CHAPTER 7

DISCUSSION

7.1 Introduction

This chapter provides an overview and discussion of the main findings of the study. The first section offers a summary of the hypotheses testing. Next, the theoretical and practical implications of the results are presented. This is followed by consideration of the limitations of the study.

This study is an analysis of the impact of Information and communication Technology on consumption of consumer durables in the rural market of Haryana in two districts Karnal and Sonipat. This study has made a significant contribution to the knowledge base in the field of Information and communication technology and consumption of consumer durables with special reference to rural market in following ways:

1. Reviewing concept of Information and communication technology and its application in rural market on farming in two districts of Haryana using the Technology Acceptance Model (TAM) developed by Davis.

2. Exploring perceptions of Farmers on the influence and acceptance of Information and communication technology in the field of farming and how it contributes in increasing the income of farmers and their consumption of consumer durables.

3. Comparison between ICT acceptance in agriculture by farmers and its impact on the consumption of consumer durables in Karnal and Sonipat District.

Most scholarly literature, acknowledges the effect of Information and communication Technology adoption in rural market in the field of agriculture since the past few years. Karthikeyan (2008) conducted a study on Kisan Call Center in Tamil Nadu where majority of queries (99.62 per cent) were made by male farmers as compared to female farmers. It is well known that in our rural society, male had higher exposure to external situations than female. Studies indicate that women’s control over production, income, and assets can increase the effect of development strategies on agriculture (Meinzen et al. 2011).
Nayar (1987) commented that position of women in agriculture is quite low due to social norms in Indian society. The percentage of women engaged in agriculture is quite large but they are rundown and discriminated in terms of financial status. Author reveals that there exists a bias against women in learning new technologies and males always prefer to utilize new technologies and innovative approaches in transfer of technology due to their exposure to the outside world. There is a strong need to involve gender into agricultural development activities and research (World Bank 2009) which is justified with the results of the present study as very less percentage of respondents are females in both the districts who are using ICT technologies.

Age as a predictor of IT acceptance has received less attention from researchers in this field. Few studies (Chung et al., 2010; Tarhini, et al., 2014c; Wang, et al., 2009) have tested the impact of age and technology usage behaviour. Prado, et al. (2011) found in their study that people with age of 25 would use ICTs to learn and improve their work which is similar to the present study where majority of respondents which belong to the age category of above 25 are using modern ICT like internet and mobile phones to gather agricultural information for increasing their efficiency in farm operations. Farmers of young age are more aware and ready to adopt new technologies for long term benefits (Polson and Spencer, 1991).

7.2 Impact of ICT on Agriculture

Agriculture contributes around 17 per cent to the GDP of India and employs more than 52 per cent of the total workforce of India (Government of India, 2010). It is also the major occupation of majority of people in the world (Infodev, 2008). Indian agriculture faces numerous challenges of low productivity, groundwater withdrawal, poor rural infrastructure, lack of product diversification, inefficient use of agricultural inputs, food security concerns of huge population, and inadequate financial support (Chandrashekhar, 2002). Poor farm productivity due to use of traditional methods of cultivation and low incomes of the agrarian class are the major hurdles faced in the agricultural sector (Dutt 1988; Pradhan and Saluja 1988; Rokkam and Ray 2005). Investments in agricultural Research & Development, technological innovations, infrastructure capabilities, logistic services and irrigation are believed to be critical elements for sustainable agricultural growth in the future.

ICT Adoption in Agriculture has been widely discussed by various authors (Gelb and Parker, 2005; Kuhlmann, 2005; Patil et al., 2008; Ramaraju, et al., 2011). Agriculture has always required continuous information flow since ages. Farmers’ search for authentic, credible and usable information both from established systems and traditional sources like relatives and neighbours to operate productively and compete economically. ICT applications depict the changing face of rural India leading towards economic progress and inclusive development.

The application of information and communication technologies is becoming increasingly more widespread across various sectors and especially in agriculture. Access to and use of information is essential for betterment of rural people’s living (Etebu, 2009). ICT technologies facilitate communication by processing and
transmitting information electronically (Technical Centre for Agricultural and Rural Cooperation (CTA, 2003). Frempong et al. (2006) revealed that ICT technologies are cost-effective and enables information delivery and knowledge sharing among farmers. An "increase in broadband penetration by 1% in India can lead to INR 162 billion which is equivalent to 0.11% contribution to Indian GDP in 2015 (Delloite, 2014). According to Munongo and Shallone (2014) adoption of improved agricultural technologies has a positive and significant effect on crop income and consumption expenditure of farmers leading to increase in welfare and reduction in poverty which is similar to the findings of the present study.

Farmers in India need ICT enabled technologies relating to generating information regarding seeds, soil, water, pest and market information to accelerate rural growth. Agricultural information is a significant element to develop production capabilities of farmers and help to bridge farmers to lucrative markets for selling their produce. Rise in agricultural productivity will be achieved when farmers have access to information (Rogaly et al., 1999). Majority of farmers depend on intermediaries for market information and sale of their produce. They travel to market for getting updated information on price. Use of ICT technologies can facilitate better information exchange and lower transaction and transportation costs of farmer thereby increasing their incomes (Munyua, 2007). Farmers in the present study are using ICT technologies to search for market prices and reduce their transportation cost by taking their produce to those markets where they are able to fetch better price for their output.

Better and faster Information flow by usage of Information and Communication Technologies (ICTs) will ominously increase agricultural production in developing countries (Arokoyo, 2005; Futch and McIntosh, 2009). Informational separation is the asymmetry of information between the producer and the consumer in the marketplace. ICT has abridged the informational separation for consumers across the world (Viitnen, 2005). Reducing digital divide and convergence of new ICT technologies will lead to higher inclusion (chakaravarti, 2006).

ICT technologies will increase market efficiency by addressing information gaps and blockages in agricultural supply chains. The main reason of ICT usage in agriculture is serving information needs of the farmer (Meera et al., 2004). A large body of research presently advocates that Information and communication technology play an important role in guiding farmers to reduce information gaps in Agriculture. Knowledge and information are significant influences for fast-tracking agricultural growth by increasing production and improving marketing and distribution (Leo and Liu, 2006) which is in congruence with the results of the present study where farmers are able to market their produce more efficiently by using these technologies.

It was observed that farmers initially tried to solve any issue related to selection of crop or pest attack (disease) using their own experience and knowledge. In-case if further knowledge is required then they try and use ICTs to seek required information at that point of time. Many factors influence farmers’ decision to embrace new technologies. Physical assets owned by farmers, type of farming and influences from their family and other villagers have an impact on their technology adoption decisions (Zhang et al. 2002; Munshi 2004) which was also observed in the present
Some farmers were eager and quick to adapt to new technologies like internet and mobile whereas some were late adopters.

In the present study, out of the sample of 288 farmers in both districts, major section of the respondents were using Mobile and Television as compared to internet for searching about agricultural information which is in line with the findings of study done by (Samii, 2010). According to Armstrong and Gandhi (2012), ICT applications majorly used by farmers are Television and mobile phones for agricultural information as compared to a very limited population using internet in rural villages of Ratnagiri district of Maharashtra which is in accordance with the responses of the sample of the current study.

This is in agreement with the findings of the analysis done by Nnenna (2013), who discussed that farmers in south east Nigeria depicted higher percentage of ownership and usage of traditional ICT like Television as compared to internet for gathering farm information. In a study by Kameswari, et al. (2011) conducted in Uttrakhand, North India where majority farmers owned a prepaid mobile phone connection due to availability of wide network, cheaper call rates and mobility. Farmer’s ownership of television was far more than radio due to its feature of providing audio visual content. Internet facility was available with limited number of farmers because of high cost and infrastructure limitations which is similar to the results of the present study.

According to Cecchini and Scott, (2003). Rich farmers owned more than one ICT and were able to access market information through these as compared to poor farmers. So there is a strong need to have low cost ICT like information centres which work for an objective of community development. Choice of ICT depends on multiple factors like experience, age, education, goals and personality (Alvarez and Nuthall 2006).

**7.3 Impact of Various ICT on Agricultural Income**

Rural population comprise of around 70% of Indian population. Agriculture is the lifeblood of the rural population and any change in its structure is likely to have a substantial impact on their economic status. Around 45% of our working population is engaged directly in the agricultural activities but this percentage is declining as majority of workforce is migrating to urban towns for better employment opportunities. Despite the importance of agriculture its contribution to GDP has been declining. ICT Initiatives can enhance the agricultural income and bargaining power of farmers in the agro supply chains by dissemination of real-time and cost-effective information to them.

Rao, (2007) proposed that ICT can facilitate development in agriculture by generating agricultural knowledge. Farmers can increase their personal income and farm productivity by using new technologies, which allow farmers to access market information about what crops to grow and which markets to sell their farm output and from where to purchase farm inputs.
The findings from this study reveal that ICTs which are commonly used by rural consumers in the districts of Haryana selected for the present study are mobile phones and Television. Few respondents are using internet and radio. Majority of respondents in both the districts felt that ICTs could enhance their livelihoods which is consistent with the findings of Infodev report (2008).

The findings of the study are similar to the results by Krishnareddy and Ankaiah, (2005) where positive relationship was found between internet acceptance and agricultural income in which farmers income had increased up to Rs 3820 per hectare of land for 1051 cotton farmers resulting in overall benefit of Rs 100 million in Warangal district of Andhra Pradesh by using the e-Sagu prototype project developed by IIIT Hyderabad in which expert advice on crop production was given to farmers through local PC terminals.

The results of this study indicate a positive correlation between mobile acceptance and agricultural income of the farmers which is consistent with the findings of Raj et. al. (2011) who conducted an experiment in Tamil Nadu in Nagapattinam in which mobile technology (SMS and interactive voice response system) and individual web pages were designed to provide customised information to farmers on crop cultivation techniques and nutrient management. This led to a significant reduction in the cost of cultivation and resulted in 15% increase in the net income of farmers in the control group.

It was observed in Warana Unwired” an ICT project implemented in Maharashtra where text messages were sent on farmer’s mobile which has significantly increased sugarcane growing farmer’s income in that area. A study conducted in Peru on a group of respondents found that household income of internet-users increased by approximately 19% as compared to the families without internet access (De Los Ríos, 2010) which is in similarity with the findings of the present study.

Rawat and Singh (2013) study on E-Choupal kiosks, started by ITC in different states of India revealed that there was increase in income levels of farmers, improved yields and a fall in transaction costs. Rizvi (2011) studied the impact of mobile enabled advising service called LifeLines, for a sample of 250 farmers in the state of Madhya Pradesh. Results of the study indicate that annual average income of users of LifeLines was about 37% more than the other set of farmers not using the lifeline service.

In a study conducted by Kumar and Sankarakumar (2012) it was observed that, majority of respondents agreed to have increased savings and earnings due to increase in productivity and better disease control. More than half population of the respondents (52.0%) had shown improvement in their Agricultural wealth and 42.3% farmers agreed to have improvement in marketing of agricultural produce after accepting ICT by a sample of 300 farmers in Ramanathapuram district of Tamil Nadu. Silva and Ratnadiwakara (2008) conducted a study in Sri Lanka on 300 farmers selected from 10 farmer association who were growing vegetables in that area. The results indicate that there is a 33% decrease in farm information search costs thus reducing transaction costs incurred by farmers in the value chain by using mobile technology.
Mobile phones have the greatest penetration in Indian market as compared to the other ICTs available, therefore its impact on agriculture is also the highest as compared to other ICT technologies which is consistent with the results of the study. Highest correlation values of between Mobile acceptance and agricultural income was found in the study as compared to other ICT; internet, television and Radio.

Ramaraju et al (2011), observed in their study on Pan India basis covering 12 states, that majority of farmers were aware about ICT benefits and ICT usage in the farm which led to a significant increase in the Crop Yield(55.5%), decrease in the use of Pesticides(39.3%) and reduced input cost (28.5%) Most popular ICT used by farmers was Mobile Phone (owned by 82%) followed by Television (73%). Farmers find mobile phone more convenient as it is an interactive format and farmers could discuss their queries with experts in their own language and could also see visual pictures of crop input or final produce. Farmers are searching information on seed varieties, weather information and various disease control practices.

Furuholt and Matotay (2011) studied the impact of mobile phones on different stages of farming cycle. It was observed that mobiles have a significant impact on all stages of farming and helped farmers to increase their income by having access to market information and reduce agricultural risks caused mainly due to environmental factors. Study was conducted in 13 villages of Babati district in northern Tanzania where semi structured interviews were conducted with farmers in 2 phases in 2009 and 2011 to find out the changes caused due to mobile usage over this time period.

Aker (2008) tried to measure the impact of mobile phones on grain trade in Niger, Africa in 2005 food crisis. Data on grain production, prices, transportation cost and rainfall were analysed during this period. Results depicted that price dispersion reduced across markets by upto 6.5 per cent and farmers could search and sell in more markets with the help of mobile phones leading to increased consumer welfare during this period.

Vodafone (2011) presented a detailed report in which 6 mobile services were analysed for improving agricultural productivity and livelihood of farmers. Report highlights that RML SMS services on mobile phones were accessed by 1.4 million farmers in 17 states of India. With the help of agricultural information provided through SMS and mobile App solution for smart phone users, farmers were able to sell their produce at higher prices leading to an average increase of 5-15% in their incomes which is in congruence with the findings of the present study as respondents were sent text messages about agro information by Krishi Vigyan Kender in both the districts which they found very useful for knowing prevalent market prices and other farm related information.

Ilahiane (2007) studied a sample of 300 farmers in Morocco, whose income increased due to adoption of mobile. A considerable increase in per capita farm income was witnessed due to adoption of mobile phone by farmers in Peru (Chong et al., 2005).

Mobile phone helped the farmers to bargain for better prices in the market and generate more income. It also helps to reduce their travel time to get market information (Muto and Yamano, 2008). The study supports the finding by Houghton (2009) that rural farmer with access to speedy information regarding market prices,
weather update and best agricultural practices through mobile phone can enhance their farm incomes and efficiency.

Myhr and Nordström (2006) further reported that information access through mobile phones has increased the bargaining power and information about market environment of fishermen in Tanzania. Mobile technology is merging with Internet as Internet could also be accessed through smart phones. Radio services can also be merged with mobile phones as it allows the accessibility of radio services also.

Mass ICT technology like Television is able to disseminate large amount of information to a wide audience at a very fast rate. Majority of farmers apply the techniques learned through agricultural informational programs aired on Television on their farms in Bangladesh (Alam and Haque 2014)

Television creates a significant impact on the level of farmers’ knowledge about farming techniques (Nazari and Hassan 2011). Television broadcasts scientific and latest agricultural information among farmers with the help of agriculture experts. In India, television has been widely used as the most effective medium of disseminating information about agriculture considering the penetration of Television among households in Haryana which is 67.2% (Census, 2011).

Farmers choose to watch Television to get information regarding weather and market along with other communication mediums. Government in many developing countries have started various television programs to provide valuable real time information to farmers (Goyal, 2010). In a study conducted by Murty and Abhinov (2012) on 540 farmers in Krishna District of Andhra Pradesh, where authors give an insight about Media like Television which has a significant impact on educating farmers about modern Agricultural Practices which is in conformance with the results of the present study.

Radio and television is considered to be among the most effective mediums to communicate with the rural people in developing countries (FAO, 2001). Kim and Lillard (2010) emphasized that farmers’ knowledge increased about the farming process due to the exposure of television. Munene and Mberia (2016) brings forth the importance of Television agricultural shows which are the most important source of providing agricultural information among small-scale farmers in the Kikuyu area, Kenya due to proper timings of the Television programs and interesting presentation of content in them which is consistent with the findings of the present study. Television is quite popular ICT used by respondents as they found it simple to use for gathering and learning new information regarding agriculture which was also highlighted by Buren, (2000) in his study where television was considered the simplest medium for educating respondents in fields like agriculture and health.

Researcher strongly recommends use of television for information dissemination in farming which creates a positive impact on agricultural income of the farmer which is similar to the findings of the present study.

According to UNESCO (1996) radio programmes for farmers in Philippines have improved their farm productivity. A study conducted by Djankov, et al. (2001)
revealed that information disseminated by radio was relevant for 90% of farmers and more than 50% of farmers confirmed that information received from radio programmes helped to increase their yields in Zambia on a sample of 21,000 farmers. Sharma (2010), emphasized that radio is an effective medium for communicating information with farmers about weather, diseases, markets, and control of crop pests which are in sync with the findings of Nakabugu (2001). Sachan, et al.(2014) in their study found Radio to be the most suitable form of communication in comparison to print for reaching rural target segment as it can be possessed and accessed the entire day by the target audience.

The evidence given by studies indicate that Information and communication technology components; Internet, Mobile, television and Radio considered for the present study produce beneficial outcomes for farmers as shown by the present study. Though growing evidence indicates that ICT acceptance in agriculture has the potential to improve agricultural performance, we are still only in the initial phase of understanding the extent to which farmers with ICT usage would be more wealthy as compared to farmers who are not using any of the ICT components and just relying on their personal experience of farming gained over generations of practising farming.

7.4 Barriers of ICT use in Agriculture

People in India have begun to recognize and realize the value of ICTs but there are many limiting factors which needs considerable deliberation. India is on 129th position out of a total 166 nations in ICT Development Index (IDI), which is quite a low rank and the condition is further aggravated by the fact that there is a gigantic urban/rural digital divide which needs to be filled quickly to spread the benefits of ICTs to the common man. In field of agriculture, it is not possible that all farmers will be able and keen to adopt new technologies due to different financial, social and environmental factors. (Mariano et al., 2012).

Kuhlmann, F. (2005) in his study found out that lack of ICT knowledge (37.5%), lack of access to ICT (22.5%) and high cost of ICT(25%) are the major barriers in adoption of ICT in agriculture in Adamawa State, of Nigeria.

Patil, et al. (2008) found that lack of training” is a major obstruction in using ICTs in Agricultural farms as there is high rate of illiteracy among farmers. Munyua, (2007) discusses the challenges faced by farmers like low literacy rate, lack of electricity, poor access to inputs and low prices for their produce despite the availability of ICT technologies as the adoption of these technologies is quite low among farmers.

Chapman and Slaymaker (2002) highlight that cost of information access and lack of ICT infrastructure as major constraints of adoption in rural areas. Illiteracy and affordability are two criterions which restricts the adoption of technologies in rural areas (Seshagiri, et al (2007). Findings by Chapman and Slaymaker 2002; Colle and Roman 2002; Dossani.et.al (2005) revealed that ICT projects face a huge challenge to create and deliver relevant content to farmers. farmers are able to access the relevant content by using different ICT components as per their requirement. Localisation and
customisation of content is a significant barrier on deriving information from web portals (Balaji, et al., 2007).

Dalvit, et al. (2011) emphasize that content available on websites is in English which is a major barrier for rural users which in in tune to the findings of the present study. Language defines the extent for ICT adoption in a particular society. The study indicates that there are farmers who perceive training and cost of ICT as a barrier to its acceptance which is in confirmation to studies by Taragola and Gelb (2005); Gelb and Parker (2005) who considered cost and lack of training as major constraints of ICT adoption in agriculture.

However the results of the research are partially in congruence with other studies as very less number of respondents are facing certain barriers while accessing the ICT technologies. Some barriers faced by respondents are with technologies like mobile phones and internet. Mobile phones, despite widespread ownership among India’s farmers, are new which they are still learning to use, and fully draw its advantages. Television imparts all the information related to agriculture but inappropriate timings of the programs, lack of interest and electricity load-shedding are the major constraint of Television as revealed in a study conducted in Lahore, Pakistan by Jafri, et el. (2014) which is also to some extent in confirmation to the present study.

7.5 Comparison of Change in Consumption of Consumer Durables

Consumption is the value of goods and services purchased by people over a period of time. The consumption function depicts the relationship between aggregate income and aggregate consumption. Various models starting with Absolute Income hypothesis (Keynes:1936), Relative Income hypothesis (Duesenberry:1949), Permanent Income Hypothesis (Friedman:1957), Life cycle Income hypothesis (Modigliani and Brumberg. 1954) and Rational Expectation theory(Hall:1978) have established a strong relationship between income and Consumption. Friedman. Income theory states that relationship between consumption and income is proportional.

There is a rise in the per capita consumption spending and its growth in India in the recent years, however the income disparities across regions is worsening (Chaturvedi and Upadhyay 2004). Rao (2005) stressed on the importance of agricultural growth and improvement which can benefit masses and thus aid in reducing income disparities and poverty.

Rural consumer in India has changed their consumption pattern in recent years by spending their income on non-necessity products like consumer durables. According to Assocham study (2014) when income of rural people increases, their consumption expenditure on durable goods increases in expectation of a better lifestyle and growth rate of rural consumption expenditure on consumer durable goods in Haryana was 23.9 per cent during that time. Rural consuming pattern is influenced by the changes in the agriculture in the State as it is the primary occupation of rural consumers.
Increased incomes provide more opportunities to people in terms of deciding their consumption basket. Consumption linkages in rural markets arise when increasing farmer incomes lead to demand for consumer goods reflecting diversification of consumption pattern into non necessities. Rural ownership of durables like Television(46%) and Refrigerator(28.7%) is quite comparable to ownership statistics in urban markets which is in accordance to the present study where majority of farmers own consumer durables like television, refrigerator and washing machine.

There has been a phenomenal growth in consumption of consumer durable goods in rural areas in recent years due to affordable pricing, awareness, new product varieties and the high disposable incomes (NCAER-CMR Analysis, 2009-2010). The per capita income of Haryana at constant (2004-05) prices as per Advance Estimates is expected to reach at the level of Rs 71,493 during 2014-15(Haryana Economic survey 2014).

Hundal,(2001) revealed that consumer durables are a necessity for rural consumer as they consider these products as a source of entertainment and information in a study conducted in 3 districts of Punjab with a sample of 325 respondents (households). Pareek (1999) opined about the tremendous potential of Indian rural market due to rising rural incomes as per National Council for Applied Economic Research (NCAER) data. Pundir and Singh, (2001) in a study of rural villages in India found increased agricultural prices, led to increased income and consumption of consumer goods (including durables).

Results showed that respondents are buying majorly all consumer durables in both the districts. There is insignificant difference in the means of consumption and its variables for farmers in both Karnal and Sonipat district. Significant difference was seen in consumption of washing machine and refrigerator of farmers in both the districts and was higher for Karnal district. This could be explained as farmers in Karnal are consuming more of durables among both the districts. However they did not differ on consumption of Air conditioner, Television and mixer/grinder. According to a CEAMA Report (2014), Refrigerators have the highest penetration in rural India followed by washing machine which is consistent as per the results of the study.

Farmers in both the districts depict high mean scores of change in income on change in consumption of consumer durables (white goods). This effect is complimented by a study done in rural India by Singh (2011) who stated that consumption basket has changed from older durables like bicycle and sewing machine to white goods category like television, washing machines and refrigerators which is in confirmation to the results of the present study.

Singh, (1991) emphasized that marketing the agricultural produce at higher prices requires increased attention as it has a significant impact on the further productive activities of the farmer The results of present study are in congruence with various scholars who have indicated that as agricultural productivity increases, it leads to increase in income and thereby creating a positive impact on consumer demand. (Vogel, 1994; Mellor, 1999; Hazell and Haggblade, 1991; Delgado, et al., 1998).
Income and Lifestyle changes across rural India indicate a transformation in consumption patterns shifting away from food towards high-value commodities. Spending on enhancing life rather than necessities is becoming visible in rural areas. The journey from dimness to hopefulness, to higher incomes and better lifestyles is aspiring and socio-culturally driven. Since Information and communication technology has been found to be a necessary condition for the progress in rural as well as urban markets including the poor segments of the society, it is recommended that Information and communication technology must be pursued as a means to increase consumption levels in the economy.