a minimum cost. Even though infrastructure facilities are very poor with ICTs it is possible to disseminate information to the targeted farmers. Internet, being the popular medium of communication and information, websites or e-portals pertaining to agriculture is proposed to disseminate information to the farming community. ICTs can act as catalyst to accelerate agricultural growth, to facilitate better information access, to develop the efficient feedback mechanism and to empower small and marginal farmers. Nooji and Overbeek (1994) observe that ICTs provide scope for information exchange between

farmers, agribusiness and state agencies which has become a key instrument in operation of modern extension services.

National policy on ICT in agricultural extension

The policy framework for agricultural extension (Ministry of Agriculture 2010) highlights the potential of ICTs to improve the quality and accelerate the transfer and exchange of information to farmers. ICT is given a high priority as a tool for improving the marketing aspects of farm enterprises. It envisages that ICTs could be useful tools to increase connectivity between various extension approaches. It places great emphasis on harnessing information and communication technology for agricultural extension. It is envisaged that extensive use of modern information technology will promote communication between researchers, extension workers and farmers to transfer technologies and information effectively. National policy for farmers (2007) indicates that the potential of ICT would be connected with establishing 'gyan chaupals' (knowledge centers) in villages. Document of ICAR framework for technology development and delivery system in agriculture (2008) outlines the need for the construction of agri- India knowledge portal. It is an electronic gateway for development of content in regional language as well as in English on crop cultivation practices. It is proposed that the portal would serve as a platform for facilitating of interaction among researchers and extension personnel through high speed server intranet (ICAR-FFTDDSA 2008).

It may be said that although many agricultural extension programmes have been using electronic space, but they are strongly criticized for one way communication. The traditional media had launched programmes such as Kisan Channel on Doordarshan, which telecasts agriculture related programs. Through the All India FM Transmitter Network, 96 stations of All India Radio broadcast half-a-hour agriculture programs. 'Kisan Call Centers' is another central government scheme introduced to provide information to farmers on demand. This telephone communication program began in January 2004. Farmers call a common toll-free number and access expert advise between 6 AM to 10 PM from Level 1 experts (agricultural graduates) from 13 regional centers

located across the country, in 21 local languages (Glendenning *et al.* 2010). However, some of the challenges to the scheme include lack of awareness, the relative inexperience of Level 1 operators, and weak links between farmers and scientists.

ICT based extension initiatives

There are a number of web-based ICT initiatives in agriculture. Some web portals like the Tamil Nadu Agricultural University's Agritech web portal act as information repositories. Another web portal AGMARKNET provides marketing information on the latest commodity prices from 2,800 major agricultural produce wholesale markets. Other web portals include Agropedia, AGRISNET, DACNET, e-Krishi, Agriwatch, and i-Kisan (Saravanan 2010).

There are a number of initiatives using mobiles to communicate information directly to farmers. These include IKSL (IFFCO Kisan Sanchar Ltd. in collaboration with Airtel), Mandi on Mobile (BSNL and Uttar Pradesh Marketing Board), Reuters Market Light, and Nokia Life Tools. Most of these approaches provide market information through SMS or voice messages, or question-and-answer approach. Other projects, such as e-Sagu and Lifelines, also use mobile phones in combination with computing technology to provide expert advice to farmers' queries. These approaches are ICT-driven, and support existing extension services provided by NGOs. The three properties of digital networks are decentralized access, simultaneity and interconnectivity have produced strikingly different outcomes in the private digital space and made access to internet by public easy (Sassen 2002). Here, some of the popular ICT based agricultural extension initiatives in India are discussed.

IKSL – Voice message based model

IFFCO Kisan Sanchar Limited (IKSL), a joint venture between IFFCO and Airtel, were launched in 2007. This venture aims to empower farmers to make decisions by providing agricultural information. IKSL is leveraging the benefit of the mobile phone in the hands of the poor farmers and converting it to a 'dynamic house of knowledge'. Farmers receive five voice messages on their mobile phones in the area of their interest through

IKSL value-added services. Farmers also get support from a helpline, which is managed by agriculture graduates and is connected to agriculture experts from different areas of specialization. These experts are connected to the farmers through teleconferencing facilities at the helpline.

In the IKSL venture, IFFCO is the domain expert and Airtel provides the mobile-telephone network for the service. The various content/knowledge partners are State Agricultural Universities (Kerala and Madhya Pradesh), the Department of Agriculture, the Indian Meteorological Department, the Directorate of Marketing and Inspection, Centre for Agriculture and Biosciences International (CABI), the M.S. Swaminathan Research Foundation (MSSRF). NGOs help in mobilizing and creating awareness to farmers by providing information regarding better farming. These NGOs also help in developing the localized content of voice messages that can be understood easily by farmers. The GSMA Foundation (Group Special Mobile Association) helps in capacity-building at IKSL and in strengthening the infrastructure for quality management and up-scaling of the service delivery platform (World Bank 2011; Report Number 64605).

Reuters Market Light (RML)

The RML model is a business model which delivers information to farmers through SMS according to their needs. It is a mobile based information delivery system and an innovation that was conceived by an RML team member at Stanford University in the Reuters Digital Vision innovation program. The RML model follows the three golden rules such as timeliness, localized content and relevant content in the delivery of information. It is a system which tries to create awareness and give alerts in case of emergencies. The messages do not necessarily contain technological details, but are conveyed in such a way that the farmer should be able to take action on the information received. The most important benefit of mobile-based information is that it facilitates two-way communication between the information provider and the farmer (Mittal and Mehar 2012).

RML's service works across all telecom service providers and mobile phone handsets.

RML provides four small text messages (SMS) to the registered farmers. These messages are delivered for two preferred crops as indicated by the farmer and sent on a pre-paid subscription. The messages are related to the crop prices in the nearby markets, agricultural news on the specific crop, input prices, advice to improve yields, and weather forecast (district level - 50 KM radius). The information is available in eight local languages. There is a customer care center with a toll-free number that farmers can access if they need further information. All queries are answered in the language preferred by the customer. Farmers also have the option to change their crop or market preference at any time during the subscription period.

The process of subscribing to the service is through purchasing a subscription card from a rural retail outlet. RML subscription cards are available at rural retail outlets and at RML's own distributors. Based on the profile of the farmer, the personalized SMS service is activated immediately. RML covers about 250 crop varieties across more than 1,000 local markets and 3,000 weather locations in India. The RML team consists of several hundred content professionals and agricultural market reporters spread throughout the country. RML operates on Reuter's principles of speed, accuracy and freedom from bias. Presently RML has 1.3 million subscribers in about 50,000 villages across 13 states in the country who solicit information on more than 300 crops. The RML trial project was first started in Maharashtra in 2007. To understand the farmers' needs RML team spent about a year conducting pre-testing services and gathered information regarding the perception of SMS based information services among the farmers. RML has collected service charges of Rs 175 for 3 months, Rs 350 for 6 months, and Rs 650 for 1 year (Kasina 2011). Marketing activities, including organizing farmers' meets in villages, participation in agriculture fairs, etc., are undertaken by the sales and marketing teams of RML to create awareness. RML support is provided to the farmer throughout the crop cycle (Mittal *et al*. 2010).

Kisan Sanchar

Kisan Sanchar is an interactive platform for scientists, agricultural experts situated in various universities, KVKs and other agricultural institutions for sharing technology and knowledge with registered farmers in local languages. This was initiated by Sristi Gyan Kendra. It is a platform to communicate or to broadcast text and voice messages on the mobile phones of individual farmers. Kisan Sanchar enables companies and organizations to send personalized and interactive outbound text and voice broadcast messages at the touch of a button.

The first service of Kisan Sanchar was launched as a pilot project to deliver price information to paddy farmers (about 250 farmers) in the district of Kurushetra in Haryana state during the 2008 kharif season. Later it was continued from May 2009 to November 2009 through the KVK of Kurushetra. Kisan Sanchar sends messages to farmers' mobile phone, to ensure that the information made available to farmers could be put to use. Training workshops and awareness campaigns were organized before the initiation of the service. Later, this system was changed to a computer-based application and an online content-management system (The World Bank Report Number 64605). Kisan Sanchar employs volunteers who conduct surveys in villages and add farmers to the database, and educate them on how they can benefit from Kisan Sanchar.

There are three key partners in the functioning of Kisan Sanchar. They are 1) Administrator - The main portal hosting rights are with Kisan Sanchar and messages are transmitted through the administrator. 2) Collaborators (Content partners) - KVKs and NGOs are the collaborators (collaborators fund the project for farmers). They develop the content and post it on the portal through personalized, secured access to the content management system. 3) Farmers - farmers receive, free of cost text messages and voice messages in their local language. At present, it provides services to more than 62,000 farmers across 75 districts in nine states (Haryana, Punjab, Himachal Pradesh, Jammu & Kashmir, Delhi, Rajasthan, Gujarat, Uttarakhand and Uttar Pradesh). These are operating through ten SAUs and their related KVKs.

e-Choupal

e-Choupal is one of the private initiatives in agricultural extension which integrates information services with market facilities. It was started in the year 2000 by ITC. ITC Limited or ITC is an Indian conglomerate whose headquarters is located in Kolkata. Its diversified business includes five segments: Fast Moving Consumer Goods (FMCG), Hotels, Paperboards & Packaging, Agri Business & Information Technology. ITC was established in 1910 as the Imperial Tobacco Company of India Limited, the company was rechristened as the Indian Tobacco Company Limited in 1970 and further to ITC Limited in 1974. The e-Choupal initiative is a part of ITCs Agri business and Information Technology initiative. e-Choupal was started with an aim to provide market related information through the kiosks to farmers to sell their produce at the most appropriate prices. e-Choupal consists of 6,500 kiosks, serving four million farmers in 40,000 villages in 10 states (ITC 2010). e-Choupal refers to a kiosk located in a village equipped with computers with internet access. e- Choupal is managed by Sanchalak, a local farmer, who bears the operational costs. The e- Choupal aims to provide an alternative marketing channel, information on local district weather, agricultural best practices, soil tests, feedback on quality of crops, and input sales to farmers (Marco and Zhou 2011). The main purpose of the kiosks is to reduce procurement costs and provide timely information. Farmers, who access information, prices of particular products, can sell their produce directly to the ITC or at mandi (Annamalai and Rao 2003).

It has been reported that the e-choupal initiative has a positive effect on the incomes of the farmers where it is functioning because farmers access appropriate information from the village internet kiosks. e-Choupal promises to bring efficiency to the supply chain by removing intermediaries and by reducing transaction costs and enabling farmers to make decisions. This service also concentrates on providing the timely and scientific advices to the farmers in order to increase productivity. Its service also deals with providing inputs to the registered farmers (Kumar 2005).

Conclusion

The discussion so far brought out the complexities of India's agriculture, reflected in the presence of small and marginal farmers, varied farming systems, inadequate agricultural extension services, and the emergence of ICT based agricultural extension methods. Despite strong posse of agricultural extension functionaries and state led approaches a majority of the farmers doesn't have access to appropriate sources of information. Many public and private extension service initiatives have taken place to provide timely and appropriate information to farmers. However, it may be said that yet farmers lack timely and appropriate agricultural information. In this context the emergence of ICTs has been viewed as a ray of hope to meet the challenges of conventional agricultural extension services and to overcome the traditional barriers of communication.

In the today's context what is required is to have an effective extension system to meet the needs of farmers in general and marginal and small farmers in particular. An extension approach which can address the diverse set of problems and offer relevant technologies integrated with appropriate services at the farmer level is the need of the hour. The new agricultural extension approach should be able to address relevant issues beyond crop production, such as storage, processing, market access and trade, agribusiness management and entrepreneurship, natural resource management. The research and extension linkages should strengthen to improve quality and effectiveness of research and extension system. The extension system should be broad-based and inclusive. Innovative and decentralized institutional changes should be introduced to make the extension system accountable to farmers. In this context, a non-state ICT initiative in agricultural extension has been studied and based on empirical observations the thesis presents the nature and form of such initiatives and brings out the complexities rooted in the social context of operationalization of these initiatives. The next chapter presents the empirical data on the non-state ICT initiative and also makes a comparison with the data from the field site where conventional agricultural extension services are available.

Chapter - 5

Non-state ICT agricultural extension initiative, i-krishi[4]

Introduction

Indian agriculture is based on small, inefficient landholdings, and structured around subsistence. The land holding of a typical Indian farmer is small (i.e. Below two acres) and has been vulnerable to natural economic and technological changes. Traditional farming practices and unpredictable weather patterns left India with an underperforming agricultural sector. Even today majority of the Indian farmers follows traditional agricultural practices operated in an archaic fashion that limits its productivity.

Over the years agricultural information has become a key input in crop production. In fact, it is said that robust extension service machinery enabled the success of agriculture during green revolution period. However, in the last two decades, we may find the decline in the state agricultural extension services which have been concentrating more on the bureaucratic work rather than disseminating agricultural information to the needy farmers. Critics point out that factors like ineffective extension services, unresponsive bureaucratic system, weak market orientation and one way agricultural communication pattern have made agriculture a risky enterprise. It is being realized that through the conventional extension system information is not reaching the needy farmers, and the village level extension worker seldom visits farms. The conventional agricultural extension system has limitations like one way communication, top down approach and supply driven rather than demand driven. It is reported by many that the delivery of agricultural information through government extension services is ineffective and incapable to cope with the rapid changes that are taking place in agriculture. Timely and appropriate information still remains a dream despite several attempts and the developmental programmes initiated by the state.

[4] Pseudonym used for the ICT based private agricultural extension which was taken up for the study

i-krishi: A non-state ICT agricultural extension initiative

Among many ICT initiatives in agricultural extension i-krishi is the most widely used and popular one. i-krishi was started in the year 2000 with an objective to provide linkage between farmers and the agricultural markets. The major focus of the initiative is to provide information about market prices on different crops to farmers at the village level. Traditionally, agricultural produce is sold in the mandis[5]. Mandis are the age old major agricultural marketing centers in rural areas. A typical mandi is a local market, which is specific to a particular geographic location where a large majority of the small and marginal farmers sell their produce.

Mandis are largely controlled by middlemen who are said to make most of the profit. They decide the price of the product, usually, a low price when compared to the national and international market. Mandis are laced with problems of corruption, inefficiency and secretive and unfriendly transactions occupied by middlemen interested in making profits at the expense of farmers' net returns. Usually the middlemen operate as a cartel preventing healthy competition to safeguard their economic and political interests. Farmers often depend on middlemen, who is also referred to as traders, for their credit needs also. Dependence on mandis and middlemen for marketing and credit needs is complete as there is a lack of alternative mechanism both for marketing the produce as well as for credit needs. Against the backdrop of such agricultural produce market situation, i-krishi initiative came up to offer choice to sell their produce at a better price. It is positioned as an alternative to traditional modes of procurement where farmers travel to the mandi to sell their produce.

Before discussing the organization structure and functioning of i-krishi it is important to discuss how, when and why farmers get in touch with i-krishi. It is important to discuss where and how i-krishi is established and what is the criteria for selecting the particular villages. MC (Pseudonym of the organization that started the ICT initiative in agricultural

[5] Mandi is a Hindi term referring to the conventional place where buyers and sellers assemble. It basically refers to agricultural produce market. The social organization of mandi is controlled by customary practices.

extension) conducts the meetings in the regions where the commercial crops are cultivated. It conducts meetings with the farmers and creates awareness among the farmers about the marketing/procuring their produce at hub (place where the procurement takes place) and how it reduces the time and transportation costs and increases transparency. Based on the interest of farmers the MC will set up i-krishi centre in that particular village.

Till today there is no organized method of registration in i-krishi, any farmer can use these services for free of cost. MC selects the agent who is known as a Promoter, who primarily acts as the intermediary between farmers and MC. i-krishi claims that it provides number of agricultural services such as information on modern agricultural scientific practices, weather report, insurance policies, soil testing, field trials, market information and price trends, government policies, etc. But i-krishi mainly concentrates on the direct procurement of the produce from farmers. i-krishi provides information on price trends of particular crops on a daily basis and farmers are encouraged to sell their produce at the MC-hub, which is located near to the village (generally, within a radius of 10 km). The location of MC hub has become an advantage for farmers as the traditional mandis are located far away (generally about 25km away from the village).

However, it was reported by farmers that selection of markets is determined by; the time needed to reach the nearest paved road, the time needed to reach the nearest market and the availability of transportation facilities. Thus easy access made farmers turn to MC hub to sell their produce. The reduction in the transportation costs and reduction in time led to wider acceptance of MC hubby farmers. Farmers report that they are able to save their time by selling at MC hub when compared to the traditional market where farmers were made to wait for 5-6 hours or sometimes 24 hours to sell their produce.

Model of i-krishi

Bloome (1993) suggests that the private extension sector is seen as an alternative to public extension that delivers advisory services in agriculture. Van den Ban and Hawkins (1996) states that in private extension farmers are expected to share the responsibility for the service and pay all or part of the cost. i-krishi agricultural extension system is a private initiative available at the village level, however, at free of cost. This initiative was launched by a large corporate group which has interests in agricultural products named MC (pseudonym of the organization that started the ICT initiative in agricultural extension) in 2000. MC has set up a network of i-krishi centres around the country to procure agricultural produce by offering an alternative market mechanism. Along with the procurement of agricultural produce it also provides extension services to the farmers of the village where i-krishi kiosk is set up.

i-krishi is a virtual market place where farmers can make transactions directly with MC. The i-krishi initiative directly links farmers with the market for selling their produce. Additionally, i-krishi supports best practices in farming through training sessions, provides information on weather conditions, and supplies quality agricultural inputs like seeds and fertilizers. Through i-krishi, farmers can directly sell their produce at MC hub. Hub is a place where agricultural produce is procured.

i-krishi kiosk is equipped with a computer and internet connectivity. The computer with internet connectivity in the i-krishi enables farmers to obtain information on mandi prices, good farming practices, and offers scope to place orders for agricultural inputs such as seeds and fertilizers online. This access to information helps farmers in improving the quality of produce and obtaining better prices. i-krishi claims that it serves both as a place for social gathering where exchange of information on agricultural practices and market trends takes place between farmers of the village. i-krishi believes in making farmers market savvy so that farmers get a better procurement price for their produce. It believes that this can be done by constantly informing farmers about the price trends in the local markets – both traditional and MC Hub – and national and international markets. Along with providing extension services and market information i-

krishi also claims to have created transparent, farmer friendly, and scientific method of marketing agricultural produce for farmers. Thus i-krishi not only provides information but also creates alternative market structure. i-krishi claims that it allows direct information flow to the farmers by using internet. Farmers can use computer to access daily prices on local mandis, as well as to track global price trends or find information about new farming techniques either directly or through Promoter of the village. Thus it claims to have overcome the problems of intermediaries in the chain of information flow of conventional agricultural extension. It claims to help farmers to improve price realization for farm produce by making available live data on markets. It provides expert opinion on expected future price movements and helps farmers in getting remunerative price for the produce.

i-krishi coordinates its activities with institutions such as the national meteorological department, agricultural universities to build useful internet content, and also with companies supplying agricultural inputs like fertilizers and seeds. It disseminates latest information on district level weather and other relevant agricultural news. It transfers knowledge on farm management, crop production, pest control, etc. i-krishi has also been into the supply of quality inputs like seeds, herbicides, fertilizers, pesticides, etc. in the village itself.

Functioning of i-krishi

i-krishi kiosk is established in villages where population is above 3500. i-krishi can be seen as a medium of delivering critical market information, thus allowing farmer an empowered choice of where and when to sell the crop. i-krishi also provides information on crop prices, weather, scientific farming practices, crop insurance and soil-testing services.

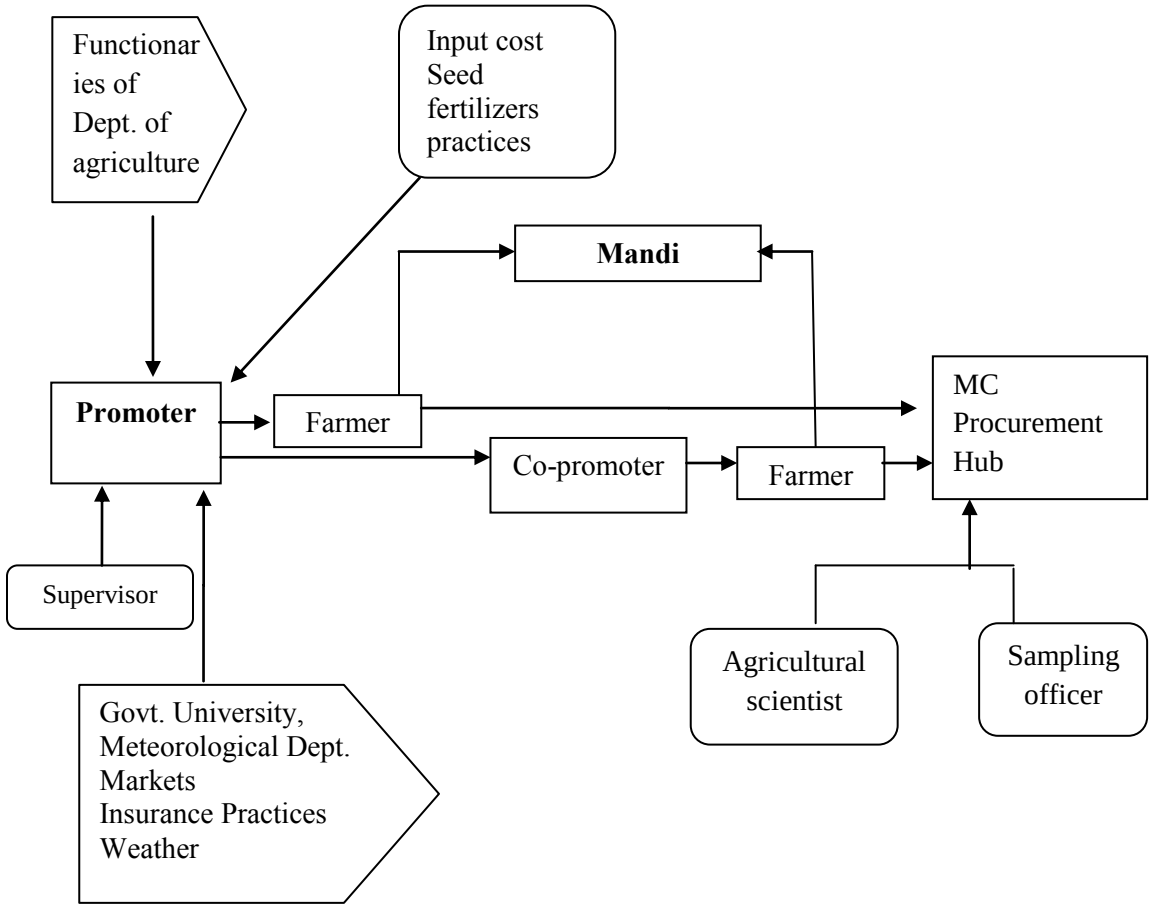
i-krishi collects information on weather from state weather department and also gathers information on modern farming practices and market price from different state, national and local markets. This information is uploaded onto I-Krishi web site. All information is customized according to farmers' requirements in local language (Marathi). Information

provided at i-krishi is free of cost which encourages farmers to access information and change their transaction behavior. The revenue for the i-krishi project is not dependent on transactions stemming from the direct use of the computer, but rather from a business proposition that has been enabled through the exchange of information.

i-krishi, in collaboration with different organizations like agricultural universities, meteorological department, and local research stations conducts meetings in the villages where kiosks are set up. It facilitates the conduct of field trials, soil tests and introduction of appropriate technologies suitable to the area by the agricultural university and other research stations. The state Department of Agriculture provides information regarding the availability of fertilizers and pesticides at the local level.

i-krishi claims to offer farmers more control over their choices thus helping them to gain higher profit margin, and access to information that improves crop productivity. By providing transparency in transactions i-krishi claims to have gained the trust of the farmers. i-krishi aims to enhance the returns on agriculture through the dual strategy of ICT-led improvements in production and procurement efficiencies. i-krishi therefore seeks to leverage ICTs to integrate rural areas into global markets.

Figure 5.1: Organizing, functioning and operation of i-krishi



VLW: Village Level Worker

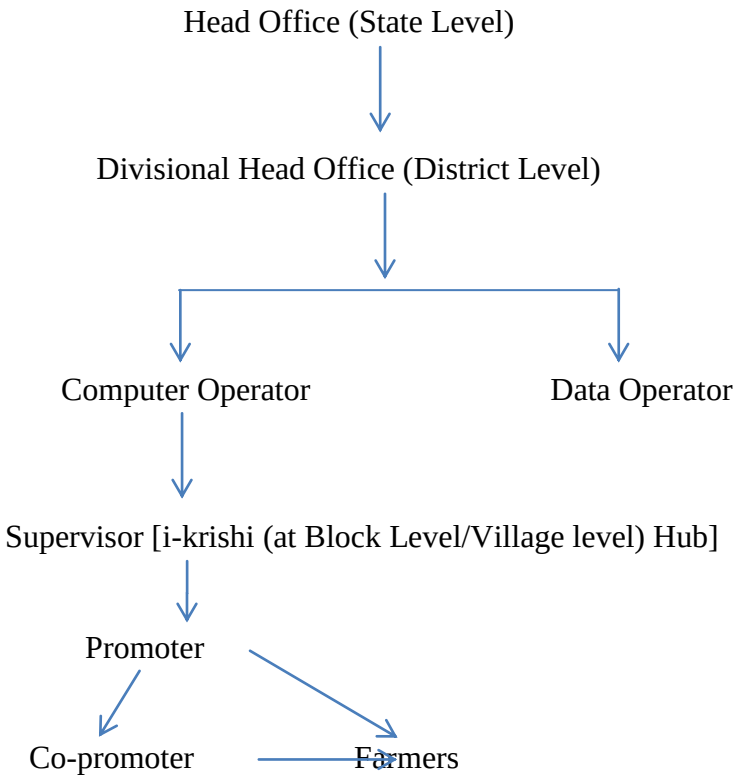
MSP: Minimum Support Price

i-krishi claims to tackle the problems of fragmented farms, weak infrastructure, and large number of market intermediaries in the Indian agriculture. This model uses information technology, i.e., internet as an important tool to deliver information with vertical coordination. This system has not eradicated the intermediaries totally but it uses them (intermediaries) for popularizing i-krishi. It concentrates on setting up of direct marketing channel linked to the mandi system for price comparison and simultaneously eliminating wasteful intermediation. This reduces transaction cost and makes logistics efficient (Paul 2003). In cases where the MC - hub is not present it appoints intermediaries. These intermediaries purchase the produce directly from farmers and pay the amount

immediately. MC pays commission along with the cost of bagging to the intermediaries, whereas farmers have to pay weighing charges to the agents.

MC office is located in every state where i-krishi is operating. The head office, which is located at the state level, monitors the functioning of i-krishi. Head office concentrates on arranging agricultural meetings with the help of government agricultural institutions. About 12 employees work in the head office, which look after the financial transactions, entry of data, flow of information and business logistics. It is headed by the executive officer. Divisional office is located at the district level where I-Krishi operates. Divisional office focuses on the smooth running of i-krishi centres located in the district. It coordinates the selection process of Supervisors and Promoters for the villages where i-krishi kiosks are set up. It is also responsible for uploading data regarding the procurement status and availability of stock to the head office on a daily basis. It is headed by manager. The head of the Divisional Office monitors the functioning of the kiosks in the district and the performance of the Supervisors and Promoters. Computer Operator deals with the information flow from top to bottom and vice-versa. Based the data Head Office takes decisions about the performance of the divisional office. Computer Operator also trains the Promoters of the district and interested farmers in the usage of the i-krishi web portal and operating computers. Data Operator takes care of the collection and collation of data at the district level. He also takes care of the entry of the data related to farmers of the villages where i-krishi is functional. The data on land holdings, type of soil, crops grown and their extent, status of credit, etc. is uploaded by the data operator.

Figure 5.2: Organization structure of i-krishi



Promoter

The promoter is a key functionary in i-krishi. i-krishi kiosk at the village level is maintained by the Promoter. The promoter is one of the farmers of the village where I-Krishi kiosk is set up. Criteria for the selection of the Promoter are land holding, education and personal status of the individual farmer in the village. Typically a farmer who is a large land owner (between 8-10 acres, however, this varies from village to village, depending on the average size of land holding), who is well respected, who has been actively following market situation, who can read and write and who has enthusiasm to know new things is selected as Promoter for the village. Generally, farmers from upper caste who maintain good communication with higher officials and the functionaries of the Department of Agriculture are generally selected as Promoters in different villages. The Promoter acts as a bridge between i-krishi and village farmers. The basic task of the promoter is to disseminate the agricultural information to farmers which is received from i-krishi web portal. i-krishi kiosk is established in the house of the promoter.

After selecting the Promoter, an e-mail account is created for him/her and a user ID and password to access the system is generated. MC need not invest in building and securing the physical infrastructure for setting up kiosk as it is set up in the Promoter's house. The financial gain for the Promoter comes from the commission on every transaction processed through the i-krishi. The Promoter need not employ someone to run the center because s/he is trained to use the computer and the internet. A Co-promoter is appointed for a village where i-krishi kiosk is not set up. Usually in villages with less than 3500 population Co-promoter is selected. Co-promoter works under the guidance of the Promoter (every promoter covers 3-5 villages). Co-promoters play a critical role in delivering information where i-krishi is absent. Most of the transactions between Promoter and Co-promoter are personal. Promoter accesses the information regarding weather and new techniques of farming since i-krishi web portal and disseminates to farmers and Co-promoters orally by conducting meetings. Successful Promoters usually have a number of common characteristics, including risk-taking ability and the willingness to try something new and the aspiration of earning additional income through i-krishi.

Promoters are trained at the nearest MC centre for two months on basic computer usage, operation of i-krishi web site, basic business skills, as well as in crop management. Promoters are trained to help farmers by providing different services of i-krishi like soil testing, usage of weather data, information of market price trends, etc. Promoters are also trained to motivate the farmers of the village to sell their produce to the MC. Promoter places orders for various like seeds, pesticides directly with the suppliers through the website of an MC using the internet and thus facilitates the supply of high quality farm inputs to the interested farmers. The promoter also purchases farm produce at farmers' doorstep with the help of Co-promoter. Co-promoter serves as a link between the Promoter and farmers of the village where i-krishi kiosk is not set up. Co-promoter communicates daily prices received by the Promoter to the farmers in the village. This further reduces the time spent on finding agricultural prices by farmers in non i-krishi villages. Promoters can take help from the functionaries stationed at the Hub regarding the transactions and payments. Farmers can sell their produce directly at the hub or they

can sell to the Promoter at the villages. Because of transportation risks and fluctuations in the prices majority of the small and marginal farmers sell their produce to the Promoter in the village.

Training to Promoter

The promoter is trained in computer operation. S/he is also trained in interpersonal communication skills so as to deal with farmers, including those who are non-literate. Training the Promoters to use a computer effectively is deemed vital to the success of i-krishi. The computer installed in the i-krishi kiosk is usually the first computer in most of the villages. After recruitment Promoters are trained for a day or two in the nearest MC Hub. The training is focused on familiarization of computer operation to the Promoter. Training focuses on

- Learning the fundamentals of computer and its applications
- Training in handling the computer like switching it on and off, using the mouse, keyboard, printer etc.
- Training in word processing, typing in Hindi, web browsing and finding information on the internet and i-krishi applications and their relevance for farmer in the village.

The second phase of training is given to the Promoters after a gap of 10 days to know their comfort levels with operating a computer and to know any other practical difficulties. Promoters are asked to operate the computer independently to assess their capabilities. Based on observation, customized training is then provided to raise their comfort and competency levels. During this phase Promoters are trained specifically on using the i-krishi web site and the procedure to access information from the site. Promoters are given the opportunity to voice their concerns and seek clarification.

During the third and final phase of training, which takes place after 30-45 days, Promoters are trained to troubleshoot commonly occurring problems. MC hopes that improving the troubleshooting capacity of the Promoters will significantly reduce the maintenance and system support costs. Promoters are taught about the importance of

other devices such as the UPS and the battery backup. They are given guidelines on what to look for when there is a problem. For instance, they are instructed on the significance of the display lights on the devices. When Promoters call for technical help, these details help the support staff to identify and resolve problems, perhaps even over the phone, without the necessity of a site visit.

Supervisor

Supervisor plays an important role in the initial stages of setting up i-krishi, and in the selection of Promoters because s/he is assumed to be aware about the village structure and farmers. Persons who have been actively engaged in the functions of mandi as intermediary are often selected as Supervisors. Supervisors are employed by the MC to look after functions like maintaining records, payment of cash to farmers, stock entry, etc. Supervisors also take up functions such as bagging the produce purchased from farmers, labor management at the hub, handling paperwork, etc. Supervisors are appointed by the company to coordinate with Promoter, document information at the procurement center level, collect information about market prices, ensure transport of produce to the processing center, supply of inputs to the Promoter and to strengthen relations between farmers and the Promoter. MC hires traditional commission agents as supervisors in i-krishi who manage information and collect day-to -day price information from local mandis. Thus, it may be said that the intermediaries are not removed from the process, but their roles are redefined as supervisors.

The focal point of interface between farmer and i-krishi is the information related to agriculture. Whether it is about market price of agricultural produce or a weather forecast or appropriate inputs, farmers approach the kiosk set up by MC as part of the i-krishi programme in the house of the Promoter. For example, farmers approach Promoter to know about the market price of the produce s/he intends to sell. Farmers enquire about the current price of the produce on the particular day. If farmers satisfy with the price offered by MC, they show their willingness to sell their produce at the MC hub. The farmer may sell the produce to the Promoter directly in the village also. Farmer compares the i-krishi prices with the mandi prices and weighing the merits of each s/he

decides up on selling the produce.

Once a farmer decides to sell the produce at the MC procurement Hub, s/he transports it to the Hub. The farmer has to register name, village and the Promoter's/Co-promoter's name with the MC Hub officials. Then a sample of the produce brought by the farmer is tested by the Quality Controller of the MC Hub. In the next stage the produce is tested by the Agricultural Scientist (employee of MC) with the help of the scientific meter. Depending on the quality, the produce is graded as high or low based on which the price quote is offered to the farmer. If the farmer satisfies with the price quote and expresses willingness to sell the produce, the entire produce is weighed by the workers at the MC hub. The payment is made by the Supervisor of the MC Hub. After that the produce is unloaded and a sample of the produce is sent to the laboratory. In this process the farmer may come alone or can bring Promoter along with him/her. A certain percentage of the total value of the produce is paid to the Promoter in the form of commission. The promoter is not paid any salary by the MC but receives commission on financial transactions from the village. Bigger the volume of the transactions in a season higher the commission received by the Promoter. Hence Promoter works hard to convince the farmers of the village to sell the produce at the MC hub.

Inspection and grading

When farmers bring the produce to the MC Hub the Quality Controller (Chemist) tests its quality by taking a sample. The quality of the produce is assessed physically by observing the produce for any foreign matter (other than the produce that is sold, for example, soybean is checked for any other matter than seeds, hay, stones, etc.). Deduction for foreign matter is done in the presence of stones, hay, etc. Based on the Chemist's assessment of the quality and appropriate deductions (if any) to the benchmark price, a conditional quotation is given to the farmer. After this the sample is tested for quality and moisture content by using an electronic machine. This is done in the laboratory by the Agricultural Scientist employed by the MC.

The important point to note is that these quality control checks are transparent as the

process is done in the presence of farmer and farmer has the right to accept and reject the price quoted. If the farmer feels any inconvenience about the results s/he can ask for re-sampling and retesting the quality. The previous day's closing price at the MC Hub for specific produce is used to determine the benchmark for Fair Average Quality (FAQ) price. Generally the previous day MC Hub prices are communicated to the Promoter through the i-krishi portal. Usually farmers enquire about the previous day's price information and current day's price before they take their produce to the procurement Hub.

Payment

The higher price is paid to the high quality produce. The quality of the produce is deemed to be high when the bad seed (2%) and foreign matter (2%) are within the limits and moisture-free (not more than 10%). Inferior quality material fetches a lesser price. Once a farmer accepts the price, the entire produce is weighed on a large, automated scale instead of a manual scale. It is important to note that the presence of the Promoter is not compulsory during the procurement process, but usually Promoter comes to the Hub to gain trust of the farmers. In the absence of the Promoter the estimated quote is given directly to the farmer. During the peak season, procurement of the produce may take about 24 hours. The material handling systems at the MC collection center ensures that tractors, trolleys, or trucks can directly unload the produce without spilling any grain, and a modern weighbridge ensures precise weighing.

After the produce tests for its quality, it will be weighed by the digital weighing machine. Then the farmer takes the estimate quote to the Supervisor and receives the payment in cash. The supervisor, who deals with handling large amounts of cash, is entrusted with the responsibility of payment. The entire process of loading, unloading and packing is done by the workers employed by the MC. Farmers need not pay any amount for handling charges which otherwise used to be paid to hamali in the conventional mandi transaction. After the sale of the produce is complete, MC performs laboratory testing of the sample produce collected. Based on these results, farmers are given customized feedback on the ways to improve the crop quality. MC emphasizes on quality as the poor

quality produces fetches low price for farmers. To avoid such loses MC advises farmers for improving crop quality.

Every stage in the procurement process is accompanied by documentation. The farmer is given a copy of lab reports of the quality checks, price quotation, and receipts for the transaction. At any stage of the transaction farmer is free to interact with the Agricultural Scientist and others to clarify doubts regarding the quality and estimate. Appropriate suggestions for increasing the quality of the produce are given by the Agricultural Scientist of the MC. The additional advantage with the MC procurement is that it provides insurance policy and quality seed material. The only hindrance found with the procurement through i-krishi is that the number of transactions per village is limited. Thus, those farmers who come first will stand a chance to sell their produce on the given day. Those who come late will have to wait for their turn in the coming days.

Delivery of information and other services to farmers through i-krishi

i-krishi claims to bring farmers belonging to different sections onto a single platform, i.e. i-krishi kiosk which allows farmers to discuss contemporary agricultural issues and share their views. i-krishi conducts agricultural meetings in collaboration with the agriculture department and other organizations related to agriculture like Indian Farmers Fertilizer Cooperative Limited (IFCCO) etc. At present MC is providing the services at free of cost which encourages farmers to access i-krishi.

Timely information on weather is important for farmers in the cultivation process. i-krishi claims to provide information on daily weather on its website. It provides localized weather information with the help of information and communication technologies. At the district level, data on weather is collected from the meteorological observatories. As Indian farming is monsoon based, advance weather information can help farmers overcoming critical situations related to weather.

MC employs Agricultural Scientist at the district level whose responsibility is to provide advices and solutions on problems in cultivation to the farmers. MC also arranges farmers' meetings with the local agricultural officers and agricultural department

functionaries to provide advices related to agriculture. If the problem of farmers can't be solved at the village level by the Promoter they can seek advices in these meetings. There is also a possibility of farmers finding solutions through i-krishi web portal. Web solutions are offered the by Scientists located at the district level. These uploaded advices can be viewed by the farmer at the i-krishi kiosk. Historical data and figures of a particular crop which are available with the Scientist make it possible to give appropriate suggestions. Information about future prices for different crops, farming practices and techniques, soil fertility status and weather data can help farmers in reducing the risks associated with farming.

Indebtedness is a chronic problem of Indian farming as the majority of the farmers takes credit from informal sources at exorbitant rates of interest. i-krishi claims to provide credit support to farmers through linkages with banks. The extent of credit support is based on land holdings and repayment ability of the farmer. Parameters like land holding, procurement for the season from the farmer and crops grown is used to assess the credit worthiness of the farmer. In this process Promoter plays a key role.

Loans by the banks are processed through the Promoter who as the group leader gives inputs to the bank on the credit worthiness of farmers of the village. The group doesn't necessarily mean an organized group. The group here refers to a section of farmers of the village with whom the Promoter interacts closely. Promoter plays a major role in providing credit as the opinion of the Promoter on lending loan to a farmer in the group is relied upon by the Bank. The promoter has better access to the farmer and information about his/her repayment capacity. Promoter encourages group members to repay loans in time. The promoter is entitled to a commission which is based on the amount of loan recovered from farmers.

i-krishi acts as representative of insurance companies also. It encourages farmers to insure their crop. Whenever farmer losses the crop due to drought or pest attacks insurance helps farmer to recover the loss, at least partially. In case of crop failure, based on the policy premium paid, the farmers get insurance amount. When farmers fail to pay the insurance premium in time MC pays such amount in installments and recovers the

same from the farmers at the time of procurement of the produce.

MC hires about 15 engineers who provide field infrastructure support to i-krishi kiosks. Based on calls from Promoters i-krishi kiosks are visited by the Engineer for infrastructure support. In order to overcome the transportation problems, MC provides motorcycles for its support staff. However, it was noticed that even though proper training is given to the Promoter about the operation of computer, technical failures occur due to downloading and installing untested or unapproved software by the users. Another commonly occurring problem with the kiosks is malfunctioning of the computer due to voltage fluctuations. It was said that about 20-30 percent of the calls received are about burnt UPS units due to voltage fluctuations. To avoid risk and waste of time Promoters has now been provided with replacement fuses and have been trained to change fuses of the UPS on their own.

i-krishi system is designed to gather and store information of farmer's agricultural status, namely, extent of land holding, type of land, crops grown, credit liability, etc. Data plays a crucial role in assessing the field problems of the particular regions and to find needs and solutions for the problems. However, this data is used for multiple purposes like to know the location of farmers, credit worthiness and financial position of the farmers. Information about each farmer is gathered during the user registration process. The question and answer section of the website allows for two-way transport of data which is stored in a database. MC's initiative in using ICT's in agriculture has created a large database available at the finger tips.

Functioning of mandi

Before the establishment of i-krishi farmers used to sell their produce at mandi, the traditional and informal market, where trading is conducted by the commission agents, called as intermediaries. Persons who carry the transaction in the mandi are basically intermediaries who have no direct association with cultivation. White (2005) argues that markets are actually influenced by the economic power, by which he meant that power is legally sanctioned. Generally mandi is maintained by members of a particular caste,

which varies from region to region. With every level of intermediary the cost of the agricultural produce increases to the consumers but doesn't benefit the farmer. In mandi system the main sources of market information for farmers are their peers and market intermediaries. Intermediaries, in general, are not perceived to be transparent when doing business as they are oriented to maximize profit. Even though they perform an important role in the market, they are often criticized by farmers because they take advantage of the farmer's lack of awareness about market prices through control of information (Urquieta 2008).

Although most of the farmers sell their produce to the intermediaries, they feel that the transactions are exploitative as the prices are dictated by the latter. Even though they are aware of the exploitation of the intermediaries farmers still maintain good relations with intermediaries because of lack of alternative market mechanism. The intermediaries function with greater access to market information as they keep track of the price information. They access information on local and national market to know the trends. Often intermediaries block the flow of market information to the farmers by not communicating the information on price to the farmers and use the same for their own benefit. Poor and uneducated farmers have been the major victims of intermediaries. Lack of professional competition and ineffective regulatory mechanism of markets the agriculture markets have been exploited.

Based on the price information available to him/her in the village, a farmer chooses the mandi where the produce to be sold. When farmers arrive at the mandi, potential buyers (like intermediaries) would inspect the produce, a mandi employee conducts the auction, where commission agents place bids. The inspection of the product is made by the buyers by sight. There is no scientific method and the grading of the produce is done only by the moisture meter. A majority of the transactions is done orally. They often downgrade the price according to their own estimation of the quality of the produce. Traders change their prices all the day. Pricing is set locally at the mandis, and is not reliably tracked or reported nationally, resulting in the lack of information that reduces the opportunity for arbitrage and leads to market inefficiency.

Once the produce is auctioned, it is moved to the weighing area operated by the intermediary. Here, the produce is unloaded into sacks, the charges for which are borne by the farmers. There is no electronic weighing machine and the loss due to spillage is a common sight. The bagged produce is then loaded on to the buyer's trucks and transported to the processing plant. The intermediaries pay the price based on the weight calculated.

In the absence of alternative mechanism to sell the produce farmers are compelled to sell their produce in the mandi to the intermediaries. This is not a hidden or latent fact. In fact, both the parties to the transactions, i.e. farmers and intermediaries know this fact. Interestingly, however, intermediaries maintain good relation with farmers by providing cash or inputs on credit. Farmers, in the dire need of cash or inputs, tend to go to these intermediaries. The transactions between farmers and intermediaries are based on mutual trust and individual farmer's social standing and the caste to which the farmer belongs to. Such market relations have been existing for generations without undergoing significant changes. Although agriculture witnessed tremendous changes in term technologies of production, inputs used, mechanization, etc. the market relation remained same and exploitative.

Limitations of the mandi system

Acharya and Agrawal (2004) argues that farmers, particularly small and marginal farmers face immense difficulties in marketing their produce because they tend to have small quantities of marketable surplus due to the small size of land holdings. As a result, they sell most of their produce in the local markets at very low prices, immediately after the harvest (distress sales) to meet their needs. Acharya also suggests that rural markets are not fairly operated, as they are dominated by interlinked transactions and money lenders. Farmers continue to depend on middlemen and traders for their credit needs and they are caught up in the vicious circle of credit for decades. Credit needs of small and marginal farmers make them susceptible to sell their produce to traders at unremunerative prices. Over the decades, the government has been assured fair prices, both as a regulator and buyer, but with limited success. As corruption, inefficiency and bureaucratic control took

hold, auctions no longer remain transparent or fair. By preventing private investment in agricultural markets, these regulated markets or mandis stifle competition and guard the interests of middlemen.

In India the infrastructure facilities needed for marketing of farm produce such as paved roads, cold storage facilities, warehouses, telephone connectivity, etc. are very poor. Asides the small and marginal farmers are disinclined to take the produce to markets where high price is quoted due to the low quality of their output. Also, most of these farmers are tied to intermediaries who give credit on the precondition of buying the produce. These are some reasons why small and marginal farmers sell their produce to intermediaries at low price. One of the important drawbacks of the Indian market system is that most of the market yards are located far away from villages (approximately 20-30 km) and there is no guarantee for the sale transaction to be over in a day. In such cases farmer has to wait for hours, or even days to sell the produce. In addition, transaction costs such as bagging, transportation, loading, and unloading are to be incurred by the farmers. Most of the time the farm produce is left in the open air courtyards, where the produce is damaged thus affecting the price.

Farmers feel that the intermediaries consistently under-weigh the produce by applying practiced and timely nudges to the scale used for weighing the produce. Commission agents at the mandi use a small weighing scale which is inaccurate. This results in loss to the farmer. Moreover, the wastage level is high, because the agents tend to throw away some grain while evaluating its quality. The markets and mandis are governed by elected market committees whose members are drawn from the farming community, largely belonging to upper castes, medium or large farmers with meager representation from the small and marginal farmers.

The mandi system is burdened by inefficiency, complexity and dominated by agents rather than government officials. The majority of the farmers is illiterate and as a result of which farmers do not have the scope or resources to analyze price trends. Farmers have only an approximate idea of price trends and have to accept the price offered to them at auctions on the day they bring their produce to the mandi. The inspection process is

unscientific and often arbitrary, tending to favor the buyer.

However, it is a known fact that social (caste) and economic barriers (market power, economies of scale, asymmetry or costly information) can lead to exclusion of marginal and small farmers from certain markets. Lack of information can create inefficiencies and major losses for farmers. When there is an asymmetry of information between buyer and the seller or when relevant market information do not exist an imperfect market will prevail (Golan *et al.* 2001). In order to raise the income of small and marginal farmers and to reduce their vulnerability of social, economic, and environmental challenges, enhancing market information is one of the important needs (Urquieta 2008).

The next chapter discusses the data collected from the two field situations, namely, Parbhani in Maharashtra and Karimnagar in Telangana. Data on the socio-economic profile of respondents along with other aspects related to agricultural information communication are presented in it.

Chapter - 6

Findings and Discussion

Introduction

This chapter discusses how structural forces operate in the process of information dissemination and the new initiatives privilege certain groups and marginalize some other sections in the villages. It presents the socioeconomic profile of the respondents and discusses the findings in the backdrop of the ICT initiatives in agricultural extension and the current agriculture scenario. The study was carried out in two districts, one each of the States of Telangana and Maharashtra (Vidarbha region). Karimnagar in Telangana and Parbhani in Maharashtra are the two districts where the field sites are located. In Parbhani the ICT initiative is one of the important agricultural extension sources for the farmers whereas in Karimnagar sources of agricultural extension are state led extension services.

The study relied on empirical evidence. Qualitative and quantitative methods were used in data collection. In-depth interviews and intensive interactions with the respondents and participant observation constituted the core of the study methodology. Data were collected using semi-structured questionnaire and interview method. Interviews were aimed at capturing the perception of farmers about the agricultural information communication so as to understand how agency acts and responds to the new information technology based initiatives in agricultural extension. The process of interaction was spread overextended and leisurely conversation mode to suit the needs of the farmers. The socioeconomic profile of the respondents from both the field sites is discussed in the ensuing part of this chapter. Discussion based on the analysis of data collected in the two field sites finds place in the latter part of the chapter.

Field site - I (Telangana)

Karimnagar district is located on the north-eastern region of Godavari River. Karimnagar town which is the headquarter of the district is situated on the bank of the river Maniar, a tributary of the Godavari. It is bounded by Adaliabad on North, Maharashtra State on the

Eastern Side, Nizambad district on the North-West and Medak and Warangal districts on South. The total geographical area of the district is 11.82 lakh hectares. The Net sown area is 3.93 lakh hectares.

The major source of irrigation is the Sriram Sagar Project, located in, Nizamabad built across Godavari. It irrigates about to 5.42 lakh acres out of the 11.82 lakh hectares of total geographical land in the district. Upper Manair project, Boggula Vagu project, Shanigaram project is the medium irrigation projects providing irrigation. The district consists of three types of soils, namely loamy, sandy, (*Chelka)* and black cotton soils in the ratio of 60:30:10. The gross irrigated area in the district area is 3.70 lakh hectares and net irrigated area is 2.24 lakhs. Total barren land or uncultivable land is 95,963 acres. The net sown area in 2007-08 was 4,78,098 acres and 4,69,786 acres in 2008-09 and 3,93,467 acres in 2009-10. The total cropped area in 2007-08 was 6,88,669 acres and 7,56,607 acres in 2008-09 and 5,63,089 acres in 2009-10 (Hand book of Karimnagar 2012). Two villages, namely Chenjarla and Jubillenagar were selected from Karimnagar district. These villages were selected after interaction with the scientists at the DAATT centre located in Karimnagar town. The study began in 2010 with a pilot study and data were collected from the two villages between 2010 and 2012 during both the seasons Khraif and Rabi.

Village profile

Chenjarla is located about 20 kms away from Karimnagar town. This village is part of Manakondur mandal. The total cultivable land is about 800 acres. Major crops grown here are cotton, maize, chili and vegetables. There are about 140 households out of which 95 belong to OBC castes and 45 belong to schedule castes. Munnur Kapu is the numerically dominant caste among OBC castes, whereas Dalits and Yadavs also present in significant numbers. Majority of households own pakka houses. The village is connected to the mandal headquarter with an all weather motorable road.

The village has a high school run by the state government and an Anganvadi Kedram. The literacy rate is about 60 percent. Major occupation of the villagers is agriculture.

However, in the recent past many villagers have started taking up construction work which has a demand in the nearby mandal headquarter town and as well in the district headquarter town. The major transportation is the three wheeler autos, and a majority of the households own a two- wheeler.

Jubillenagar, another village from where data were collected, is located about 20 kms away from the district headquarter town. There are about 120 households with a population of 2800. The majority of the households belong to OBC castes like Yadavs, Padmashalis, Kapu and Goud. The village has a gram panchayat office, a government high school and an Anganwadi centre. The literacy rate in the village is about 56 percent. Agriculture is the primary occupation and a majority of the land holdings are small and marginal. The total operational land is about 900 acres and the major source of irrigation is a canal. Cotton, maize, paddy are the major crops grown in the village. The Majority of the households have pakka houses, and the village has the all weather motorable roads connecting well with the district headquarter town.

Profile of the respondents

Data were collected from 99 households from the two villages of Karimnagar district, namely, Chenjarla and Jubillenagar. The main occupation of the respondents is agriculture. Karimnagar district comprises of small, marginal and semi-medium farmers. Agricultural land is concentrated in the hands of backward class communities who depend on agriculture for their livelihood.

Caste

According to Beteille (1974) Indian rural society is a caste based society. Caste is an important factor in accessing resources and it determines the social status and economic position of the individual in the society. Indian village is clearly differentiated in terms of ownership, control and use of land where a very small section of people own or control much of the agricultural land. It is a well-known fact that those castes ranked high in the caste hierarchy have been controlling land for centuries thus influencing the social organization of agriculture. This also suggests that the scheduled castes and scheduled

tribes have been the most marginalized and vulnerable groups in the agrarian relations. Therefore, an examination of the land holding status of these marginalized groups in relation to the general group has become a sociological imperative. The NSSO data (NSSO 2006) indicate that 5.7 percent of scheduled caste households are pure landless and 5.6 percent have less than 0.002 hectares. Among schedule castes there are about 80 percent households who hold land between 0.002 to 1.0 hectares. 6 percent of households hold land between 1 to 2 hectares, and only 0.6 percent holds land above 4 hectares.

Unequal distribution of land is one of the major factors for low productivity, poverty and inequalities in India. What emerges from the NSSO data is that the average area owned by Dalit farmers is significantly less. Despite many reforms by the state to address the issue of unequal distribution of land the stated goal has not been achieved due to lack of political will. The land holdings of SCs and STs have become vulnerable with the commercialization of agriculture. The agrarian social structure has been preventing the marginal and small farmers from taking advantage of the new opportunities offered by the green revolution.

Venkateshwarlu (1998) suggests that post 1991 economic reforms, agrarian social structure witnessed substantial changes. Agriculture has changed considerably in such a way that farmers have to equip themselves according to the global changes. It is apparent that many educated large land owners left agriculture for urban based non-farm occupations. Due to migration of landlords there has been a vacuum created in the agriculture sector. The middle rank peasants, agricultural labourers, and non-cultivating caste groups have taken up agriculture as their livelihood. The displacement of caste based services is also an important cause for the emergence of small and medium cultivators. In addition to this, the aspiration for upward mobility among the small and marginal farmers made them to enter into commercial agriculture. In case of Telangana, Naxalite movement had great impact on out migration of landlords and large farmers (Vasavi 2012). In Punjab also, Jodhka (2006) observes that, large farmers have withdrawn from agriculture because of the availability of better opportunities in non-farm sector for them whereas small holders are withdrawing from agriculture because of their

unviable holdings.

Caste-wise distribution of the respondents, presented in Table 6.1 indicates that a majority of them belong to the backward class (BC) communities like Yadava, Padmashali and Goud. Scheduled castes (SC) comprise both Madiga and Mala.

Table 6.1: Caste wise distribution of respondents

Caste	No of respondents (%)
BC	62 (63)
SC	37 (37)
Total	99 (100)

Landholding pattern

Data on the land holding pattern was collected from the respondent farmers with a view to assess the distribution of land in the village. Karimnagar district is located in the Deccan region where agriculture is heavily dependent on rainfall. Over the years with the spread and access to modern technology in tapping ground water many farmers in the region have dug bore wells for irrigation. As a result of the indiscriminate digging of bore wells, high usage of ground water and lack of rain water harvesting structures the water table in the region has been declining over the years. Farmers invest huge sums of money in digging bore well, purchase of electric pump and motor and other necessary equipment to irrigate crops. Digging of a bore well of 500 feet and its operationalization, costs not less than a lakh of rupees. All the investment is borne out by the farmers from their personal sources as the state doesn't provide any subsidy or other financial support.

Table 6.2: Landholding pattern

Type of land holding	**Number of respondents (%)**
Marginal (below 1 ha.)	25 (26)
Small (1 ha. to 2.0 ha.)	37 (37)
Semi-Medium (2 ha. to 4 ha.)	29 (29)
Medium (4 ha to 10 ha.)	8 (8)
Total	99 (100)

A majority of the respondents are small land holders (37 percent) followed by a semi-medium (29 percent) and marginal (26 percent). As there were no large farmers (who own more than 10 acres of land) in the villages where data were collected no respondent from the category was included in the study. Caste wise distribution of land holding pattern among respondents suggests that about 42 percent of the respondents from the backward class communities are semi-medium farmers. Among the schedule castes about 52 percent respondents hold one to two hectares of land. It may also be inferred from Table 6.2 that about 87 percent of the scheduled caste farmers included in the study hold less than 2 hectares (i.e. Five acres) of land.

Table 6.3: Caste and land holding pattern

Caste	Number of respondents (%)				
	Marginal	Small	Semi-Medium	Medium	Total
BC	12 (19)	18 (29)	26 (42)	6 (10)	62 (100)
SC	13 (35)	19 (52)	3 (8)	2 (5)	37 (100)

It was observed in the study that many small and marginal farmers are unable to demand agricultural information from the functionaries of the state agricultural extension, for example, Agricultural Officer of the Mandal due to their small landholdings. The size of land holdings plays key role in accessing and demanding information on new agricultural techniques and practices which enhance productivity. When questioned about the access to latest agricultural information it was reported by the respondent farmers that Agricultural Officer generally tends to overlook their questions as s/he feel that the small and marginal farmers have problems which are unworthy to be addressed. This may be because of the widely held notion of the agricultural scientific community, including the extension staff that the small holdings are unviable in terms of productivity and efficiency.

Data was also collected on land holdings along caste categories and the nature of the land. Those lands which have assured irrigation facility in the form of bore well or open

well or canal irrigation are categorized as irrigated land and those lands where cultivation is taken up purely by depending on rain fall are categorized as dry/rainfed land.

Table 6.4: Caste, land holding pattern and type of land

Caste	No. of respondents (%)									Grand Total
	Irrigated					Dry/Rainfed				
	Marginal	Small	Semi-Medium	Medium	Total	Marginal	Small	Semi-Medium	Total	
BC	10 (20)	12 (24)	22 (44)	6 (12)	50 (100)	3 (25)	5 (42)	4 (33)	12 (100)	62
SC	7 (47)	4 (27)	2 (13)	2 (13)	15 (100)	6 (27)	15 (68)	1 (5)	22 (100)	37

In the field site in Karimnagar district, there is no canal irrigation facility and thus irrigated land implies bore well irrigation. Almost all the open wells in the region have gone dry over the years due to the large scale digging of bore wells. Table 6.4 on the caste wise distribution of irrigated and dry land among respondents suggests that a majority of the farmers (44 percent) belonging to backward class communities (in the category of semi-medium) own irrigated land, whereas the majority of the Dalit farmers (68 percent) who are small land holders own dry land. Out of 65 farmers owing irrigated land 77 percent belongs to a backward class category. It may be suggested that farmers belonging to scheduled castes have less access to irrigation sources. This is because of the fact that a large majority of the scheduled caste farmers cannot afford to invest huge sums of money on providing irrigation to the field thus they depend on rainfall for cultivation. High incidence of dependence on rain for crop cultivation makes the scheduled caste farmers more vulnerable.

Education

Many farmers in rural areas do not have up-to-date information on efficient and economic means of cultivation (Rosegrant and Cline 2003). Education has been found to be an important factor influencing the absorption of the information delivered by the agricultural agencies. Rogers (1976) and Tichenor *et al.* (1970), who have done extensive research on agricultural innovations and diffusion, report that education of farmers is one

of the important factors influencing their access to information and new technologies. Education can help farmers in overcoming the problems posed in the adoption of new technologies. It is also said that majority of agricultural information disseminated to farmers through brochures, magazines and agricultural journals in the conventional mode of extension system doesn't reach the illiterate farmers.

Data were collected on the educational level among the respondents. Table 6.5 suggests that the education level among farmers belonging to backward class communities is high when compared to SC farmers. Only 29 percent of backward class farmers have no formal education while 65 percent of SC farmers have no formal education. Out of 99 respondents 42 have no formal education and a majority of them belong to the scheduled castes. Out of nine farmers, who have studied beyond tenth standard, a majority of them belonging to backward class communities,. Educational level among the respondents was assessed with the assumption that farmers who have more formal years of education tend to have greater access to agricultural information from the Agricultural Officer and other state extension functionaries. Higher educational levels would help them understand the language in which agricultural information is communicated.

Table 6.5: Educational profile of the respondents

Caste	No. of respondents (%)					
	No formal education	Primary	Secondary	High School	Above 10^{th}	Total
B.C	18 (29)	19 (31)	14 (23)	4 (6)	7 (11)	62 (100)
S.C	24 (65)	7 (19)	4 (11)	0 (0)	2 (5)	37 (100)

Primary: 1-5^{th} standard; Secondary: up to 7^{th} standard; High School: up to 10^{th} standard

Age

Age is considered as an important variable in understanding the issues pertaining to agricultural information communication. The conventional literature in agricultural extension suggests that the old farmers tend to show less inclination to formal sources of agricultural information when compared to young farmers. Data on the age of the

respondents was collected with a view to examine its association with the sources of agricultural information. It may be mentioned here that the respondents of the study were selected randomly and representativeness of the sample was ensured. The majority of the respondent farmers (about 66 percent) belong to the age group of 31-50 years. Thirty seven percent of the backward class respondents belong to the age group of 31 to 40 years while forty percent of SC respondents belong to the age group of 41 to 50 years. Data an age reveals that while the no young Dalit farmer (below 30 years) involved in agriculture when compared to their counterparts from the BC category. When the reasons for such distribution was ascertained from the respondents, it was found that the small holdings of Dalit farmers have become economically unviable due to rapid changes in agriculture, like commercialization of agriculture, increasing cost of cultivation, etc. However, in the case of BC farmers the younger generation is still in agriculture as their holdings are relatively large and this group of farmers has been in the forefront in accessing extension services of the state. Besides, the social capital this group of farmers bestowed with enables them to continue in agriculture while the SC farmers lack such capital.

Table 6.6: Caste and age of the respondents

Caste	No of respondents (%)					
	Below30 years	31-40 years	41-50 years	51-60 years	Above years 61	Total
BC	8 (13)	23 (37)	18 (29)	12 (19)	1 (2)	62 (100)
SC	0 (0)	10 (27)	15 (40)	11 (30)	1 (3)	37 (100)

Cost of production

The cost of production per acre varies from crop to crop. Timely usage of fertilizers and pesticides, timely sowing and harvesting, and access to appropriate information at the appropriate time reported to have reduced the cost of cultivation to a majority of the farmers from backward class communities. Many farmers reported that there has been a substantial increase in the intensity of external input usage in cultivation in the last ten years. What once used to be subsistence farming, farmer, over the years, began

cultivating for a market which demands intensive usage of inputs. Inputs like chemical fertilizers, pesticides, weedicides and mechanical implements like tractors, weeders and harvesters have become part of the present day agriculture. It is important to note that the inputs, apart from the machinery, have to be procured from sources external to the village. Usage of farm yard manure has been on the decline, only to be substituted by chemical fertilizers. Awareness about biological pest control methods is nil or partial thus forcing the farmer to procure pesticides from the market.

Table 6.7: Cost of production (per acre)

Caste	No .of respondents (%)		
	Less than Rs. 10,000	Rs. 10,001 – Rs. 15,000	Total
BC	60 (97)	2 (3)	62 (100)
SC	1 (3)	36 (97)	37 (100)

Table 6.7 suggests that the cost of cultivation is reported to be lower among the backward class community respondents than respondents from the scheduled castes. Ninety seven percent of the BC farmers have been reported to be investing less than ten thousand rupees per acre, while the same percentage of SC farmers spending more than ten thousand rupees per acre. The reasons for such marked difference in the cost of production between BC and SC farmers are that timely availability of seeds and fertilizers, following the agricultural advices given by the scientists, timely availability of machinery like tractors and harvesters and timely procurement. One of the important findings from the data is that those farmers who actively seek agricultural information from different sources and invest more on inputs reported high gross income. Although the reliance on input dealers for information is high among both BC and SC farmer those farmers who also seek advices from agricultural officer and attend DAATT meetings reported higher income than who don't.

Access to credit

In the last few decades, agriculture has become input intensive, thus calling for greater investment on inputs. As most of the farm families in India suffer from insufficient monetary capital to invest, they lag behind in agricultural development. Realizing that credit needs are important, the state has enacted many agricultural credit programmes.

State directed credit sources for farmers are nationalized banks and credit cooperative societies. The non-institutional credit sources are money lenders, relatives and friends. Data on credit sources for the respondent farmers reveal that a majority of BC farmers (65 percent) and SC farmers (57 percent) took loans from money lenders while only about 31 percent of BC farmers and 41 percent of SC farmers borrowed loan from institutional credit sources like banks and cooperative societies.

Table 6.8: Sources of credit

Caste	No. of respondents (%)					
	Never borrowed	Bank	Money Lender	Relatives	Cooperatives	Total
BC	2 (2)	13 (21)	40 (65)	1 (2)	6 (10)	62 (100)
SC	0 (0)	5 (14)	21 (57)	1 (3)	10 (27)	37 (100)

Accessing agricultural information or advices

It is an emerging reality in the Indian agriculture that information needs of farmers for cultivation have been increasing. Information needs are also becoming complex with the rise of commercial agriculture, even among small and marginal farmers. Table 6.9 presents data on the sources of information for respondent farmers in Karimnagar field site. 18 percent of BC farmers and 16 percent of SC farmers receive information from multiple sources, with input dealer emerging as the lead source. The negligible number of farmers accessing Agricultural Officer for advices and information reflects the apathy of the state towards agricultural information dissemination. The question that arises immediately is that it might be possible that the respondent farmers have not accessed information from the AO although the services are available. To clarify this researcher elicited responses from the respondents during the in-depth interviews. It was found that although the AO is functioning from the mandal head quarter, s/he seldom presents when farmer calls for him/her at his/her office. Respondent farmers also observed that even if the officer is present the advices s/he gives, proven to be inappropriate or irrelevant in the farmer's context. Farmers observe that most of the AOs whoever is functioning in the mandal lack sufficient appropriate information. Thus, over a period farmers have stopped visiting the AO for information. Only on the certain occasions the Agriculture Officers

and DAATT centre scientists visit the village and provide advices related to the event. But when the farmers are in need of information it is not available to them. As a result, farmers have begun to rely on the input dealer who is available throughout the season and who is more than willing to provide advices, although, the veracity of which is questionable. Thus, Table 6.9 presents that a large majority of the respondent farmers access information from the input dealers. An overwhelming majority (nearly 95%) of the respondent farmers reported that AO seldom visits the village and fields. Disseminating of agricultural information is the primary duty of the state, but over a period many other sources (like input dealers, private agencies, NGOs) are disseminating information to farmers.

Table 6.9: Advice on field problems

Caste	No .of respondents (%)					
	Fellow farmers	AO	Call centers	Input dealers	Multiple sources	Total
BC	2 (3)	2 (3)	3 (5)	25 (40)	30(48)	62 (100)
SC	1 (1)	0 (0)	0(0)	18(48)	18 (48)	37 (100)

AO = Agricultural Officer
Call centres= Kisan call centre of the government of India
Multiple sources= more than one source, which include, for example, a combination of input dealers and fellow farmers

To overcome the problems of information dissemination through agricultural extension, the government of India started an initiative by which farmer can seek advices by making a telephone call. This is called as Kisan Call Centre, where the subject matter experts take the calls from farmers and offer solutions. The farmer can make this call at free of cost at any time between 6:00 AM and 10:00 PM as the call centre functions for 16 hours a day. Moreover, farmers can seek advices in their known language. When this was raised during the in-depth interview with the respondents, 90 percent of them said that they are not aware about the call centre facility. However, it was observed that tremendous changes in the communication have led to increased use of mobile phones among farmers irrespective of caste and size of land holding. Despite having access to mobile phones it

was observed that farmers seldom call the Kisan call centre. It was observed that less than 40 percent of the farmer respondents watch TV for agricultural information and less than nine percent listen to Radio for agricultural information.

Among several reports published recently, Indian Council for Research on International Economic Relations (ICRIER) 2012 study (Kathuria and Kedia-Jaju 2012), based on the rich data set of 19 states for 10 years, found that a 10 per cent increase in mobile penetration leads to a 1.5 percent increase in state gross domestic product (GDP), while a 10 per cent increase in internet subscribers leads to a 1.08 percent increase in state per capita GDP *(Ibid*). 24 Studies also have found micro evidence on the pathways through which access to ICTs results in efficiency and productivity gains. Mobile and internet access, for example, empowers farmers with the know-how, timely and relevant weather information, transparent price discovery and access to wider markets to maximize income.

Marketing the produce

Marketing the agricultural produce has become an important aspect in the today's agriculture as farmers' net income depends directly on the fair price, fair means, and immediate payment for the produce. It was observed in the study that, the village has an IKP (Indira Kranthi Patham) procurement center, which is run by Self Hel Group[6] (SHG) members of the village. Women SHGs have begun procuring agricultural products at the behest of the state which wanted to provide fair price and fair means of procurement and avoid exploitation by traders and middleman. Thus a majority of the farmers chooses to sell their produce at IKP centre because farmers could save some money on transporting

[6] Self Hel Groups (SHGs) are formed by women of the village. In each SHG there are about 12-15 adult women who form into a group voluntarily with an aim to work for all round development of their families and village with the financial and administrative support from the state. The state recognizes them as key institutions in the village level to implement various economic and social development programmes. Since 2007 the state has been encouraging the SHGs to procure the agricultural produce from the farmers of the village. This was introduced to curb the unfair practices of the middlemen in the village, to help farmer getting remunerative price for the produce and to strengthen the SHGs economically as they get a certain percentage as commission on the purchases they make.

the produce as it is located in the village. In the light of untimely rains which damage agricultural produce like paddy grain or cotton lint, the state has allowed the IKP centres to procure even partially damaged product at the same price. Otherwise, it is very difficult for the farmer to get remunerative price for the product in the event of damage to the produce. Small and marginal farmers have been preferring the IKP centre to sell their produce as it provides best prices for their produce within the village. The advantage with the IKP is that it pays cash immediately or within a week's time when compared to others who pay even a month later. It may be ascertained from Table 6.10 that the role of middlemen has been reduced by the establishment of IKP centers as the majority of the farmers irrespective of caste (58 percent BC farmer respondents and 65 percent SC farmer respondents) have started selling their produce at these centres.

Table 6.10: Marketing the produce

Caste	No. of respondents (%)			
	IKP	Local Market (nearby towns)	Middlemen in the village	Total
BC	36 (58)	20 (32)	6 (10)	62 (100)
SC	24 (65)	6 (16)	7 (19)	37 (100)

Ranking of information needs

Agriculture has been witnessing tremendous changes and so are the information needs of farmers. Information regarding cultivation at the small and marginal farmers' context has become important in the contemporary agriculture. Amidst the reports of increasing technology-knowledge gap due to rapid advances in agricultural technologies it has become important to understand the information priorities of farmers. With an aim to know the priorities of farmers as far as their agricultural information needs are concerned data were collected from the respondents. They were asked to rank their priorities in relation to their information needs. Table 6.11 reveals that farmers belonging to backward class communities and scheduled castes show high interest in obtaining information regarding crop insurance. Farmers are of the view that they frequently face crop failure

due to the practice of unscientific methods and use of spurious pesticides and seeds (particularly in case of cotton crop). Purchase of seeds from private agencies is one of the important reasons for crop failure. It is, therefore, understood that information regarding crop insurance has become essential for farmers to recover the crop loss. The other priorities of information for the respondents are knowledge about reducing the cost of cultivation, information regarding market prices, latest agricultural practices. Farmers belonging to backward class communities evinced interest in knowing the weather forecast whereas scheduled caste farmers were interested in knowing the process of acquiring crop loans. For them information on crop loan was an important requirement next to crop insurance. Thus, it may be stated that the preference for information regarding various issues of cultivation by farmers varies from caste to caste. Data reveals that the information needs of farmers are different among BC and SC farmers. It may also be said that the information priorities vary based on the size of the landholdings as most of the scheduled caste farmers have small holdings when compared to their counterparts. This finding of the study strongly suggests that farmers need a personalized information system based on their landholdings, type of soil, availability of irrigation facilities, crops cultivated earlier, willingness to adopt modern farming practices, level of mechanization and community they belong to.

Table 6.11: Caste wise ranking of information needs

Rank	Farmers' information needs	No. of farmers (%)	
		BC	SC
1	Crop Insurance	60 (97)	37 (100)
2	Reduce of cost cultivation	55 (89)	35 (94)
3	Market information and price trends	55 (88)	30 (81)
4	Weather Forecasting	50 (80)	27 (73)
5	Information on crop loans	48 (77)	35 (96)
6	Latest agricultural practices	42 (68)	25 (67)
7	Early pest and disease warning system	42 (68)	0
8	Advices from scientists	37 (60)	15 (40)
9	Success stories of Farmers	37 (60)	18 (49)
10	Soil testing	36 (65)	23 (62)
11	Input services	35 (56)	27 (73)
12	Government policies	30 (48)	25 (67)

Farmers attending agricultural meetings

Agricultural information dissemination is one of the important functions of the state department of agriculture. Timely and appropriate agricultural information are one of the important factors that affect agricultural productivity. Rogers (1969) argues that lack of proper information regarding various patterns and techniques of cultivation is one of the serious issues. It is also important to note that small and marginal farmers face a different set of problems (such as usage of fertilizers, pesticides and low yields) when compared to progressive farmers. Apart from the district level functionaries of the Department of Agriculture in Karimnagar, a DAATT (District Agriculture Advisory and Transfer of Technology) centre is also providing extension services in the district. In collaboration with the agricultural research institutions of the State Agricultural University, located in the district it conducts field demonstrations as part of its extension activities. It also tests sustainability of technologies generated by the research scientists and their suitability in different farming situations. It disseminates information to the farmers of the village where the field trials are conducted. It was observed that DAATT centre's services are

mainly utilized by the backward class farmers who were observed to maintain close contact with the former while the scheduled caste farmers stayed away.

Apart from the DAATT centre's field demonstrations, the state functionaries of agricultural extension carry out several activities of information dissemination to farmers throughout the year. However, generally, a majority of the programmes is scheduled during the crop seasons, Kharif and Rabi. Such meetings are aimed at providing appropriate suggestions and creating awareness about pest and disease management and other crop production practices among farmers. Agricultural meetings are conducted in the village panchayat office by the local agricultural officer and the scientists of the DAATT centre. Some of the meetings are mandatory as the Ministry of Agriculture of the state insists on organizing such meetings. Otherwise, several meetings are held with the initiative coming from district level officials of agriculture and agricultural extension agencies, like DAATT centre, operating in the district. Typically, for a meeting organized by the officials of the Department of Agriculture, farmers of the Mandal or District mobilize in large numbers. Through their contacts in the village the Agricultural Officers mobilize farmers for the meetings as the number of participants is an important factor in assessing the success of the programme. During the meeting farmers discuss various issues regarding the techniques of cultivation, usage of pesticides, and other problems with scientists and agricultural officers. It was observed that the educated farmers actively interact with agricultural officers and seek information regarding the government programmes.

In order to understand the extent of participation in the meetings organized by the state extension agencies' data were collected from the respondents. Data reveals that caste is one of the important factors influencing farmers' participation in the agricultural meetings. Usually progressive farmers of the village are entrusted with the responsibility of communicating the schedule of agricultural meetings to the farmers in the village by the Agricultural Officer. As most of the progressive farmers belong to the upper castes and from the non-scheduled castes, usually, the information reaches the scheduled caste farmers late. Dalit farmers are informed regarding agricultural meetings only when the

officials of the Department of Agriculture and other higher officials visit the village. It was also observed in the study that as the houses of the scheduled caste farmers are located at the margins of the village, communication on the meetings reaches them late. Also, it was reported that officials of the agricultural extension and the progressive farmers belonging to non-scheduled castes presume that the information disseminated in the meetings in inconsequential to the scheduled caste farmers because they don't adopt the practices disseminated as their holdings are small and their economic condition is weak.

Table 6.12 explains that no single Dalit farmer has attended the agricultural meetings regularly (once a month), whereas about 27 percent of BC farmers attend meetings regularly. It may also be stated that during the visit (usually once in six months) of Agricultural Officer and District authorities majority of the farmers attends the meetings. It may be observed that farmers belonging to backward class communities attend meetings regularly when compared to Dalit farmers. BC farmers were observed to be interacting personally with agricultural officers and scientists in the offices and at the meetings. They also visit the office of AO frequently to seek solutions on problems and to know about the subsidy schemes of the state. The majority (52 percent) of the BC farmers attends meetings twice in six months, whereas it is only 19 percent in the case of Dalit farmers. A large majority (81 percent) of respondent farmers belonging to the scheduled castes attend meetings just once in six months.

Table 6.12: Farmers attending agricultural meetings

Caste	No. of respondents (%)			
	Once a month	Twice in six months	Once in six months	Total
BC	17 (27)	32 (52)	13 (21)	62 (100)
SC	0 (0)	7 (19)	30 (81)	37 (100)

Field site – II (Maharashtra)

The other field site where data were collected is in the Vidarbha region of Maharashtra. The present state of Maharashtra came into being in 1960, after the bifurcation of the

bilingual state of Bombay. Historically Maharashtra is divided into four main regions, namely Konkan, Marathwada, Vidarbha and Western Maharashtra. Western Maharashtra and Marathwada were mostly under ryotwari land tenure. Marathwada has become a major cotton growing region from the late nineteenth century. The Maratha-kunbi castes improved their position through cotton and also sugarcane cultivation due to their large holdings of fertile lands.

Parbhani district is located in the Vidarbha region. The district got its name after 'Prabhavathi Vidarbha, son of Vrishabha Deva Rao who formed Vidarbha kingdom. Till 1956 Marathwada region was under Hyderabad Kingdom. The district was formed in 1999. Plathor, Gangakad, Jayakauadi, Jinthoor are the irrigation dams which are located in Parbhani district. Godavari and Ajanta are the two main rivers that flow through the district. The average rainfall is 773 mile meters and this district is located at 457 meters sea height. It is spread over an area of 6,541 square kms with eight towns and 828 villages. The irrigated land is about 42,000 hectares and there are about 34 small irrigation projects, 2 medium projects and one large irrigation project. Soybeans, cotton, wheat, sunflower, pulses and rice are the major crops grown in the district (Hand book of Parbhani district 2013).

Vidarbha has been well known for cotton cultivation as well as farmer suicides in the recent past. The region witnessed a regressive zaminidari system that reduced investment and promoted a feudal culture, which has been blamed for agrarian stagnation. It is said that the region was neglected by Maharashtra state and the lion's share of resources captured by the farmers belonging to the dominant Maratha Kunbi and Brahmin castes (Shan *et al.* 2014). Recognizing the problem of agriculture in the region an ICT based agricultural extension, named i-krishi, was initiated in 2000 in the region by a non-state actor with an aim to provide agricultural information to farmers at the village level.

Data were collected from 120 households spread across three villages namely Asola, Nandgaon bk, and Malsonna in Parbhani district. Each of these villages is dominated by farmers belonging to one caste. The majority of the farmers in these villages has been utilizing the services provided by i-krishi. The major crops grown in the study villages

are cotton, soybeans and sugar cane. The majority of the land holdings are irrigated by canal irrigation and bore wells.

Village profile

Asola, Nandgaon bk, and Malsonna villages are located within a radius of 40 km from Parbhani district head quarter. Three villages possess homogenous characteristics. Malsonna village comprised of different caste groups like Martha, Mahar, Rajpuits, N.T and Kambi. The dominant caste group is Nomadic Tribe. There are about 300 households in the village whose major occupation is agriculture. The population of the village is about 4000. The majority of the households belong to the Nomadic Tribe, which is a scheduled tribe. The majority of them households own hold irrigated land. Nandgaon bk is located 20 km from away from the district head quarter. This village comprises of different caste groups like Maratha, Vanjari, Patil, Mahar and Kambi. The majority of the households belong to the dominant caste (i.e., Maratha). The number of households is 180 with a population of 3500. Major occupation of the households is agriculture. Major crops grown are wheat, sugarcane and soyabean. Asola is located at about 20 km distance from the district head quarter. It comprises of households belonging to castes like Maratha, Patil, Kambi and Mahar. Among them Martha is the dominant caste whose members holds a large percentage of land in the village. The number of households of the village is 210 with a population of about 4000.

Profile of the respondents

Data were collected from 120 farmers located in three villages. Respondents belong to different castes like Kumbi, Patil, Dhangar and Vanjari, Mahar and Mang. The name OC is used to refer to these castes because all these castes are the dominant castes in the region. The status of dominant caste comes from the large land holdings the castes own in these villages. These castes are also politically dominant. Table 6.13 suggests that apart from the respondents belonging to OC (35 percent) respondents from SC, BC and NT are also included in the study.

Table 6.13: Caste wise distribution of respondents

Caste	No. of respondents (%)
Other castes (OC)	42 (35)
B C	22 (18)
S C	31 (26)
Nomadic Tribes (NT)	25 (21)
Total	120

Landholding pattern among respondents

The size of land holding plays a crucial role in accessing agricultural information, credit, and in the commercialization and mechanization of agriculture. A majority of the respondents included in the study belong to the marginal and small farmer category. About sixty one percent of the respondents own less than five acres of land. About five percent of the respondents include farmers belonging to the large farmers category (see Table 6.14). Caste wise distribution of land among respondents, as presented in Table 6.15, suggests that about 67 percent respondents belong to OC category who own more than five acres of land each, whereas a large majority of the SC and NT farmers (84 percent and 72 percent respectively) own less than five acres each. Out of 31 SC farmer respondents 17 (55 percent) are marginal farmers. One respondent belonging to the NT category reported owning more than 25 acres of land. Data also reveals that the majority (59 percent) of the total land holdings is marginal and small.

Table 6.14: Landholding pattern

Type of land holding	Number of respondents (%)
Marginal (below one 1 ha.)	43 (36)
Small (1to 2.0 ha.)	28 (23)
Semi-Medium (2 to 4 ha.)	26 (22)
Medium (4 to 10 ha.)	17 (14)
Large (above 10 ha.)	6 (5)
Total	120 (100)

Table 6.15: Caste and land holding pattern

Caste	Number of respondents (%)					
	Marginal	Small	Semi-Medium	Medium	Large	Total
OC	9 (21)	5 (12)	13 (31)	10 (24)	5 (12)	42 (100)
BC	7 (32)	6 (27)	5 (23)	4 (18)	0 (0)	22 (100)
SC	17 (55)	9 (29)	4 (13)	1 (3)	0 (0)	31 (100)
NT	10 (40)	8 (32)	4 (16)	2 (8)	1 (4)	25 (100)

The agricultural lands in the villages of Parbhani district where data were collected are irrigated by canals or by bore wells. Large parts of this region have hard rock aquifers with limestone, basalt and other rock formation 15 to 20 feet below ground level. Data reveals that the majority (93 out of 120, about 78 percent) of the respondent farmers has irrigated land (through bore wells and canals). Table 6.16 on the distribution of land, both irrigated and rainfed along caste lines reveals that the majority (about 88 percent) of the upper caste farmer respondents has irrigated land holdings. It may also be observed that the majority of the NT farmer respondents (92 percent) has irrigated land. However, in the case of scheduled caste farmers a majority of them (about 52 percent) has dry land where rainfed cultivation is practiced. Data reveals that out of 27 farmers who own dry land among the respondents about 59 percent belong to the scheduled castes. One of the reasons for the large number of scheduled caste farmer respondents owning dry land is that the land given by the government, as part of land distribution to the scheduled caste families, is unsuitable for cultivation. Another reason cited by the respondents is that since they lack the resources to develop the land, for example, by digging a bore well or leveling the land, the land provided by the state has remained unused for a long time.

Table 6.16: Caste, land holding pattern and type of land

Caste	No. of respondents (%)										Total
	Irrigated						Dry/rainfed				
	Marginal	Small	Semi-Medium	Medium	Large	Total	Marginal	Small	Semi-Medium	Total	
OC	9 (24)	3 (8)	10 (27)	10 (27)	5 (14)	37 (100)	0 (0)	2 (40)	3 (60)	5 (100)	42 (100)
BC	6 (34)	4 (22)	4 (22	4 (22)	0 (0)	18 (100)	1 (25)	2 (50)	1 (25)	4 (100)	22 (100)
SC	7 (47)	3 (20)	4 (27)	1 (6)	0 (0)	15 (100)	10 (63)	6 (37)	0 (0)	16 (100)	31 (100)
NT	10 (43)	6 (26)	4 (17)	2 (9)	1 (5)	23 (100)	0 (0)	2 (100)	0 (0)	2 (100)	25 (100)

Education

Data on the educational profile of the respondents of the Maharashtra field site suggests that about 25 percent of the respondents have no formal education. Out of these 25 respondents 22 (88 percent) belong to SC and NT categories. A large majority of the OC farmer respondents is educated beyond secondary school. Table 6.17 suggests that there is a marked difference in the levels of education along caste lines.

Table 6.17: Caste and Education level among the respondents

Caste	No. of respondents (%)					
	No formal Education	Primary	Secondary	High School	Above 10^{th}	Total
OC	4 (10)	7 (17)	13 (30)	7 (17)	11 (26)	42 (100)
BC	3 (13)	7 (32)	6 (27)	1 (5)	5 (23)	22 (100)
SC	16 (51)	3 (10)	3 (10)	0 (0)	9 (29)	31 (100)
NT	16 (64)	2 (8)	3 (12)	1 (4)	3 (12)	25 (100)

Age

Data on the age of the respondents as presented in Table 6.18 reveal that out of a total of 42 respondents belonging to OC castes sixty nine percent are in the age group of below forty years. Similarly a majority of the respondents from BC castes also belongs to below forty year age group. However, in the case of scheduled castes and nomadic tribe farmer respondents a majority of them (78 percent of SC respondents, 68 percent of NT respondents) is in the age group of above forty years. Significantly, less percentage of respondents in the age group of above forty years are found both among OC and BC

castes and below forty years is found in both SC and NT respondents. It may be mentioned that the respondents chosen for the study are selected randomly. Thus Table 6.18 helps us to infer the fact that while the socially and economically dominant castes prefer their younger generation to continue agriculture, farmers belonging to SC and NT don't prefer their younger generation in agriculture. This data allows us to infer, although to a limited extent, that agriculture has been remunerative for the dominant caste farmers while those castes which have entered into agriculture late has been unremunerative. Vidharbha region to which the study villages belong to is known for commercial agriculture. Traditionally cotton has been cultivated on commercial lines for a long time. Recently we have witnessed a shift from cotton to soyabean cultivation as cotton has become vulnerable to pest damage and cotton price to market fluctuations. Cotton cultivation, and of late soyabean cultivation has been carried out by farmers belonging to OC and BC castes. However, unable to withstand the risks associated with commercial agriculture, farmers belonging to SC and NT categories prefer their younger generation to migrate to urban centres for non-farm work. This was corroborated in the responses of farmers during the in-depth interviews. Significantly, the OC and BC farmers who have been holding their control through electoral politics wish to continue their legacy by encouraging their younger generation in agriculture.

Table 6.18: Caste and age of the respondents

Caste	No. of respondents (%)					
	Below 30 years	31-40 years	41-50 years	51-60 years	Above years 61	Total
OC	12 (29)	17 (40)	8 (19)	1 (2)	4 (10)	42 (100)
BC	5 (23)	10 (45)	5 (23)	2 (9)	0 (0)	22 (100)
SC	1 (3)	6 (19)	8 (26)	14 (45)	2 (7)	31 (100)
NT	1 (4)	7 (28)	5 (20)	12 (48)	0 (0)	25 (100)

Cost of production

The cost of cultivation has been increasing steadily over the years as a result of increasing dependence on external inputs by farmers in cultivation. Apart from the inputs of cultivation like seeds, fertilizers, pesticides and herbicides which are sourced from

places external to the village, farmers in the study villages have been using machines for a majority of farm operations. As a result, the respondent farmers have observed in their interaction with the researcher that the cost of cultivation has skyrocketed over the past ten years. Dependence on hired labour, mechanized cultivation, and commercial agriculture have been contributing to the rise in cost of cultivation. Besides, unregulated seed, fertilizer and other inputs in the 'black market' and ground water irrigation systems are also contributing to the increase in the cost of cultivation. The cost of irrigation, both fixed investment and operating costs, is a factor that led to the agrarian crisis, which reportedly has resulted in the incidence of farmer suicides in various parts of India. Huge investments on digging deep bore wells to extract groundwater, high cost of motor pumps to draw water and the interest on loans borrowed from non-institutional sources, for instance, led to tragic suicides, particularly in dry land areas of Telangana, Maharashtra and Karnataka states where low rainfall causes increased dependence on groundwater (IRDR 2013). Until recently, the minimum support prices (MSPs) for crops has failed to rise fast enough to compensate farmers for increased cultivation costs. Since cultivation costs vary across regions, a nationwide MSP benefits some regions, but hurts others where it may not even cover the cost of production. Farmers, thus, were increasingly exposed to market price volatility, a major factor in eroding farming viability.

Table 6.19: Cost of production (Per acre)

Caste	No. of respondents (%)		
	Less than Rs. 10,000	Rs. 10,001 – Rs. 15,000	Total
OC	40 (95)	2 (5)	42 (100)
BC	0 (0)	22 (100)	22 (100)
SC	3 (10)	28 (90)	31 (100)
NT	0 (0)	25 (100)	25 (100)

Table 6.19 presents that about 63 percent of farmer respondents incur an expenditure of Rs. 10,001 – 15,000 on cultivation. It is widely accepted that the cost of cultivation varies from farmer to farmer (plot to plot). However, it is a known fact that over a period the intensity of usage of chemical fertilizers and pesticides has increased significantly among all the sections of farmers to increase productivity. The chemicalization and mechanization of agriculture have led to the use of fertilizers, pesticides, tractors, and

harvesters which made them to depend on market/other farmers and also led to the negligence usage of organic manure. It is also viewed by many researchers that the input cost depends on the timely availability of fertilizers and pesticides. Data reveals that majority (95 percent, 40 out of 42 respondents) of the farmers from OC category spend less than Rs 10,000 in cultivation per acre whereas SC, BC and NT farmers spend above Rs. 10,000. The input cost is low among the upper caste respondent farmers because these farmers procure inputs like seeds, fertilizers and pesticides in time and they seek advices personally from the agricultural officers and act on them. Thus, it may be stated that the social capital that this section of farmers enjoy helps them in reducing the cost of cultivation. Input cost among marginalized sections farmers is high because they hire machines on rent at higher prices during peak seasons of cultivation.

Access to credit

From the 1960's onwards commercial farming has gained prominence among all the regions of India and even in the Vidharbha region. Commercial agriculture relies heavily on external inputs such as seeds, chemicals, fertilizers which increase the cost of cultivation significantly. Being water-intensive, commercial farming is particularly risky in rainfed and dry land areas. Commercial agriculture also said to have led to degradation of productive lands due to heavy use of chemical fertilizers and pesticides. Borrowing funds for inputs is risky in the event of crop failure, particularly in the case of small and marginal farmers who lack investible surplus and access to institutional credit and who rely on moneylenders. These farmers not only pay higher interest, but also face coercive loan recovery means.

Table 6.20: Sources of credit

Caste	No. of respondents (%)				
	Never borrowed	Bank	Money Lender	Relatives	Total (%)
OC	8 (19)	34 (81)	0 (0)	0 (0)	42 (100)
BC	4 (18)	11 (50)	4 (18)	3 (14)	22 (100)
SC	4 (13)	10 (32)	11 (36)	6 (19)	31 (100)
NT	3 (12)	14 (56)	5 (20)	3 (12)	25 (100)

Table 6.20 suggests that out of thirty one scheduled caste farmer respondents seventeen (55 percent) borrowed loans from money lenders and relatives. The extent of reliance on non-institutional credit sources such as money lenders and relatives is less prevalent among the OC and BC farmers. However, data presented in Table 6.20 suggest that 69 out of 120 farmers have borrowed loans from banks. This indicates the growing monetary needs of farmers in cultivation, which is said to have caused by commercial agriculture.

It was found in the study that after the establishment i-krishi, access to credit from banks has become easier because the Promoter of the village takes the responsibility of processing the bank loan by liaisoning between banks and farmers of the village. i-krishi provides links to credit from nationalized banks to the farmers. A critical understanding of this phenomenon - increasing access to formal credit sources after the setting up of i-krishi suggests two points. One, i-krishi, by facilitating loans from banks, in a way encourages high input cultivation and second, the role of the Promoter in facilitating the loan process, because of social structural divisions in the village may be exclusivist to some farmers. It was reported by the respondents that i-krishi has never overcome the traditional barriers and in fact reinforced the dependency of marginal and small farmers belonging to lower social strata on the upper caste, as the Promoter belongs to upper caste.

Accessing agricultural information or advices

Agricultural information needs of farmers in the region have been complex because of the adoption of commercial agriculture. Close linkage with market for marketing the produce and procuring inputs for cultivation have led the farmers of the region to seek out information from the external sources. With the introduction of i-krishi there has been a perceptible change in the sources of information for farmers. As presented in Table 6.21 fifty three out of 120 farmers have been seeking advices or agricultural information from the Promoter appointed by i-krishi. However, what is significant in the data presented in Table 6.21 is that the majority of the OC farmers (52 percent) and NT farmers (80 percent) depend on Promoter for information while the majority of the BC and SC farmers depend on input dealers for information. It is also significant to note that no

single respondent reported to have sought information through the Kisan call center set up by the government of India. Also, it is important to note the absence of influence of AO in the agricultural information dissemination as no respondent farmer from the BC, SC and NT reported to have approached him/her for information. The fact that the presence of i-krishi in the villages made the officials of agricultural extension lax in the delivery of their duties, assuming that the information needs of the farmers is met by i-krishi. This was corroborated by the respondents in the interviews with the researcher who observed that i-krishi presence made the agricultural extension officials nonchalant to the information needs of the farmers. Sociologically speaking, such a phenomenon becomes problematic for the reason that, over a period, rely on i-krishi may lead farmers to become gullible partners in the scheme of corporate hijack of agriculture. Moreover, non-state initiatives always show their disinclination towards the poor, weak and marginal communities. Lacking the welfare motto, the private extension approaches may exclude these farming communities. On the other hand, in the private extension initiative farmers are treated as consumers who otherwise are viewed as citizens demanding their rightful from the state under the state extension system.

Table 6.21: Advice on field problems

Caste	No .of respondents (%)						
	Neighbors	AO.	Call centers	Input dealers	Promoter	Multiple Sources	Total
OC	4 (10)	4 (10)	0 (0)	10 (24)	22 (52)	2 (4)	42 (100)
BC	0 (0)	0 (0)	0 (0)	10 (45)	7 (32)	5 (23)	22 (100)
SC	5 (16)	0 (0)	0 (0)	15 (48)	4 (13)	7 (23)	31 (100)
NT	0 (0)	0 (0)	0 (0)	3 (12)	20 (80)	2 (8)	25 (100)

A.O. = Agricultural Officer
Call centres= Kisan call centre of the government of India
Multiple sources= more than one source, which include, for example, a combination of input dealers and fellow farmers

Marketing the produce

Over the decades, many small and marginal farmers have been facing immense difficulties in marketing their produce. As the rural areas suffered due to inefficient market linkages and ineffective procurement system small and marginal farmers prefer to sell off most of their produce in the traditional local markets at very low prices immediately after the harvest. It is widely reported in many studies that the rural markets witness interlinked transactions and are dominated by certain sections of people (traders and money lenders) who thrive on the exploitative practices. Interlinked transactions lead many small and marginal farmers to sell their produce to moneylenders and traders from whom they have taken either inputs on credit or borrowed money for household needs. Small and marginal farmers suffer serious disadvantages in the traditional marketing and distribution. Their smaller outputs, fragmented landholdings and often distant location from major markets deprive small farmers in accessing markets where high prices are offered for their produce.

It is evident that there is a drastic shift in agriculture, i.e. from subsistence farming to commercial farming, which is increasing the marketed surplus and causing a shift towards cultivating high value crops. Even small holdings now increasingly generate a marketable surplus of food grains to be sold at markets. Over a period markets have expanded to reach previously untouched areas, a significant portion of the rural population is exposed to highly volatile commodity price movements, driven by global and local factors.

Table 6.22: Marketing the produce

Caste	No. of respondents (%)			
	MC	Middlemen	Local Market (nearby towns)	Total
OC	42 (100)	0 (0)	0 (0)	42 (100)
BC	22 (100)	0 (0)	0 (0)	22 (100)
SC	30 (25)	1 (1)	0 (0)	31 (100)
NT	22 (100)	0 (0)	3 (3)	25 (100)

Marketing of agricultural produce in the study villages witnessed tremendous changes with the entry of MC into the agricultural market and extension services through i-krishi. Table 6.22 explains that almost all the respondent farmers (96%) sell their produce at the MC procurement hub. When the reasons for such a shift from traditional market to MC hub were ascertained from the respondents it was found that i-krishi procurement system is hassle-free, transparent and makes immediate payment. Farmers observe that i-krishi services are better than local mandis and also that the transactions in local mandis are secretive and exploitative. It was said that while the mandi traders pay the amount in installments or pay after a few months i-krishi allows them to collect cash immediately. Moreover mandi collects a fee from farmers. Many farmers stated that at the local mandi the marketing process is very complex and unfair, whereas in i-krishi it is transparent and the loading and unloading charges are paid by i-krishi itself. One of the important observations is that the Promoter encourages all the farmers irrespective of caste to sell their produce at the MC procurement hub to increase his commission. It was found that although the price offered for a given product for example, soyabean, at the local mandi is high when compared to i-krishi, farmers prefer to sell at i-krishi because the transaction is completed within 3-4 hours and there is also a reduction in the transportation cost. However, MC procures specific agricultural produce in which it has global agribusiness interests.

Ranking information needs

Acknowledging the fact that the information needs of farmers have increased with the onset of commercial agriculture data were collected from the respondents on their perception about the agricultural information in terms of priorities. Ranking of information priorities as felt by the respondents is presented in Table 6.23. It may be ascertained from Table 6.23 that the information priorities are varied across caste. As is evident from the data, farmers belonging to the OC castes give more priority to marketing the produce, knowing about latest agricultural practices, input services, getting access to the Promoter of i-krishi and information on markets and price trends. In the case of BC farmers the important issue for them is marketing the produce. The other information

needs like market information and price trends, information about crop insurance, and crop loans, and information on government subsidies have emerged as key in the perceptions of BC farmers. The SC farmer respondents prioritize marketing the produce and information on crop loans. Their other priorities are knowledge about agricultural practices which can help them in reducing the cost of cultivation and information on market and price trends. The information priorities of the NT farmers are information about marketing the produce, on crop loans, market and price trends, and knowledge about practices on reducing the cost of cultivation.

From Table 6.23 what emerges as key is the varied priorities among farmers. The variation in the priorities may be explained in terms of caste. As discussed earlier in the thesis that caste is a key social institution which plays an important role in agriculture. This is because caste determines the extent of social capital farmers have. The anxieties of BC, SC and NT farmers, for example, about information on crop loans, crop insurance, and knowledge about practices related to reducing the cost of cultivation are not the priorities of the OC farmers. The OC farmers who were the first beneficiaries of green revolution have required knowledge about crop loans, crop insurance, etc. whereas the BC, SC and NT farmers who lack the social capital and who entered into commercial agriculture recently feel the necessary of information on those issues which add risk to agriculture. Table 6.23 suggests that, except on marketing the produce and market and price trends on which there is a common feeling across castes, other information priorities do not match with each other. This finding highlights that fact that the information needs of farmers are not uniform and vary based on caste and land holding.

The Promoter has emerged as key player in the i-krishi model, whose task is to disseminate necessary information to the farmers at the local level. Criteria for the selection of the Promoter primarily depend upon his/her educational levels and social status in the concerned village. Besides, the location of the house of a Promoter is also one of the important criteria in the selection process. Usually the Promoter’s house is located at the centre of the village, as it is convenient for both the MC technical staff who visits regularly to the Promoter’s house as well as for the farmers of the village who are

in need of information regarding cultivation. Farmers belonging to OC castes, whose houses are located at the centre of the village, have an easy access to information regarding various issues involved in agriculture as they stay close to the house of the Promoter. However, it was observed that farmers belonging to NT and SC communities face problems in obtaining information as their houses are located far away from the village centre and also from the Promoter's house where the kiosk of i-krishi is set up. Time constraint and distance make the SC and NT farmers disinterested in obtaining information from the Promoter.

Most of the farmers belong to OC and BC communities gather at the Promoter's house regularly, particularly in the morning hours to discuss about the field problems. However, farmers belong to NT and SC communities seldom come to the Promoter's house. They approach the promoter only if there is any serious field problem during the time of cultivation and procurement. In general, these farmers seek information only about the availability of seeds and price of the produce. Whereas, the farmers belonging to the OC community discuss the field problems and seek necessary information regarding the usage of pesticides and fertilizers, and also access information regarding meetings and supply of fertilizers frequently. The frequent visits made by the farmers belonging to the upper castes to the Promoter's house and regular interaction with the Promoter makes them well aware of market information.

Table 6.23: Caste wise ranking of information needs

Rank	Farmers' information needs	No. of farmers (%)			
		OC	BC	SC	NT
1	Procurement of the produce	42(100)	19(86)	15(48)	22 (88)
2	Latest agricultural practices	40 (95)	10 (45)	13 (41)	11 (44)
3	Input services	40 (95)	11 (50)	11 (35)	9 (36)
4	Access to the Promoter of i-krishi	37 (88)	7 (32)	4 (13)	11 (44)
5	Market information and price trends	37 (87)	20 (91)	13 (41)	18 (72)
6	Export of produce	33 (79)	10 (45)	9 (29)	7 (28)
7	Solution to the problems in cultivation	33 (79)	16 (72)	5 (16)	7 (28)
8	Reduce the cost of cultivation	33 (79)	9 (41)	13 (42)	15 (60)
9	Weather Forecast	33 (78)	12 (54)	12 (38)	10 (40)
10	Soil testing	28 (66)	7 (32)	6 (19)	9 (36)
11	Crop Insurance	27 (64)	18 (81)	9 (29)	11 (44)
12	Field trails	19 (45)	1 (1)	0 (0)	4 (16)
13	Information on crop loans	18 (42)	18 (81)	25 (80)	17 (68)
14	Advices from scientists	14 (33)	9 (40)	5 (16)	6 (24)
15	Government policies	13 (30)	17 (77)	9 (29)	8 (32)

Farmers attending agricultural meetings

Agricultural information dissemination in the Maharashtra field site, after the establishment of i-krishi, has largely been through the new media called the internet. The Promoter of i-krishi would inform the farmers of the village about the information s/he obtained through the internet. The kiosk set up in the Promoter's house is used to access such information from time to time. However, personal communication has not become irrelevant in the age of new media. Agricultural extension literature suggests that personal, face-to-face communication has greater influence than other impersonal modes of communication. Realizing this, the MC organizes agricultural meetings where the i-krishi kiosks have been set up. In coordination with the local agricultural scientists the MC organizes interface meetings with farmers during the crop season. In the organization of such meetings the Promoter of the village and Co-promoters play a key role. They are entrusted with the responsibility of mobilizing farmers for such meetings.

Data were collected on the extent of participation in these meetings from the respondent farmers. It was found that the majority of the OC farmers (60 percent out of 42

respondents) attend the meetings at least once a month. In the case of other category farmers majority of them attend once in six months only. When the variable on regularity in attending meetings was cross tabulated with educational levels, it was found that farmers with a high educational level attend the meetings more regularly than farmers with less educational levels.

Table 6.24: Farmers attending agricultural meetings

Caste	No. of respondents (%)			
	Once a month	Twice in six months	Once in six months	Total
OC	25 (60)	11 (26)	6 (14)	42 (100)
BC	6 (27)	2 (9)	14 (64)	22 (100)
SC	3 (10)	13 (42)	15 (48)	31 (100)
NT	0 (0)	3 (12)	22 (88)	25 (100)

Comparative Analysis

This part of the chapter attempts at drawing comparisons between the two field sites. The non-state ICT initiative in agricultural extension has been functioning in the Parbhani field site whereas state led agricultural extension services are available in the Karimnagar field site. The thesis attempts at understanding the social organization of ICT initiatives in agricultural extension. It critically examines the issues of design, functioning and participation of farmers as the ICT initiative is located in the private domain. In order to critically examine the non-state ICT extension initiative the Karimnagar field site was selected, where state led extension services are present, as a benchmark. The following part of the chapter discusses the findings from the Parbhani field site in comparison to the Karimnagar field site. The discussion is placed along certain key sociological parameters.

Age

One of the significant change, agriculture in India witnessing is in the demographic profile of farmers. As far as interest in agriculture across different age groups is concerned it is said that the younger generation in the villages is disinclined to be engaged in agriculture. Sharma (2007) observes that farming is popularly considered to

be an old man's job in the villages. In his survey on perceptions of rural youth observes that 55 percent of the farms surveyed are primarily managed by their (respondents) fathers (while the youth contributed labour on farm), 11 percent farms are completely operated by their fathers and the rest 44 percent are managed by their wives or relatives or sharecroppers. Sharma (*ibid)* also notes that the phenomenon is more pronounced in villages which are close to towns where almost half of the youth (46 percent) were working part-time on the farm. The farming population has been ageing as a majority of the youth in the villages, due to education and urbanization, are opting for non-farm occupations and migration to urban areas. Deshingkar and Start (2003) suggest that large number youth commute to nearby towns or villages. Most of them work as daily wage laborers and are engaged in the construction industry.

In the present study, it was observed in both the field sties that a majority of the farmers are middle aged while youth from landholding families staying away from agriculture. Across castes majority of the respondent farmers in both the field sites belong to the age group 31-40 years. What is important to note is that not many youth from SC families are taking up agriculture. As is evident in Figures 6.1 and 6.2 it may be said that young Dalits are leaving home to seek employment elsewhere, particularly in the nearby towns and prefer not to engage in full time agriculture. They participate in agriculture operations during the peak seasons. It was observed that in the Parbhani field site majority of the youth from SC families work in brick kilns to repay the debts incurred in agriculture.

It is argued that migration to urban areas is not permanent and is instead circular in which rural residents migrate seasonally in search of work to urban areas and return to their villages when farm operations demand their presence. In Parbhani and Karimnagar districts such migration was observed. However, in Parbhani the young upper caste farmers continue to be engaged in agriculture as it is remunerative for them not just in economic terms but also in political terms. In Karimnagar where such political linkage with agriculture is weakened as a result of the exit of upper castes from agriculture not many young farmers even from the BC communities are taking up agriculture.

Figure 6.1: Caste and age of the respondents (Karimnagar)

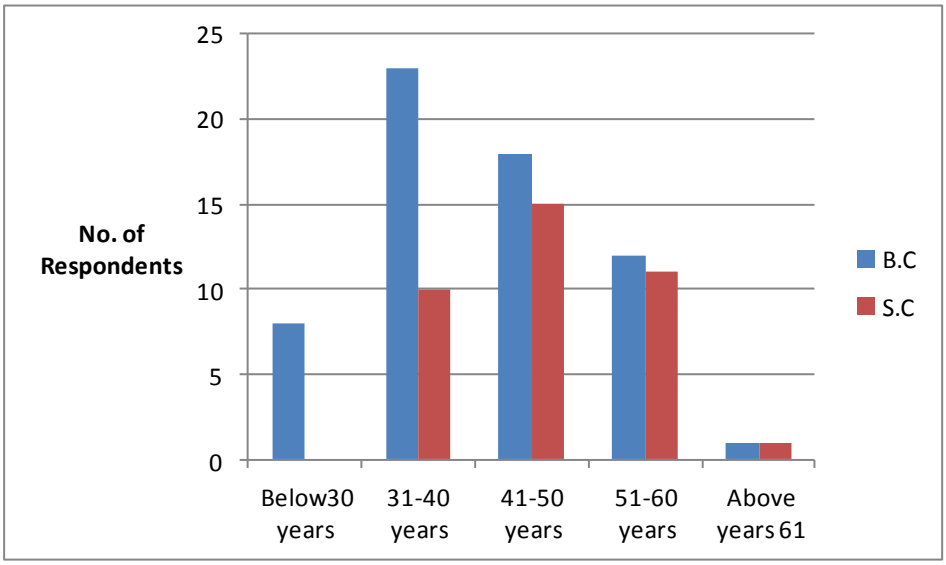
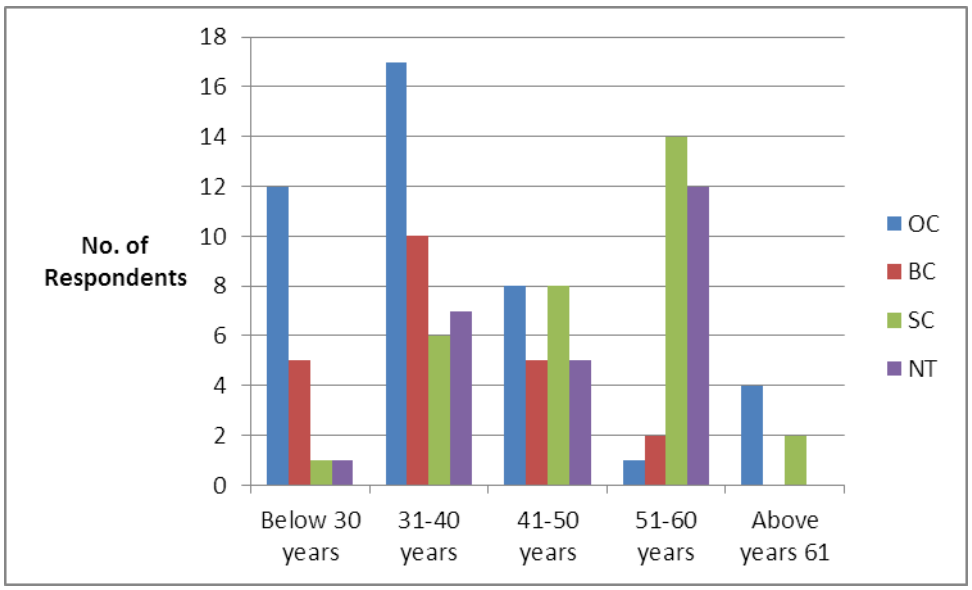


Figure 6.2: Caste and age of the respondents (Parbhani)



One of the biggest challenges for Indian agriculture is to retain its youth in agriculture. The rural workforce continued to grow, rising from 191 million in 1993-94 to 257 million in 2004-05, however, employment growth in agriculture has fallen to virtually zero since 1980's. Unless farming becomes both intellectually stimulating and economically

rewarding, it will be difficult to attract or retain rural youth in farming (Swaminathan 2001). For the farmers belonging to upper castes in Parbhani who are continuing in agriculture observe that given the poor urban living standards for unskilled rural migrants employed in cities, agriculture is a dignified occupation. However, Dalit farmers observe that agriculture is a risky affair for them because they don't have enough capital to invest in agriculture.

Landholding pattern

Access to land is crucial and of fundamental importance for sustainable livelihood and food security of a vast majority of India's rural population. The incidence of poverty is highly correlated with lack of access to land (Aggarwal 1994). There is a broad unanimity that the main causes of rural poverty lie with low rates of agricultural growth and factor productivity. The land plays an extra role in rural India aside from its value as a productive factor. Land ownership confers collateral in credit markets, security in the event of natural hazards or life contingencies, and social status (Robin 1999).

There is increasing evidence around the world that agricultural productivity is related to farm size. Small size landholdings are considered as unsuitable for new technological applications (like green revolution technology). Bhalla and Roy (1988) argue that the relationship between size of land holding and productivity is inversely related. Economists consider fragmentation of operational holdings into multiple plots as a serious limitation on agricultural productivity in India. The fragmentation process has brought about a major change in the production structure in agriculture. Much more than before, the small and marginal owners would have to shoulder in future the responsibility for the tasks necessitated by agricultural growth and modernization (Rao and Hanumappa 1999). However, it is noted that the number and proportion of households owning no land have declined significantly since independence, mostly due to the abolition of intermediaries and land redistribution during the 1950s (Robin 1999). According Planning Commission (2007) 60 percent of the peasantry who had holdings of less than

one hectare are from Dalit and Backward class communities and these land holdings are considered to be not suitable for modern technology.

The size of the land holding is one of the important factors influencing the adoption new agricultural technologies. Empirical evidence from the field study reveal that the majority of the households possesses small and marginal land holdings. In the case of the Karimnagar majority of the land holdings are controlled by BC farmers. It was found that BC farmers are adopting new technology because their land holdings are suitable for modern agricultural practices and they are ready to go for field trails as they can risk the earnings of a small portion of the total earnings. At the Maharashtra field site a major part of the land holdings are controlled by upper caste farmers as may be seen in Figure 6.4 which suggests that the majority of the semi-medium and medium farmers among the respondents are OC farmers. The majority of the SC respondents here are SC and NT farmers.

Figure 6.3: Landholding pattern (Karimnagar)

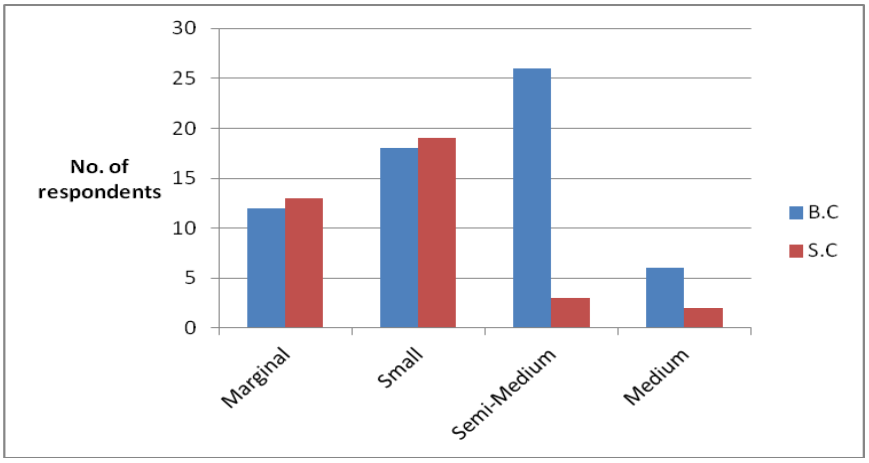
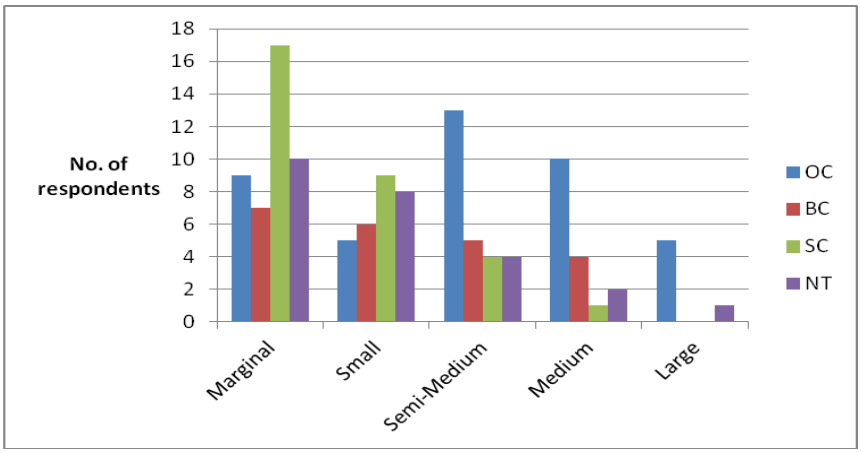


Figure 6.4: Landholding pattern (Parbhani)



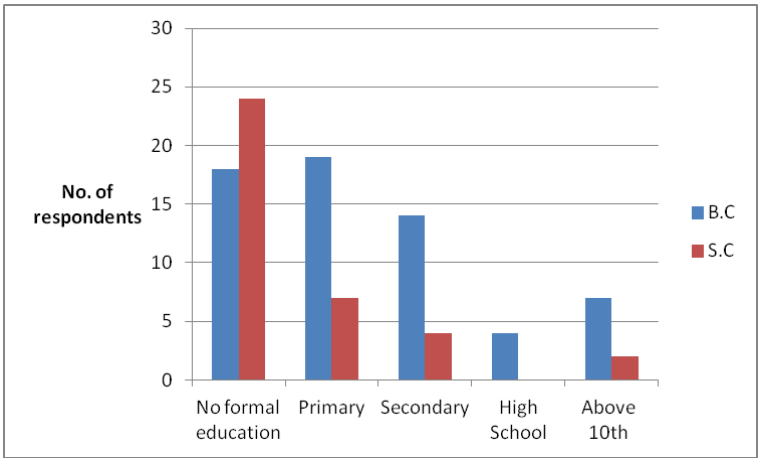
Role of education

Tichenor and others (1970) observe that education plays an important role in accessing agricultural information and in the adoption of new technologies and practices. Indian society is stratified on the basis of caste and it is considered as the major reason for unequal educational levels in rural India (Betille 1974). According Rogers and Singhal (1989) education is critical in acquiring knowledge and it enhances farm productivity directly by improving the quality of labour, increasing the ability to adjust to uncertainties and to successfully adopt innovative technologies and practices. Sharada (1999) suggests that there is a positive link between education and agricultural output and also between education and the adoption of modern agricultural practices.

Over a period the usage of pesticides has increased by the introduction of the green revolution. The new seeds are highly responsive to fertilizers and increase the productivity. Indian farmers are not enough educated to understand the contents of various fertilizers and the consequences of using such fertilizers. In fact soil needs to be tested in order to find out the fertility status and to know the suitable crops. However, due to lack of education farmers grow crops which are unsuitable to the soil in their farms. Farmers need proper guidance about the quality of the soil and the suitable crops. It was observed in the study that farmers in Parbhani have been encouraged by i-krishi to go for soil testing while in Karimnagar no such enthusiasm was found among farmers. Lack of

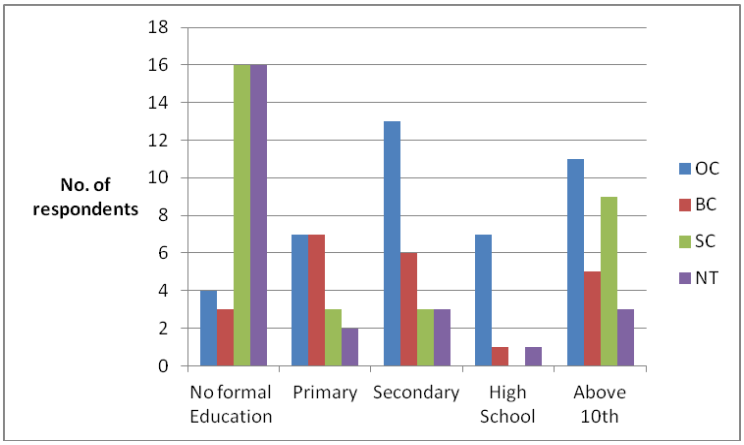
awareness on the advantages of soil testing was prominent among SC farmers in Karimnagar and SC and NT farmers of Parbhani. Due to lack of education and skills many marginal and small farmers are forced to depend on wage employment along with the cultivation for sustenance as the agricultural productivity levels are very low.

Figure 6.5: Educational status (Karimnagar)



In both the field sites, educational level among the respondents is directly linked to caste. A majority of the SC farmers in both the field sites along with NT farmers in Maharashtra poses no or low educational qualification. Only 58 percent of the respondents in Karimnagar and 69 percent in Parbhani are educated. It was observed that in the both the field sites, educated farmers show interest in attending agricultural meetings conducted by the Department of Agriculture and other private organizations (i-krishi). It was observed that due to lack of awareness illiterate farmers don't show interest in attending meetings. Illiterate farmers in both the field sites, Karimnagar and Parbhani, attend meetings only when the higher officials visit the villages, which are held generally once in six months. On the other hand educated farmers attend the meetings regularly. It may be said that education is one of the key determinants of participation in agricultural extension meetings. Unlike illiterate farmers the educated farmers are also in a position to seek clarifications regarding agricultural practices and usage of fertilizers from the scientists and officials.

Figure 6.6: Educational status (Parbhani)



After liberalization, private corporate companies have entered into the agricultural sector. Various kinds of seeds and fertilizers are available in the market, however their suitability and the methods of usage are not properly known to the farmers. It was reported by the respondent farmers that they purchase seeds and fertilizers from local input dealers. The majority of the farmers is unaware of taking the receipt while making such purchases. It was also reported that many input dealers sell poor quality fertilizers and pesticides. Farmers are aware of the fact that manufacturers produce low quality cheap fertilizers and pesticides and sell them through the input dealers by offering higher profits. However, due to lack of alternative sources or enough money to buy the good quality ones farmers instinctively buy the cheap inputs. Many farmers do not have up-to-date information on modern day cultivation practices which is claimed to be economically efficient. Improving farmer's knowledge, in addition to the supply of inputs, can dramatically increase the levels of productivity. It was opined that education will help farmers to know about the state of the art farming methods which are more productive (Rosegrant and Cline 2003).

Farmers attending agricultural meetings

The social structure of the Indian society is built on caste, wherein Dalits continue to remain excluded from the mainstream (Jodhka 2012a). Mbithi (1972) views that the allocation of inputs and resource endowments depends on the past performance and criteria set by the government like adoption of new technologies, regular participation in meetings, etc. Generally farmers belonging to the dominant castes in the villages are considered as 'progressive' as they are ready to accept innovations. Further, it is argued that the agricultural extension officers usually focus on those progressive farmers who become fixed clientele over time. The necessary information is always channeled to the same farmers, thus helping them improving the crop productivity in their farms. However, the fact is that due to small land holdings, lack of awareness and poor literacy levels, Dalits and other marginalized sections of farmers don't readily accept innovations and the agricultural extension personnel also don't pay much attention to them.

Data reveals that the percentage of respondent farmers who attend agricultural meetings is 31 in Parbhani, whereas in Karimnagar it is 17. Farmers seek advices regarding the usage of fertilizers, and discuss their field problems in these meetings. Farmers show interest in seeking advices given by the Agricultural Officer. The majority of them said that they are unable to follow the advices as they are no suitable to their field conditions. The farmers also mentioned that the fertilizers or pesticides or seeds advised by the scientists are difficult to find in the local markets. Farmers are, therefore, compelled to depend upon their own information channels (like input dealers, fellow farmers). One of the notable observations is that despite attending various agricultural meetings, farmers still depend on the local input dealers and fellow farmers for necessary advises. It was reported by the respondent farmers in Parbhani field site that with the establishment of i-krishi farmers' income has increased as the input costs have decreased by following the advices of i-krishi. However, this was reported by the OC and to some extent by the BC farmers only, whereas SC and NT farmers didn't report any substantial reductions in the cost of cultivation.

Figure 6.7: Farmers attending agricultural meetings (Karimnagar)

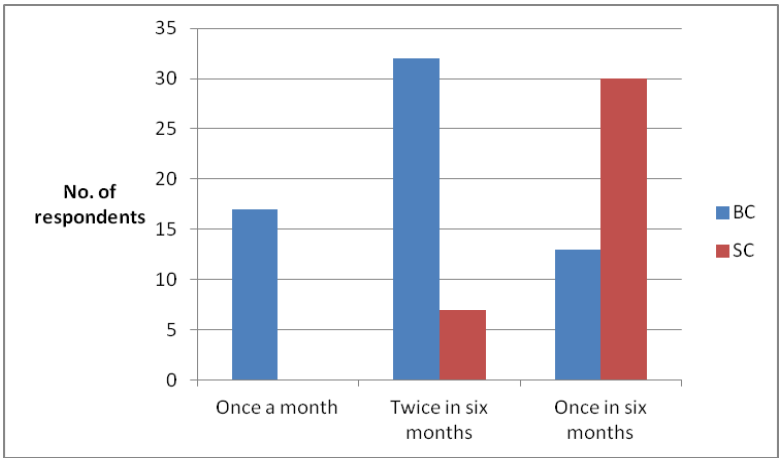
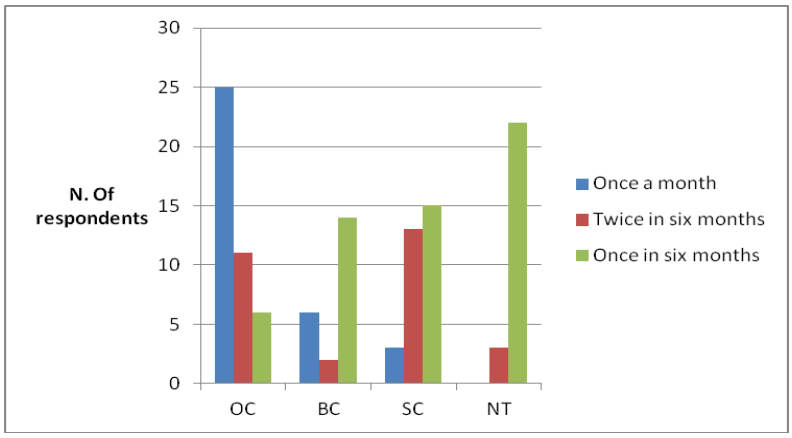


Figure 6.8: Farmers attending agricultural meetings (Parbhani)



Dasgupta (1977) observes that a progressive farmer, who generally belongs to the upper caste, works as a key informant and informs only to farmers of his caste and particularly to those who have good relations with him. It was observed in the present study that only on few occasions Dalit farmers were informed about the meetings, particularly when the DAO (District Agricultural Officer) visits the village (in case of Karimnagar district). In the case of the Parbhani field site majority of the upper caste farmers attend the meetings conducted by i-krishi. However, the majority of the Dalit and NT farmers don't attend the meetings. As the meetings are conducted during daytime these farmers prefer to go to the

field instead of attending the meetings. This is said to be one of the reasons for Dalit and NT farmers not able to access information. However, farmers belonging to the OC and BC can afford to defer their activities of the day or employ labourers for agricultural work to attend the meetings. Hence the attendance of OC and BC farmers in these meetings is more frequent when compared to SC and NT farmers. Information regarding the village activities and agricultural programmes is known only to the upper caste farmers because they have good rapport with the agricultural officer. These sections of farmers primarily possess good social network, social capital and good relation with officials. Because of good relation and social network progressive farmers' access the latest practices and latest technologies. The early adoption of technologies and access to appropriate information amplifies their income levels. The rise of income levels of these particular farmers widens the social and economic disparities within the village.

Farmers seeking information

In the contemporary context of agriculture, farmers need appropriate and timely information to raise farm output. Opening up of the agricultural sector as part of globalization made Indian farmers to compete globally. It has become imperative to follow advices of agricultural scientists and officers to enhance productivity. Timely application of fertilizers and pesticides in appropriate dosage has become essential to raise productivity. Knowledge about alternatives to chemical fertilizers and pesticides can help farmers in reducing the cost of cultivation.

The decline in the public agricultural extension services has led to the growing influence of input dealers and agents of various national and international agribusiness companies. The agents of the agribusiness companies influence the market than the state extension officials. The study finds that input dealer has emerged as the key source of information. In both the field sites significant number of farmer respondents approach the input dealer for information. Farmers reported that they approach the input dealers because they are available for most part of the day, approachable for all sections of farmers and they provide quick response. However, there is a significant variation in the caste wise dependence on input dealer for information. A large majority of the upper caste farmer

respondents in Parbhani prefers to seek information from i-krishi Promoter (see Figure 6.10) while a significant number of SC and BC farmer respondents prefer the input dealer. The OC farmer respondents were reported to be not interested in discussing the agricultural related issues with the farmers belonging to the marginal sections of society. It was observed that upper caste farmers discuss field problems with their own caste members, and they sit separately in the agricultural meetings. Only in the case of procurement Promoter informs the market price information to another section of farmers and asks them to sell at i-krishi.

In the case of the Karimnagar field site, in the absence of efficient extension services from the state, farmers belonging to BC and SC communities prefer to seek information from input dealers (see Figure 6.9). It was observed that farmers from different castes interact with each other at public places and share agricultural information irrespective of caste. They discuss issues regarding the usage of fertilizers, pesticides and different practices of cultivation. Farmers also discuss about the government initiatives in agriculture. Few Dalit farmers' fields are located next to the BC farmers' fields, in which cases Dalit farmers and BC farmers discuss about the field problems together. It was observed that farmers from marginal group face problems in agriculture because of their inexperience in cultivation.

Figure 6.9: Farmers seeking information (Karimnagar)

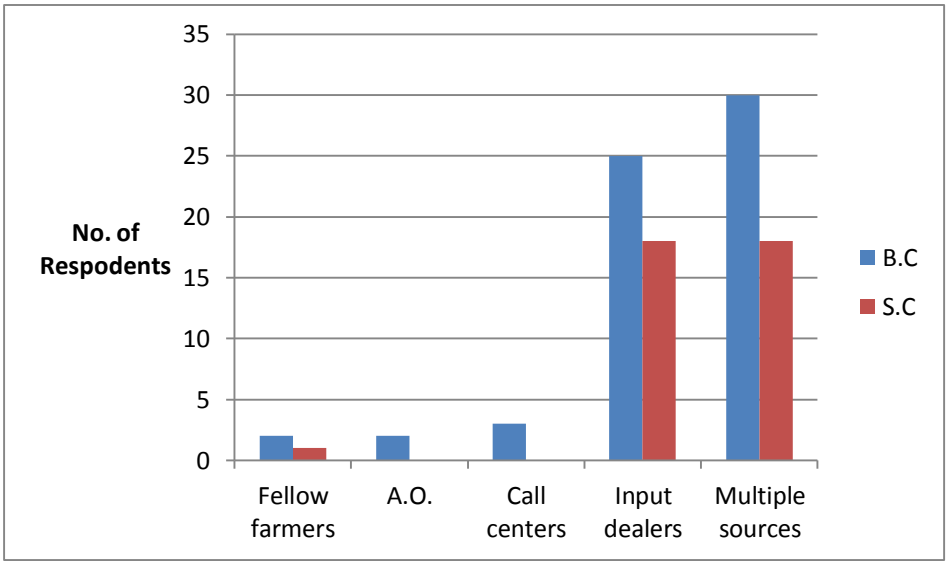
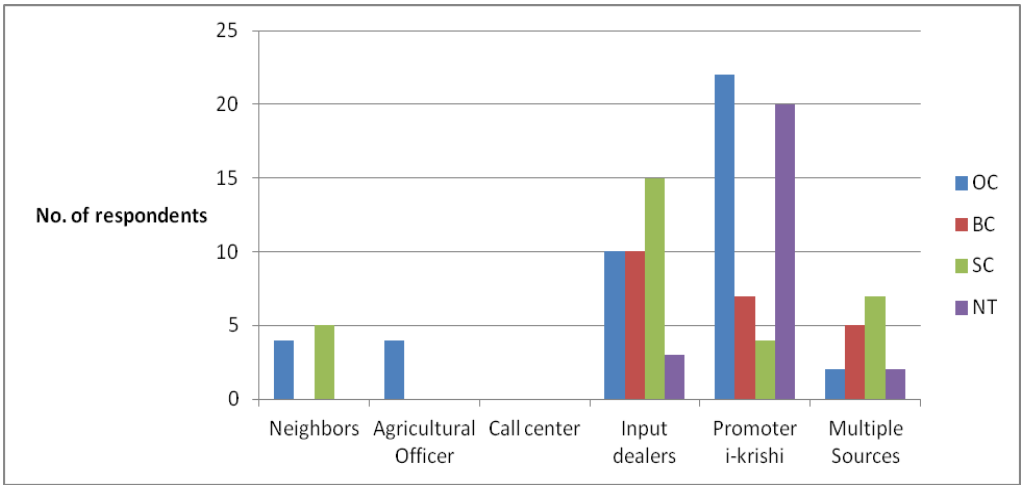


Figure 6.10: Farmers seeking information (Parbhani)



It is a known fact that an agrarian system has long been hierarchical with caste based allocation of rights over land and other resources. Literature suggests that agriculture in the non-commercial context was conducted with shared knowledge which included a combination of old and new agricultural practices. Agricultural knowledge was shared among farmers and much of the information was exchanged between relatives and

neighboring farmers. However, commercial agriculture introduced the use of external inputs and practices which are not familiar to farmers and in particular to small and marginal farmers. Commercial agriculture led to competition among farmers, which made them to acquire knowledge individually rather than collectively and guard it secretly. As a result, collective agricultural production and collective adaptations of new technologies vanished and dependence on the external sources and agencies has increased. Successful agriculturists, particularly the large farmers who succeeded in adopting green revolution multiplied profits, have secluded themselves from the collective community of production and started identifying themselves as progressive farmers (Vasavi 2012; Jodhka 2014a).

Role of state in agricultural information dissemination

The massive reduction in the state support resulted in the reduction of production subsidies to the small and marginal farmers. This is stated to be one of the reasons for the increase in cost of cultivation and a decrease in the real income for farmers. The multilateral organizations (like IMF, World Bank and WTO) have been extremely strict in making third world governments phase out subsidies for the small and marginal farmers as part of neo-liberal reforms (Pattnaik 2012). The majority of the farmers in both the field sites reported that there has been a huge increase in the cost of seeds, pesticides and fertilizers since 1990s. The reduction of subsidies has been having a negative impact on the income of the small and marginal farmers. Although the state has been providing certain fertilizers (like urea) on subsidized rates, such subsidies are mostly cornered by large farmers. Also lack of sufficient supplies affects the marginal and small farmers pushing them to source the fertilizers from the local private markets.

It was observed in the study that farmers who earn high income generally belong to the upper castes. There is an income gap between upper caste farmers and farmers from marginalized castes because of the size of land holdings and differences in agricultural practices. In case of Parbhani district it was observed that OC farmers readily accept a new variety of seeds and are ready to give their piece of land for field trials, whereas Dalit farmers are reluctant to experiment with innovations due to risk involved and lack

of capital. It is important to note that agricultural officers and scientists seldom approach the small and marginal farmers to conduct field trials because of their own prejudices and also lack of willingness on the part of the farmers. SC, BC and NT farmers never approach a Scientist or Agricultural Officer with a request to conduct field trials in their fields. One of the important observations was that farmers who access timely information could reduce the input cost. In the both field sites, timely access to information regarding the availability of seeds and fertilizers reduced the input cost as farmer avoided the purchase of the same in the black market.

At Karimnagar field site it was observed that a majority of the BC farmers approaches DAATT centre and seek information from the agricultural scientists. Agricultural Scientists visit farmers' fields for conducting field trials. However, it was widely reported in both the field sites that the officials visit only the fields of upper caste farmers. Contradicting this observation by the farmers the Agricultural Scientists, in their interaction with the researcher, reported that farmers show great enthusiasm in seeking information on government programmes of subsidy rather than seeking information on new and better practices of cultivation. The case of Parbhani presents a different picture on the role of state in agricultural information dissemination. It was reported by the respondent farmers that the visit of the agriculture department officials and Agricultural Scientists has declined after the setting up of i-krishi in their village. Even when they visit, it is only to those farmers' fields who have personal contacts with the officials and who are politically strong in the village. One of the important observations was that farmers with high social status maintain good relations with the agricultural officials and with Scientists. These farmers meet higher officials frequently in their offices and make enquiries about market trends, availability of fertilizers and discuss field problems. Agricultural officials also give high priority to this section of farmers and spend more time with them.

Credit sources

According to Walker (2009) indebtedness is one of the pathological features of Indian agriculture. Indebtedness is a common tendency in the lives of most farmers in India. The

proportion of indebted farmers from Andhra Pradesh, Punjab, Kerala and Karnataka was 82, 65, 64 and 62 percent respectively (NSSO 2005). According IRDR (Indian Rural Development Report-2012-13) 45 percent of marginal, 51 percent of small farmers, 58 percent of semi-medium, 65 percent of medium and 66 percent of large framers are accessing credit from different sources like government cooperative banks, money lenders, traders and relatives. Among 45 percent of the marginal farmers majority of them (41 percent) access credit from money lenders and traders. On the other hand a majority of the small farmers (58 percent), semi-medium farmers (65 percent), medium farmers (69 percent) and large farmers (68 percent) access credit from government and cooperative banks.

Indian farmers are entangled with indebtedness due to many reasons, like crop damage, unreliable market price for the produce, high input cost of fertilizers and pesticides, expenditure on land development, etc. (Waldman 2004). The majority of the small and marginal farmers depend on money lenders for credit because banks refuse them loans. The assessment studies on the cooperative credit societies present that much of their credit went to the relatively better off sections of rural society, and the poor continued to depend on the more expensive informal sources (Oommen 1984). Bureaucratization led to corruption and increasing unevenness among those whom they were supposed to serve (Jodhka 1995). Although banks were never controlled directly by the rural rich, the benefit of their credit has largely gone to them.

Over the years as a result of 'financial exclusion' of the marginal and small farmers input dealers and traders have emerged as the primary sources of credit as they provide inputs on credit. Also, commercialization of agriculture and reduction in the government support for agriculture led to the growth of private money lenders across the country. The deregulation of the banking sector is said to be one of the reasons for the increased presence of private money lenders who charge high rate of interest (Reddy and Mishra 2008).

It was observed in the Karimnagar field site that the majority of the respondent farmers depend on money lenders for credit (see Figure 6.11). In case of Parbhani, because of i-

krishi, which facilitates institutional loans from banks, the majority of the respondent farmers (58 percent) has taken loans from banks. However, a closer examination of the trend suggests that while the majority of the OC farmers got benefitted with i-krishi, a significant number (35 percent) of SC farmers still depend on money lenders for loans. One of the important observations in both the field sites is that majority of the Dalit farmers takes credit from money lenders at high rate of interest.

Figure 6.11: Credit sources (Karimnagar)

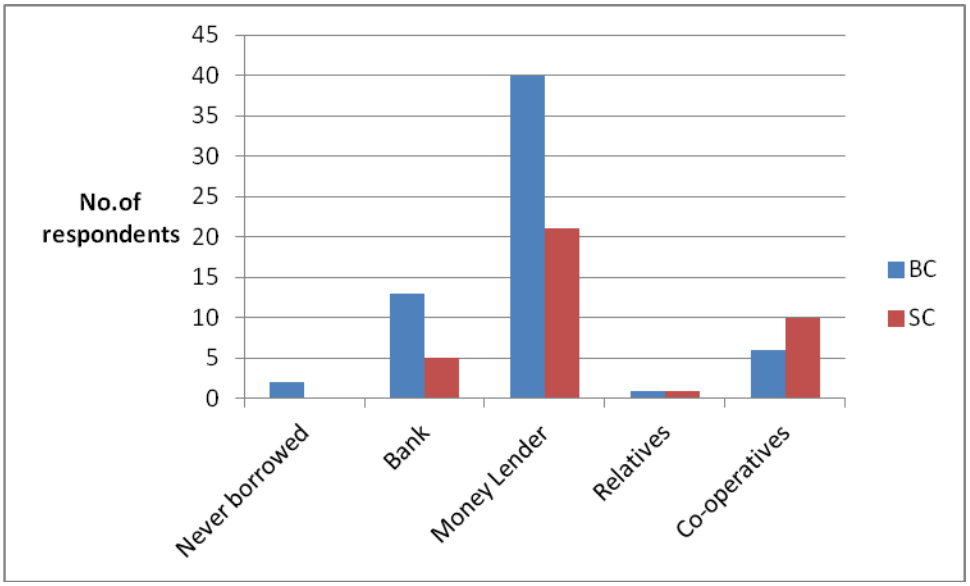
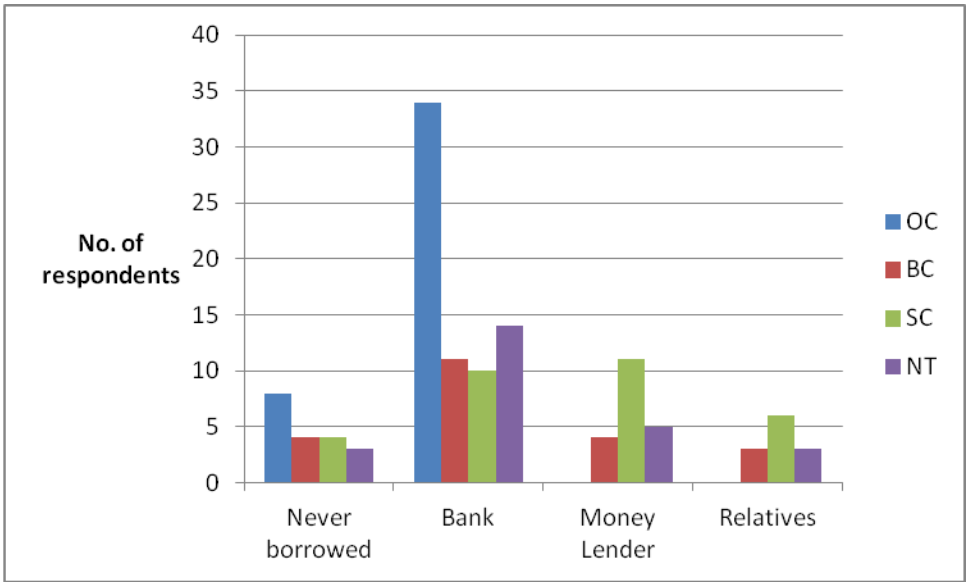


Figure 6.12: Credit sources (Parbhani)



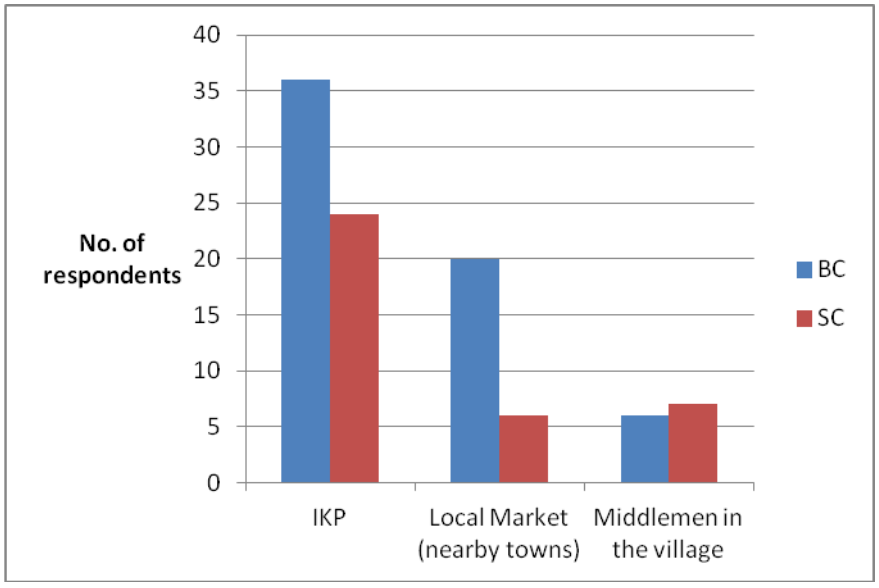
Marketing of the produce

Marketing of agricultural produce in the two field sites was observed to be similar. They are similar in the sense that in both the places farmers sell their produce to those which are accessible and trusted. Traditionally, farmers used to sell the produce in the local mandi (in Parbhani) and to the local trader (in Karimnagar). The transaction of sale of the produce, however, was never satisfactory to the farmers. Farmers used to be shortchanged by the agents in the mandi by the local traders. Farmers observed in the study that they always used to get less than what their produce deserved. As there were no alternatives farmers in both the regions had to be contended with whatever returns they used to get from the sale proceeds. However, the situation has changed with the state initiative in Karimnagar and non-state initiative in Parbhani.

In Karimnagar the state of Andhra Pradesh adopted a measure to provide remunerative prices through transparent and efficient mode of marketing. It encouraged the women SHGs operating in all the villages in the state to procure agricultural produce of the village. The SHGs which purchase the produce from farmers in turn sell it to the state

agencies of marketing. The underlying intention of the state is to employ hassle free marketing methods to the farmers and provide an alternative to the traditional exploitative marketing methods. The IKP centres of the SHG procurement offer minimum support price, fair means in weighing and grading the produce, quick payment of money and providing a transparent and decent method of transaction. Farmers reported that the local traders and their hamalies used to ill-treat them not only by asking for handling charges, but also making them wait for hours together. As a result of the alternative platform a majority of the respondent farmers in the villages prefer to sell their produce at the IKP centres (see Fig 6.13).

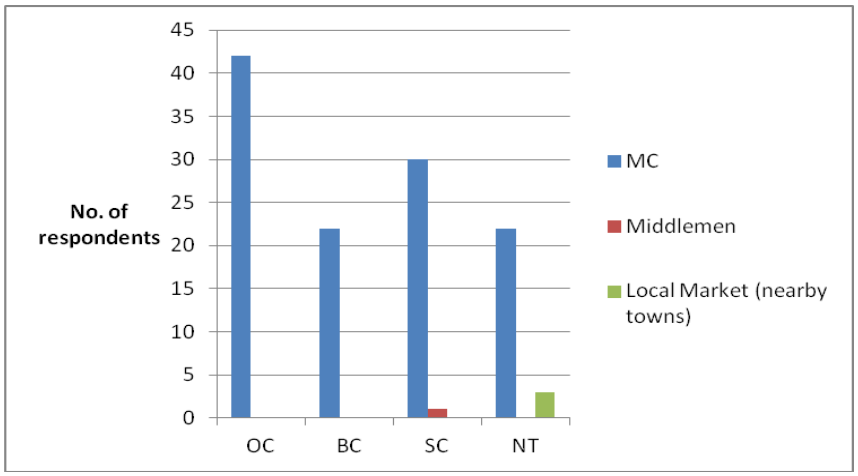
Figure 6.13: Marketing the produce (Karimnagar)



In the case of Parbhani it was reported that the traditional mandi transactions have always been exploitative. The traders, agents and even hamalies gang up to exploit the farmers to the possible extent. All the farmers, irrespective of caste, are exploited by the mandi operators. The extent of exploitation increases as the caste position in the hierarchy decreases. Thus Dalit farmers have always been cheated by the fraudulent means employed by traders in weighing, grading, lifting the produce and bagging. The price of the produce is fixed by the traders and agents who use arbitrary means in arriving at the figure. The i-krishi initiative offering alternative marketing mechanism attracted a

majority of the farmers in the study villages. It may be understood from Figure 6.14 that almost all the farmer respondents of the study villages sell their produce either at MC hub or to the Promoter in the village. The reasons for such shift to i-krishi are that the transactions at i-krishi are transparent and farmer friendly. The payment for the produce is quick and the farmer is treated well.

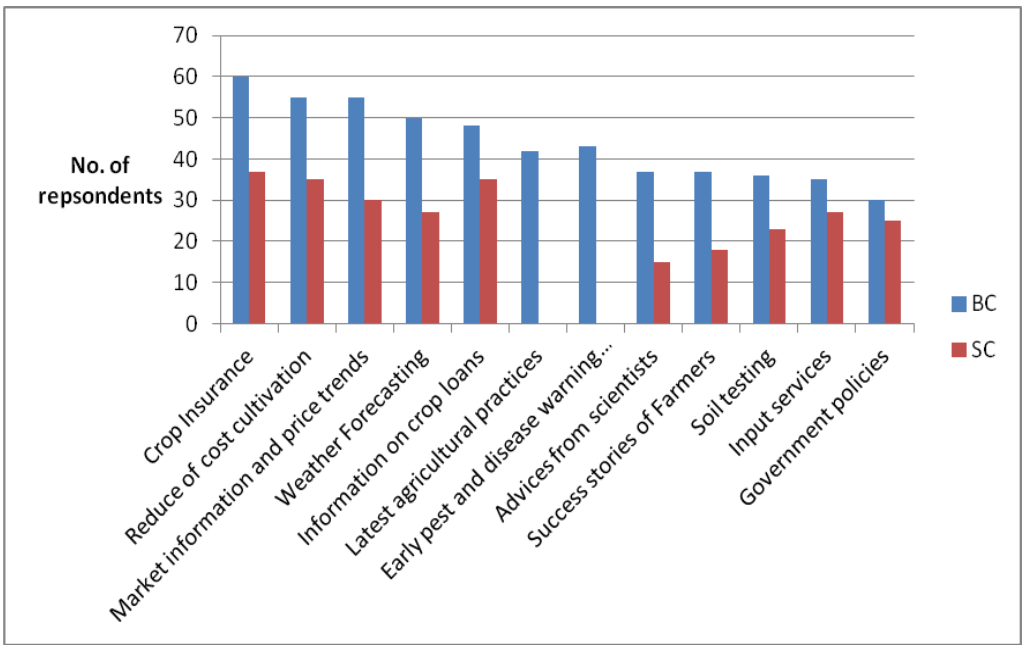
Figure 6.14: Marketing the produce (Parbhani)



Ranking information needs

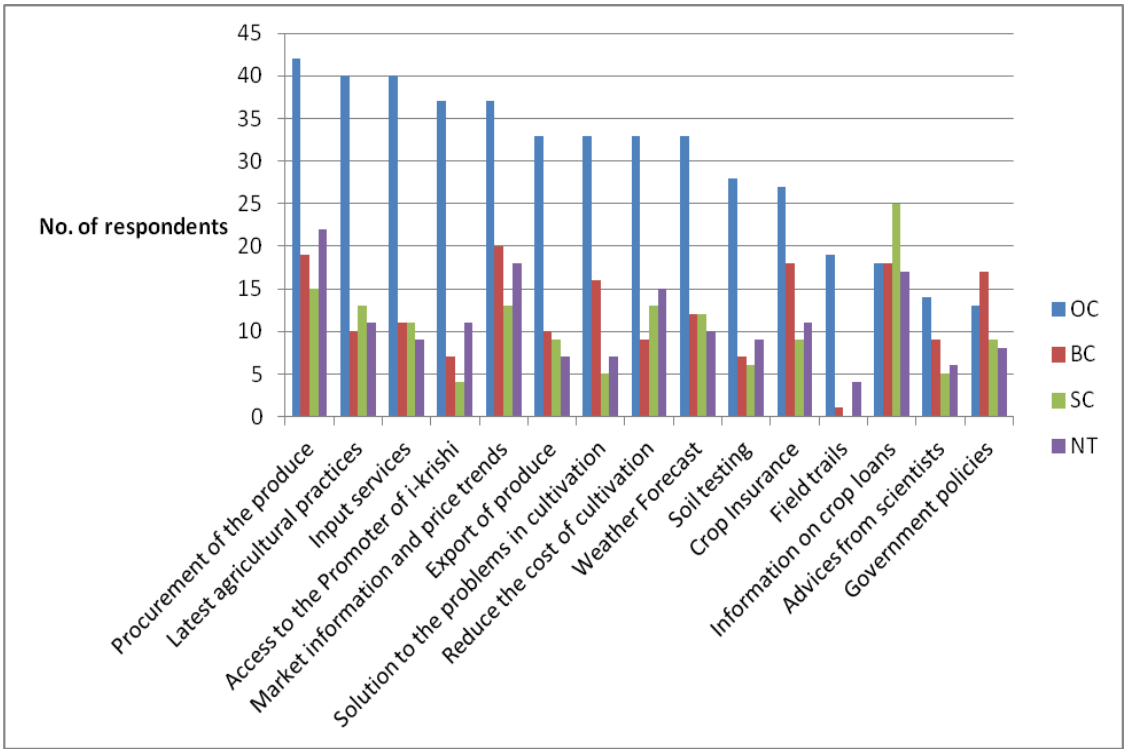
The study finds that the information needs of farmers across regions and across castes within the region vary significantly. Karimnagar field site presents a picture of agriculture, which is less commercialized than Parbhani. The crops grown here are food crops like rice, maize and non-food crops like cotton, sugarcane, and jowar. Most of the farmers in Karimnagar field site cultivate under rainfed conditions (60 percent of SC farmer respondents). Thus, for the farmers here the risks of crop failure due to excess rainfall or long dry spell are high. Thus, when asked to rank their preferences for information, the majority of the respondents mentioned crop insurance information as the important need. Information on reducing the cost of cultivation, market price trends, weather forecast and information on crop loans rank high in the priorities of the farmers. Significantly, SC farmer respondents prioritized information on crop loans from banks than other needs. This reflects their anxiety to get access to institutional credit.

Figure 6.15: Caste wise ranking of information needs (Karimnagar)



In contrast to Karimnagar, Parbhani is a place where farmers have adopted commercial agriculture for a long time. In the absence of fair marketing system farmers in the area readily accepted i-krishi's initiative of procurement. Thus marketing of the produce tops in the ranking of information needs of farmer respondents in Parbhani (see Fig 6.16). The other important needs of the farmers here are information about latest agricultural practices, better input services and access to i-krishi Promoter. Importantly, the information needs of SC farmers are somewhat different from that of other farmers. SC farmers' top information requirement is on crop loans. Their other important needs are marketing the produce, information on market trends, and weather forecast.

Figure 6.16: Caste wise ranking of information needs (Parbhani)



Mechanization

Mechanization of agriculture led to rise in the purchase of tractors and harvesters and other mechanical inputs of farming. Gupta (2012) observes that green revolution led to the intensive usage of electric pump-sets for drawing ground water to irrigate the fields and tractors for ploughing as farmers now grow multiple crops (two or more crops in a year). As the cost of cultivation has increased because of adoption of input intensive agriculture, farmers now try to meet the cost of production apart from their basic needs by going for multiple crops in a year. This anxiety has led to increased digging of bore wells to irrigate Rabi crop and to go for usage of tractors which hasten the process of land preparation for cultivation. Instead of depending on cattle drawn ploughs, as was done traditionally, farmers, including marginal and small, prefer tractors.

The consequence of usage of tractors for cultivation is that the marginal and small farmers have become dependent on large farmers who belong to the upper castes as the latter own the tractors. Because of high capital cost involved in buying a tractor farmers belonging to SC and other marginalized sections cannot afford to own one. It was observed in the study villages, in both the field sites that no Dalit farmer possesses tractor or other machines like harvester, intercultivator, etc. They hire such machines from upper caste farmers on rent which is added into the cost of production. This led to reduced net earnings or real income of the farmers. Thus, it may be said that mechanization in agriculture reinforced the existing caste hierarchies. The availability of these equipments (tractor and harvester) has become an important factor in crop production. Over a period the use of tractors and harvesters in agriculture has grown rapidly which affected the rural employment drastically. The process of mechanization has a dual effect, on one hand it raised the income of the landlords and the rich peasants on the other hand it reduced the employment of landless labor, particularly Dalit farmers, who also depend on wage labour. The mechanization process is one of the important reasons for the migration of the agricultural labourers. Many tenant farmers and Dalit farmers have lost their livelihood also.

Commercialization of agriculture

Commercial agriculture gained prominence after liberalization when marginal and small farmers started taking it up (Vakulabharanam 2004). State policies and programmes in both the states, Maharashtra and Telangana, have focused on shifting from low-value food grain crops to the high value non-food grain crops. Aspirations towards maximization of profit and access to markets led to the cultivation of non-food crops which resulted in the decline in the area under food crops. Many small and marginal farmers adopted commercial agriculture and integrated it with market and external forces. However, farmers are motivated to grow commercial crops as part of an economic strategy by the private and public agencies. Due to commercialization, there has also been a considerable reduction in the indigenous agricultural practices (Bhalla and Singh 2009).

Cotton, popularly known as ‘white gold’, is an important commercial crop not only in India but also in many other countries. India is the third largest cotton producer in the world behind China and the United States, accounting for 25 per cent of the world acreage, but only 14 per cent of world production (Siva and Balakrishnama 2013). Cotton is grown in nine million hectares of land across India and occupies around 5 to 6 per cent of the total cultivated area distributed over 12 states in the country. Cotton offers a big market for hybrid seed companies, pesticide companies and non-formal credit suppliers. All categories of farmers throughout Telangana and in other states in the country took cotton as a panacea for their economic and social problems. The area under cotton crop has increased from 10.45 lakh hectares in 1999-2001 to 11.41 lakh hectares in 2004-2005 in Andhra Pradesh (Qayum and Sakkhari 2005).

Cotton has attained an important economic priority in the rural society and the area under cotton cultivation has increased significantly. Cotton as a commercial crop gained immense popularity through media advertisements promoted by private seed, fertilizer and pesticide companies. Construction in media advertisements of cotton as a crop that can help in gaining more income attracted many farmers, particularly the marginal and small farmers. Farmers who wanted to raise their income have opted for cotton cultivation. It was observed in Karimnagar, irrespective of the land holdings and caste, that most of the farmers cultivate cotton. Earlier, farmers used to cultivate paddy and maize as the primary crops. Due to lack of irrigation and to increase their income majority of the small and marginal farmers started cultivating cotton. What used to be cultivated in one acre now the small and marginal farmers cultivate cotton in at least seventy percent of their total land. It is significant to note that farmers started giving up cultivating paddy for cotton or chilli. The private sector seed companies also made a significant contribution to increasing the area under cotton cultivation. The Majority of the farmers reported in the study that income from cotton is high when compared to paddy. As cotton requires less water, it can be grown on dry land under rain-fed condition. However, over the last two years the acreage under cotton has come down in the village due to the failure of crop and low market price. Now farmers have shifted to maize because the market for this crop emerged strongly.

In the Marathwada region soybean is considered as ‘golden bean’ or the 'miracle bean’ as it provides rich dividends to the cultivators. Over the years area under soybean crop has increased manifold. Soyabean crop is cultivated mostly in the areas where the average rainfall is low (Bisaliah 1985). Before the establishment of i-krishi in Parbhani district, cotton and sugarcane and were the major crops grown. After the i-krishi initiative farmers in the region started cultivating soybean as the primary crop. MC through its meetings conducted in the villages began marketing soya as a ‘global crop’, with potential for high returns with less cost of cultivation. The region used to be well -known for crops like sugarcane, jowar, tur, chana and wheat. However, with the introduction of soyabean the cropping pattern in this region has changed drastically. Farmers decreased the area under traditional food crops and shifted to soyabean. In the initial stage of i-krishi establishment only large farmers shifted to soyabean, but later on seeing the benefits, the small and marginal farmers, irrespective of caste, have shifted to soyabean cultivation giving up crops conventionally grown.

ICT initiative (i-krishi) and the agrarian social structure

ICTs are claimed to be revolutionizing communication across the globe. Applications of ICTs in agricultural extension are often seen as a means of overcoming the limitations of conventional extension approaches. Several state and non-state initiatives have been launched in India to augment the information dissemination processes to farmers. The failure of conventional extension is due its heavy reliance on personal communication mode. Personal sources of communication work with limitations such as influence of social structure in the information dissemination process for the farmers. Apart from this, ideologically, the green revolution based model of agricultural extension concentrated on progressive farmers who belong to the upper castes. The ideological basis of trickle down, unfortunately, did not happen in information dissemination. Contrary to this what took place was the spread of misinformation or information in a contrived form which was readily grabbed by the emerging class of farmers, i.e. marginal and small landholders belonging to the lower sections of the caste hierarchy. Operationally, the extension organization has undergone major changes with the liberalization process. Structurally,

the extension organization's functioning has been favoring the rich landed class of farmers belonging to the upper castes. The social embeddedness of extension organization enabled the rich peasantry to corner benefits while excluding the farmers from marginal castes.

In the given context, ICTs claim to provide agricultural information to all the farmers irrespective of caste, class and other social divisions. The present study made an attempt to understand the issues of access and inclusion of ICT based agricultural information to all sections of farmers critically. The question to be probed was to what extent the ICT initiative could overcome the existing social hierarchies and barriers in communication. It was observed in the study that the ICT based i-krishi initiative is emerging as a new means of information dissemination without much effort in the direction of breaking the old hierarchies. In fact, it was observed to be reinforcing the old hierarchies that operate in the agrarian social relations.

In the information dissemination process through i-krishi Promoter plays a key role. S/he acts as the mediating agency between farmers and the MC. The MC, while appointing the Promoter looks at the social status of the person in the village. In its anxiety to be accepted by the farmers of the village i-krishi prefers to engage the services of a person who has influence over other farmers in the village. Thus, most of the Promoters employed by my-Krishi belong to the upper castes. The Promoter may be compared with the Progressive farmer notion of the conventional extension system. If the Agricultural Scientists and extension officials relied on Progressive farmer for information dissemination under the conventional extension system the i-krishi model emphasizes on the role of the Promoter. The socioeconomic characteristics of the Promoter and the Progressive farmer are same. Although the functions of the Promoter are slightly different from that of the Progressive farmer, structurally both the positions operate similarly. It may be said that thus, the ICT initiative doesn't replace or weaken the old hierarchy rather strengthens it. The reason for the statement is that the Promoter who belongs to the upper caste of the village maintains a close relationship with his/her caste members rather than with other cast members. Access to the internet kiosk of i-krishi has

been observed to be not open to all, particularly to the SC and NT members. This contradicts the claim of the ICT initiative that information is available within the village and can be accessed by anyone. If the mediating agency between the farmer and the information available on the web happens to belong to the upper caste the social structure hampers the information flow to the marginalized castes. If we inverse this, say the Promoter happens to be from lower caste the access to information for the farmers belonging to the lower castes may be high.

ICT, similar to other technologies is politically neutral. However, the social embeddedness of ICT becomes problematic. The design for use and the design to use are problematic for the scholars engaged in the social studies of science and technology. The ICT initiative in agricultural extension is designed in such a way that it has to be mediated by individuals. As far its operationalization is concerned, i-krishi is to be mediated by the Promoter. Not only the social structural forces that influence the selection of Promoter is problematic, but the demand i-krishi's web portal places on its users, say farmers of the village where i-krishi kiosk is set up is the concern. The information on the web portal is available in Hindi and in local languages and accessing it needs some amount of computer literacy on the part of the users. Thus its direct access to a non-literate farmer is limited. Such farmers have to depend on the Promoter.

Thus not just the social structure represented in the form caste and class (size of land holding), and the spatial barriers (location of the kiosk in the house of the upper caste Promoter) that place limitations on access but also the cultural embeddedness of i-krishi blocks information flow. The assumption in the design of i-krishi that information accessed by the literate farmers would be shared with the non-literate farmers appear to be problematic as the social structural impediments block such information flow between upper and low caste farmers.

i-krishi also conducts field trials as a means to disseminate information and also to make its presence felt in the village. It was observed in the study that the field trials are generally conducted in the fields of large upper caste farmers. The selection of the farm for field trials is again based on the suggestion of the Promoter. It is appropriate to quote

Kumbamu (2009) who observes that ‘aggressive marketing strategies such as demonstration plots are not simply neutral experiments in the field, but are interwoven with power relations and social relations, which thereby reinforce inequities in the rural society’.

I-cruise is a private agricultural extension initiative, which concentrates on profit making. It is said that the establishment of i-krishi has increased the income of the farmers by reducing the cost of marketing the produce (transportation and baggage costs) and by providing quick and transparent process of sale. However, what is important to note here is that the price for the produce is fixed through a standardized quality check of the produce. It is said to be scientific as the grading of the produce is done using machines which detect the moisture content and other material in the produce. In the absence of adequate knowledge among farmers about the grading standards the transaction at i-krishi hub may not be of much beneficial to them. Farmers who are well aware of the parameters are in a position to pre-test the quality of the produce and bring it after appropriate processing. Thus, it may be said that farmers of the same village are paying the differential price for the same produce. i-krishi hub pays higher price when the produce meets the standards of quality. Farmers who follow the advices given by i-krishi get better price and thus realize more income when compared to those who don’t follow. Otherwise the process of sale transaction is transparent and open to farmers being informed at every stage of the transaction. Moreover the transaction is formal as the price quotation is given on a printed receipt which is to be endorsed by the farmer for completing the process. This is unlike the exploitative mandi practice where the entire transaction is informal, oral and based on trust.

One of the consequences of i-krishi is that the government agricultural extension services have become non-functional in the villages where kiosks are set up and the Promoter and Co-promoter are appointed. Suggesting that the requirements of the farmers in the villages are taken care of by i-krishi the state agricultural department officials have stopped visiting the villages. As i-krishi is reported to be interested in certain crops the information requirements of farmers for other crops are being affected by the absence of

state extension services in the villages. It was suggested by one of the SC farmers that 'i-krishi being a private initiative farmers cannot demand services from it. We have to take whatever it offers. If we have the state extension services we as citizens can demand the state for our needs'. Also the fact is that i-krishi being driven by profit motive doesn't bother much about the issues concerning biodiversity and environmental risks. It promotes the crops in which it has commercial interests. Due to the favorable market for soyabean, the majority of the small and marginal farmers have given up cultivating traditional crops like jowar, tur and sorghum. Similar market guarantees for other crops would surely help controlling the practice of monocropping.

It is widely claimed by the advocates of ICT initiatives in agricultural extension that ICTs can break the social and spatial barriers as these can help extension services to reach out to farmers of all sections located in different regions. However, in the case of i-krishi questions are being raised about the scalability of the project geographically as well as in terms of crop diversity. It was observed that the I-Krishi services are oriented towards specific crops, basically targeting a certain section of farmers of the village. Information on other crops is not available even if farmers want to know. Moreover, i- krishi is not personalized, and as a result, individualized advisory is not available. Rather, it demands, farmers to adapt to what it suggests.

i-krishi binds a large number of farmers into its network. It was observed that the number of farmers attending the meetings conducted by i-krishi has increased. Promoter encourages farmers' participation in the agricultural meetings. It was stated by the respondent farmers that before the establishment of i-krishi farmers participated in agricultural meetings occasionally. It was also stated that i-krishi involved a majority of the farmers in the market mechanism by creating awareness regarding the price trends of the agricultural products. However, on the other hand it also monopolizes channels of agriculture related information and products, as well as the rural market for many other services and products. i-krishi model demonstrates that a large corporation can play a major role in increasing the efficiency of an agricultural system and create a platform that benefits farmers. However, it may not be considered as a model of inclusive growth

because till now it is has not holistically addressed other issues like social (like migration, fragmentation of land) and ecological, which apparently play a significant role in rural life.

Chapter – 7

Conclusion

Agriculture continues to play a significant role in the economies of the developing countries and thus forms an integral part of the development agenda of these countries. Indian agriculture has been part of the development agenda of the state since independence as it occupies a pivotal position in the country's economy. Agricultural development pursued by the development planners in the country led to considerable changes in the rural agrarian social structure. Understanding the changes in the social organization of agriculture has been the focus of academicians, policy makers and Indian polity as agriculture influences the livelihood of millions of people in the country.

For decades Indian agriculture was characterized by feudal land relations, employing traditional technology, greatly dependent on unpredictable monsoons and marked by low productivity. As a consequence, acute poverty and unemployment or under-employment that diffused all over India posed serious challenges to policy makers and researchers. Post-independent Indian state has implemented many reforms to raise agricultural productivity in order to eradicate poverty and to augment industrial development to solve the problem of unemployment. In this direction the Indian state introduced the green revolution technology as a means to achieve instant solutions for shortage of food grains and increasing the pace of development.

From a technological point of view every new innovation or development of technology results in change. Thus the technological innovations in agriculture resulted in significant changes in the rural social structure. Green revolution technology may be considered as the epicenter for radical changes in rural India resulting in severe changes in the agrarian social structure. Besides causing significant improvement in productivity and thus meeting the food needs of the country, a green revolution is said to have caused changes in the social, economic and political aspects of rural India. Widening the inequalities between the large farmers and the marginal and small farmers and the landless agricultural labourers, accentuating regional imbalances, and commercialization of agriculture has been reported as the consequences of green revolution in the last four to

five decades of Indian agriculture. The rich landed class capitalizing on the surplus from agriculture usurped political power.

It is widely noted by the social scientists that there is a major paradigm shift in the social organization of agriculture with the introduction of the green revolution. Green revolution, which is highly responsive to fertilizers and can help reap high yields, however, was favourable to the large farmers and to the command areas. The differential spread had its drastic impact on the total agricultural system in the country. It has led to mechanization, marketization, capitalization, chemicalization, modernization and information oriented agriculture. Usually large and progressive farmers, who are able to deal with the risks of commercial agriculture and who had sufficient institutional support and had social and economic capital could reap the benefits of the green revolution.

Green revolution is also said to have widened the technology-knowledge gap leading to a retrogression in agriculture. Vasavi (2012) contends that '…the agricultural regimes, from the green revolution model's use of hybrid seeds and external inputs to the current use of genetically modified (GM) seeds, induce increasing dissonance between knowledge and know-how. While large and established agriculturists have access to wider and more updated knowledge that is relevant and reliable for their production, the smaller agriculturists, especially newcomers, are unaware of the agro-ecological rationale of their choices' (p: 90). In the past three decades, the external input intensive commercial agriculture of green revolution made forays into rainfed areas and vulnerable farming systems of marginal and small farmers resulted in increasing knowledge dissonance. At the same time the neo-liberal policies of the state enforced the withdrawal of state from agricultural extension.

Over a period, the number of small and marginal farmers has been increasing in India. Called as 'new entrants', these farmers possess such characteristics as small holdings, low risk taking ability, depending on family labour, poor social capital, less access to institutions and markets, etc. Post 1991 witnessed decreasing presence of state in agriculture, and the withdrawal of state subsidies for agricultural inputs, like seeds, fertilizers, etc. and the increasing role of market players. The spell of commercial

agriculture has cast its web on the new entrants, and farmers in the rainfed regions as well. In the context of heightened commercialization of agriculture and risks associated with agriculture, the need for timely and appropriate agricultural information has become imperative for increasing productivity and raising net farm income. The marginal and small farmers belonging to the lower strata of society have been in need of information that suits their agro-economic conditions.

With the advent of modern globalized agriculture, erosion of traditional and indigenous agricultural knowledge has been taking place gradually. Adoption of new technologies and new production approaches in agriculture has become critical in farming in order to meet the global challenges and to withstand the market economy. Modernization of farming practices led to instructive agriculture, which subsequently placed greater responsibilities on the extensive sector. The contemporary agriculture scenario has become more complex and farmers' access to sources of reliable and relevant information has become increasingly important. Updated information allows farmers to cope with the changes that are taking place globally and locally. In this context, the role of agricultural extension services has become more critical for farmers to economical sustenance of farm and home.

During the 1970 and 80s the state agricultural extension agencies took the lead in the dissemination of agricultural information. However, the traditional extension service is also criticized for its complexity, hierarchy, rigid bureaucratic structure, and emphasis on 'push technology' rather than 'demand technology' and one way communication system. It is also criticized for untimely, ineffective information and irrelevance of information delivered. Traditional extension services provides homogenous information rather personalized location specific information. Access to quality information by marginal and poor farmers is uneven. As a result, many private agencies and NGOs have entered into the agricultural extension claiming to provide an alternative to the traditional extension services and address the problems of small and marginal farmers. In the post-liberalization era, the state has become a facilitator for many private agencies and NGOs in the field of agriculture rather the direct provider of services.

In the context of the emerging agriculture scenario, the advocates of technological interventions for agricultural development vouched for making use of the advances in agricultural extension. Based on the ICT platform a number of state and non-state initiatives focusing on the information dissemination to the farmers offers a ray of hope at the time of agrarian distress. It is believed that ICTs in agricultural extension would help the newcomers into agriculture, who belong to the marginal and small farmers' category, coming from the marginalized sections of society, located in the fragile regions of the country, and who lack expertise in making the best use of external inputs. The proponents of ICTs in agricultural extension see the scope for appropriate and timely information dissemination to the farmers at their doorsteps using ICTs. ICT based agricultural extension has been believed to be a means to overcome the deficit in knowledge dissemination created by the increasing absence of state from agricultural extension.

One of the important technological developments in the 20th century was the ICT revolution. ICT revolution that has impacted all spheres of human social life also offers opportunities in the field of agriculture and agricultural extension. Today, ICTs deal with the rapidly expanding innovations in agriculture. It is being realized that the advantages of ICT based agricultural extension are that it allows two way communication, cover larger geographical areas, speedy delivery of information and huge data storage and retrieval capacity. Huge data storage capacity and the ability to access data remotely have dramatically improved the application of ICT in agriculture. It allows sharing of knowledge and exchanging of data which will create opportunities to involve more stakeholders in agricultural research. In this context, many private agencies and MNCs have begun initiatives in agricultural extension using ICTs. It is suggested that in the absence of state agricultural extension services, ICT based agricultural extension has become a ray of hope for many Indian farmers because it promised to deliver appropriate, timely, scientific information and it allows for two way communication where scientist and farmers can discuss the problems directly. ICTs have the potential to deliver personalized location specific information which will widen the scope of farmers to take appropriate decision. ICTs disseminates information on agricultural practices and weather forecast/information which is essential for farmers on account of the vagaries of

monsoon. ICTs are expected to reduce the uncertainty, intermediaries and claimed to dissolve the old hierarchies which are inherent in the stratified society in agricultural information dissemination. It is also believed that ICTs act as catalyst to accelerate agricultural growth, improving the capacity and livelihoods of the poor, to facilitate better information access, to develop the efficient feedback mechanism and to empower small and marginal farmers.

There is a number of state and non-state ICT based agricultural extension services being offered to enhance the knowledge of the farmers. i-krishi is one of the non-state ICT based initiatives operating in many states in the country. This initiative claims to provide different kinds of agricultural services (like market information, information on new agricultural practices, weather information etc.) at farmers' door steps.

The present study aimed at understanding the social organization of agricultural information through ICTs conducted a field study in the villages of Parbhani district of Maharashtra (where i-krishi initiative has been working). The findings of this are compared with the findings from the field study in the villages of Karimnagar district of Telangana state. The findings of the study suggest that the i-krishi initiative enabled farmers a greater access to the market information. It not only provided information about the nearest markets, but also created alternative market mechanism to the existing exploitative mandis. It is claimed by the farmer respondents that the marketing transactions to i-krishi are more transparent and speedy. It reduced the wastage of produce while loading and unloading and it also encouraged majority of the farmers to be a part of the formal market structure. i-krishi helped farmers to save time and income as the transaction with i-krishi marketing is speedy. Respondent farmers observed that the transaction costs with i-krishi marketing are less compared to mandi transactions as the loading and unloading charges at the i-krishi hub are paid by the MC company (whose initiative is i-krishi). In the conventional mandi transactions intermediaries collect the mandi fee and farmers are forced to bear the hamali charges. In the mandi, the transaction time, as farmers observed, is more than 20 hours and more.

The documentation of every stage of transaction with i-krishi allows more transparency and accountability. i-krishi has created the scope for questioning and it allows for interaction with the agricultural scientist located in the MC hub to seek appropriate advices for improving the yields as well as quality. Apart from the market intervention i-krishi helped farmers in developing the habit of attending and participating in the agricultural meetings where agricultural scientists clarify doubts and give expert advices. It was reported by one of the farmers that i-krishi changed the perception of farmers towards agriculture from that of subsistence to entrepreneurial activity.

It was found that the i-krishi initiative enabled farmers a better access to market when compared to that of farmers in Karimnagar field site. In Karimnagar field site, farmers since two years have been selling the produce at the IKP centres which are supported by the state. As far as agricultural information is concerned farmers in Karimnagar rely on the input dealers and traders. It was also found that while farmers in Parbhani are helped by i-krishi Promoter in accessing loans from banks, in Karimnagar majority of the farmers still rely on the local money lenders and traders for their credit needs.

On the other hand, based on the observation from the field study, it may be said that the ICT based agricultural extension services when operated by the non-state actors and funded by the corporate groups or by other private agencies would concentrate on the benefits to the funding agency and make farmers market oriented leading them to high yield and high productivity mode rather than making agriculture sustainable. It is of interest to know that these non-state ICT based agricultural extension initiatives are being operated only in those regions where commercial crops are grown. Although i-krishi claims to provide agricultural information at farmers' door steps it fails to deliver the customized information appropriate to the needs of the farmers. Due to lack of individualized information system, many farmers, particularly those belonging to the lower strata of the society, are unable to interact with Scientist and other agricultural extension officers resulting in an ineffective feedback mechanism.

Sassen (2000) argues from a gender perspective, that ICT can't overcome the older and structural barriers. In this context, Sassen arguments are placed from marginalized

perspective. The other major question that arises is access to information. It is envisaged that ICTs can break the social structural barriers in the information flow and will be accessible to all sections of farmers. However, it was found in the study that the old structural hierarchies are seldom broken. Instead, it was found that it created new structures if not reinforcing the existing structures. It was observed that new intermediates emerge in the information dissemination as well as market intervention. The new intermediary in the case of i-krishi is the Promoter who becomes the access point for the farmers to i-krishi. Farmers of the village have to approach the Promoter for any engagement with i-krsihi. It was observed that the Promoter appointed in a village belongs to the upper caste and has considerable economic power. As a result, the empirical findings suggest that, the farmers from the lower strata, i.e. SCs and NTs access i-krishi only at the time of marketing the produce. They don't access market information or information on agricultural practices as frequently as the upper caste farmers of the village.

What is most intriguing in the understanding of i-krishi is that how structural forces try to maintain their hold albeit in a new avatar. It was observed that i-krishi intensified the dependency on the Promoter who emerged as the important factor in the total operation and functioning of the system. Promoter emerging as a political power in the village is possible with the approach of i-krishi as the Promoter's recommendations are important for other farmers in the village to procure inputs like, seeds, fertilizers and also credit from banks. Here we witness Promoter, critical in the functioning of i-krishi at the village level, belonging to the upper caste can create information barriers. It is also equally important to note how the agency perceives the new initiative and reacts to it. In the case of i-krishi, while the farmers from upper castes accepting it more than willingly and were observed to be gained from the initiative, the lower caste farmers maintaining a distance because of the caste inequalities. A hypothetical proposition like, 'would the participation of lower caste farmers increase with the appointment of a Promoter belonging to one of the lower castes' arises in making information accessible to farmers using ICTs.

It was also observed in the study that i-krishi initiative has helped farmers in getting better access to markets. But on the other hand it made farmers to shift the cropping pattern. As i-krishi focuses on one particular crop farmers had begun to cultivate that particular crop. As a result cropping area under soybean increased manifold while the area under cotton and other traditional crops has come down. In the absence of equal amount of information and initiatives for market access for other crops farmers would invariably chose to cultivate only one crop on which information and other support is available. This tendency among the agency may lead to monocropping which may spell doom for the region's biodiversity. This raises the issue that, whether ICT initiative increases or narrows the scope of choices for farmers. On the other hand, in the absence of neither the state initiative (present to a minimal effect) nor non-state initiative in Karimnagar field site it was observed that farmers cultivate a variety of crops adding to the biodiversity.

The social constructivists view that technological advances are influenced by the interests of different social groups and those groups which are powerful would ultimately influence the final design of the technology. The present study observes that the design of ICT use is greatly influenced by the non-state actor whose interest lie in agriculture. It may also be observed that new technological initiatives seldom bother about breaking the old structures rather they work with the existing structures. Thus the present study suggests that ICTs are shaped by structural forces and are deeply embedded in the social and economic milieu. It may be said that technologies per say are neutral, but the way they are designed becomes problematic for sociologists in general and scholars of science technology and society studies in particular. In modern societies, technologies generate development options, comfort and safety and at the same time lead to heightened vulnerabilities. ICTs neither automatically produce positive nor negative effects but it all depends on how they are designed and in which societal context they are embedded. Public information and communication services are superior to the private driven ones because the former can provide equal access to every citizen. However, when they are controlled by private, non-state forces it might lead to fewer choices and promote hegemony and ecologically unsustainable practices. Finally, it is important to recognize

that these new technologies are not going to remove old hierarchies, but may reconfigure the same forces of the social structure. Gibbons (2004) argues that the globalization of innovation and information flows destroy the local cultures and organization activities on innovation.

It is viewed that agriculture needs new technologies to increase productivity. It is widely accepted that the existing extension mechanisms are unable to deliver the information on new technologies to farmers to help them cope with the tremendous changes that are taking place in the globalized world. In this context, it is being highlighted that ICTs can help deliver the information on new technologies to farmers. However, what emerges from this study is that it is important to see who controls the ICT based initiatives and what is the social organization of its information dissemination. Capitalistic transformation of Indian agriculture was hastened by the control of capitalist forces engaged in agriculture. If this was confined to production technologies, now we see the control of information dissemination by the same capitalist forces. It may be the control of information dissemination now, and later control may be extended to information as such. The modern agricultural practices, promoted by the scientific community have created a public sphere in which farmers cannot just think of the advantages of the traditional practices. Such public sphere may be captured by the capitalists by the control of the information dissemination process. In such an event the emergent public sphere would be controlled by private capitalists' interests disregarding the long term ecological, environmental and socioeconomic implications.

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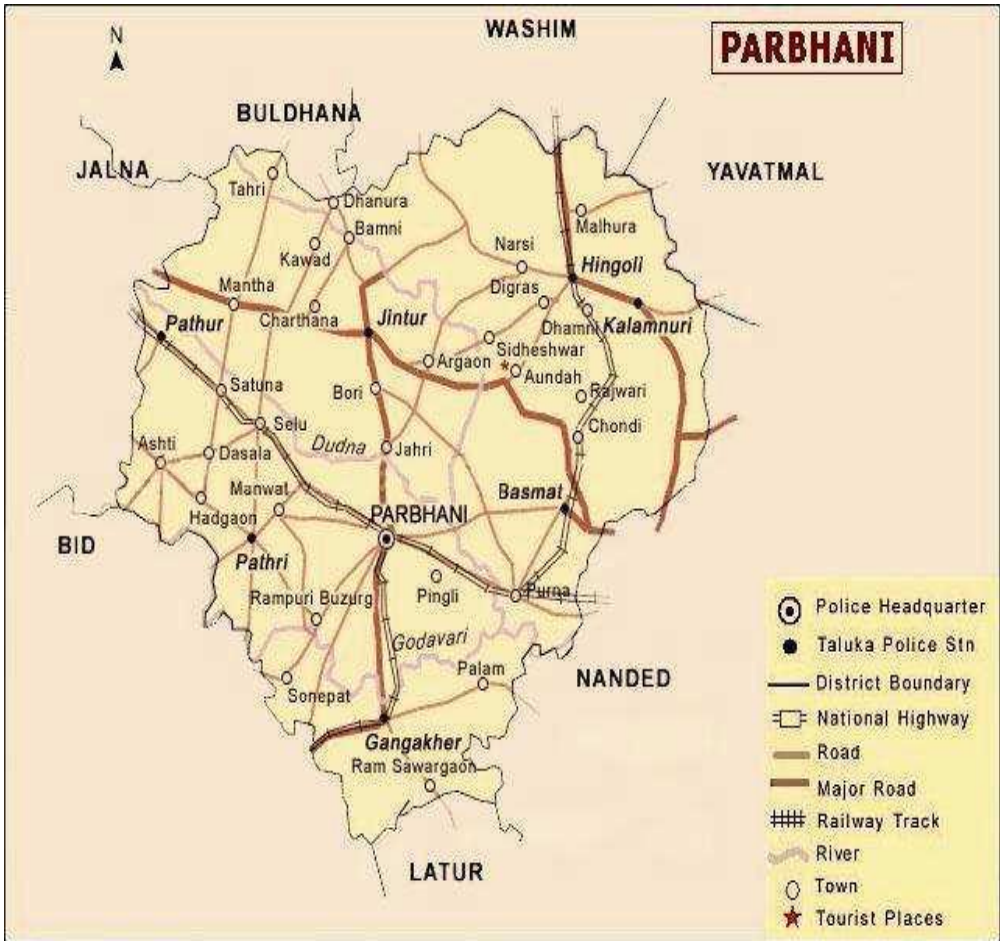
Map of Parbhani District



Map of Karimnagar District