INFORMATION AND COMMUNICATION TECHNOLOGY

(ICT) FOR RURAL DEVELOPMENT : A CASE STUDY (2006-2012)

OF MANAGEMENT OF Wi-MAX PILOT PROJECT ,

BARAMATI.

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BY

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UNDER THE GUIDANCE OF

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JUNE

2014

CERTIFICATE

This is to certify that the thesis entitled **"Information And Communication Technology (ICT) For Rural Development: A Case Study (2006-2012) Of Management Of WiMAX Pilot Project, Baramati"** which is being submitting herewith for the award of Degree of Vidyavachaspati (Ph.D.) in Management of Tilak Maharasthra Vidyapeeth, Pune is result of original research work completed by **Shri. Janardan Adinath Pawar** under my supervision and guidance. To the best of my knowledge and belief the work incorporated in this thesis has not formed the basis for the award of any Degree or similar title of this or any other university of examining body upon him.

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Place: Pune   **Dr. Prasanna G. Deshmukh**
Date: **Research Guide**

DECLARATION

I hereby declare that the thesis entitled **"Information And Communication Technology (ICT) For Rural Development: A Case Study (2006-2012) Of Management Of WiMAX Pilot Project, Baramati"** completed and written by me has not previously been formed as the basis of award of any degree or other similar title upon me of this or any other Vidyapeeth or examining body.

Place: Pune   **Mr. Janardan Adinath Pawar,**
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Mr. Janardan A. Pawar

C O N T E N T S

Certificate
Declaration
Contents
Acknowledgement
List of Tables and Diagrams
List of Abbreviations
Abstract

ABBREVIATIONS

Short form	Full form
ICT	Information and Communication Technology
T.V.	Television
UNDP	United Nations Developmental Programme
COW	Computer On Wheel
W.W.V.P.	Warana Wired Village Project
MANAGE	National Institute of Agricultural Extension Management (MANAGE), Hyderabad
IIM	Indian Institute of Management
NGO	Non Governmental Organisation
IT	Information Technology
UNESCO	United Nations Educational, Scientific and Cultural Organization
INSAT	Indian Satellite
IGNOU	Indira Gandhi National Open University
DTH	Direct to Home
ISRO	Indian Space Research Organisation
UNCTAD	United Nations Conference on Trade and Development
WTO	World Trade Organisation
WLL	Wireless in Local Loop
NABARD	National Bank for Agriculture and Rural Development
SARI	SATELLITE ACCESS TO RURAL INDIA
IIS	Indian Institute of Science, Bangalore
IIT	Indian Institute of Technology
ITC	Indian Tobacco Company
VAC	Value Added Centre
PHC	Primary Health Care Centre
D.S.L.	Digital Subscriber Line
LAN	Local Area Network

GHz	Giga Hartz
3G	Third Generation
MMS	Multimedia Messaging Service
SMS	Short Messaging Service
IP	Internet Proptocol
ASN	Access Service Network
CSN	Connectivity Service Network
RAM	Random Access Memory
UN	United Nation
WHO	World Health Organisation
VIIT	Vidya Prathisthan's Institute of Information Technology
G.D.P.	Gross Domestic Product

List of Tables

53	V	Table No. 5.25	**Hurdles involved in WiMAX**
54	V	Table No. 5.26	**Suggestions for effective utilization of WiMAX.**

List of Diagrams

Sr. No.	Chapter No.	Diagram No.	Contents
1	II	Diagram No.2.1	Growth of Radio Sets in India
2	II	Diagram No.2.2	The rapid growth of Satellite television in India
3	II	Diagram No.2.3	Internet users by segment in India
4	III	Diagram No.3.1	Backhaul network of WiMAX.
5	III	Diagram No.3.2	WiMAX for educational institutions.
6	III	Diagram No.3.3	WiMAX for Oil and Petroleum companies.
7	III	Diagram No.3.4	WiMAX for Oil and Petroleum companies.
8	V	Diagram No.5.1	Awareness of Computer according to land holding pattern.
9	V	Diagram No.5.2	Role of Mass Media in Health Awareness.
10	V	Diagram No.5.3	Role of Communication Networks in Women Empowerment.
11	V	Diagram No.5.4	Role of effective communication networks in women empowerment.
12	V	Diagram No.5.5	A Comparative picture of interpersonal communication in Experimental and Non-Experimental village.
13	V	Diagram No.5.6	Year-wise Sugarcane production in experimental and non-experimental villages (MT/acre)
14	V	Diagram No.5.6 (A)	Differences in sugarcane production (Per acre) before and after WiMAX Kiosk.

23	**V**	**Diagram No.5.13**	**Topics of Discuss at the WiMAX Kiosk.**
24	**V**	**Diagram No.5.14**	**Needs of WiMAX among the peasants of Non-Experimental village.**

ABSTARCT OF THE THESIS

ON

INFORMATION AND COMMUNICATION TECHNOLOGY (ICT) FOR RURAL DEVELOPMENT: A CASE STUDY (2006-2012) OF MANAGEMENT OF WI-MAX PILOT PROJECT, BARAMATI.

INTRODUCTION

Application of ICT communication for development is not a new concept but the modern ICT technology like WiMAX is very powerful tool to consider using in the rural development. This chapter also covers the review of literature and development of genesis of ICT projects and its applications in rural development.

Communication is a fundamental pre-requisite of all living beings. The development of human civilization is directly depends upon refinement and growth of forms, mechanisms and quality of the contents of communication. Sociologically it is possible to construct both processes and structures of culture and society through communicational contents and networks (Sharma, S. C., 1987:5).

A characteristic feature of the Third World countries is that they are predominantly rural in character and their economy is agrarian and subsistence-oriented. The transformation of these countries by structural changed in the total society has been the major emphasis in all models of development. Communication is now one of the central issues in Third World countries like India where 72.22% (2001 census) people live in villages.

Communication networks have been considered as potential agencies for the development of people primarily because their reach is very wide.

Further, television and radio have the power to overcome the literacy barrier and hence their interaction with the illiterates may be higher. Consequently Information and Communication Technologies (ICTs) are suitable instruments for the rapid development of underdeveloped and developing countries like India.

Michiels and Van Crowder (2001) have defined ICTs "as a range of electronic technologies which when converged in new configurations are flexible, adaptable, enabling and capable of transforming organisations and redefining social relations." The range of technologies is increasing all the time and "there is a convergence between the new technologies and conventional media."

In recent times, ICT is playing a role of catalyst in rural development. It is used in every aspect of information, management and governance of development. Therefore it is to be noted in the mind present study raising some fundamental questions on the application of WiMAX for rural development with the help of case study.

From the past studies it is proved that, Information and Communication Technology (ICT) has earned its reputation to be the key to information-flow for intensifying the development efforts in rural India and is being considered as an imperative strategy for achieving the goal of sustainable rural development (Ghosh Abhijeet, 2011). Application of ICT has the potential to improve living standards of people in remote and rural areas by providing important commercial, social and educational benefits. By expanding the use of government services – ICT strengthens the livelihood opportunities for rural India (Anup Hazara, 2012)

With the background of rural development WiMAX pilot project at Baramati poaching to conduct the study. The key questions in this study attempts to answers: how organization and management of WiMAX project for rural development? What is the role of WiMAX in the rural

development? What is the application of WiMAX project at Baramati? In spite of the fact that much research has been undertaken on communication in Western countries, the peculiar problems of various communication networks operating in the transitional societies, such as India are yet to be located and analyzed. Turning to the Indian context one comes across very few studies which seek to explore the impact of communication networks on various field of interest. The present study is only limited up to analyze the role of ICT i.e. WiMAX in the rural development at Baramati in general and in the experimental village (Katewadi) in particular. For analysing the rural development through ICT following indicators are selected for measurement. These are a) human resource generation, b) crop production, c) livelihood, d) mobility, e) income and saving and f) agriculture allied activities.

OBJECTIVES OF THE STUDY

The main objective of this case study is the management of ICT for rural development through WiMAX pilot project at Baramati. With this main objective in mind the study has following other objectives.

1) To find out Organization and Management of WiMAX project in Baramati.

2) To analyse the profile and existing communication networks in Experimental and non-experimental villages.

3) To find out social and economic changes after implementation of WiMAX in the Baramati, Katewadi experimental village.

4) To understand the role of WiMAX to create awareness in the use of information and communication technology in experimental and non-experimental villages.

5) To draw conclusions and make suggestions if any for improvement.

HYPOTHESIS

1) Modern ICT tool i.e. WiMAX helps to increase agriculture production i.e. sugarcane, maize and wheat.

2) WiMAX is time saving ICT tool and is tremendously helpful to provide the information services in the experimental village.

3) WiMAX is cost effective tool for rural development.

4) People of non-experimental villages (Zargadwadi) needs WiMAX Kiosk

5) WiMAX is an effective ICT tool for rural development.

6) WiMAX is better than traditional media for rural development.

RESEARCH DESIGN AND UNIVERSE OF THE STUDY

As regards the nature of this kind of study, an experimental type of research design was used. As the present study has its focus on the, "ICT and Rural Development: Study of Wi-MAX Pilot Project Baramati." Here we decided to treat Baramati region in the Pune District as the universe of study. The purposive sampling method is used to select the two villages respectively as experimental and non-experimental villages i.e. Katewadi and Zargadwadi.

SAMPLING DESIGN

WiMAX Kiosk is only running Kiosk at the Katewadi village in Baramati; this village is selected for proposed study whereas for comparison similar nature village (i.e. Zargadwadi) near to Katewadi is selected by using following indicators. For the purpose of the proposed study the researcher selected two villages. Out of that one village was selected as an Experimental village, where 100 respondents (i.e.5%) are selected through quota sampling method and another was considered as a Non-Experimental village where 114 respondents (i.e.5%) are selected through quota sampling method.

SELECTION OF THE SAMPLE VILLAGES

Following strategy was adopted for the selection of sample villages.

a)   *Experimental Village:*

i)   Criteria for selection of experimental village.

      1)   The experimental village must be under Baramati region.

      2)   The experimental village has successfully implemented the Wi-MAX Kisok.

ii)   Selection Procedure of Experimental Village:

The WiMAX Project includes Kisoks in 5 villages in Baramti tahsil in Pune district. The present study is restricted to only Katewadi village connected with WiMAX Kiosks which considered for the selection procedure of Experimental village. To give preference for the selection criteria of Experimental village, the researcher has personally observed and discussed with *Grampanchayat* and WiMAX officials about such villages where WiMAX has successfully implemented. The researcher selected 1 village (Katewadi) as an Experimental village by using random sampling technique by adopting lottery method.

b)   *Non-Experimental:*

For comparison and to examine the role of communication networks in development the researcher has selected one Non-Experimental Village from Baramati region by using following procedure.

i)   Criteria for selection of Non-Experimental village

      1)   Non-Experimental village should not be very far from Experimental village.

      2)   Non-Experimental village should be of the same socio-economic status and geographical conditions.

      3)   Non-Experimental village should not have implemented the WiMAX Project.

ii)   Selection Procedure of Non-Experimental Village:

For the selection of Non-Experimental Village the researcher has conducted a small survey to fulfill the criteria's for the selection of Non-Experimental village. After the survey researcher has selected one village as a Non-Experimental village. Purposive sampling method was used for the selection of Non-Experimental village. The Non-Experimental village is Zargadwadi in Baramati tahsil.

SELECTION OF RESPONDENTS

To collect in-depth data from the heterogeneous peasant groups from the selected villages, the researcher has referred Land holding, Sex and Caste category wise report of Government of Maharashtra, Ministry of Agriculture (Survey report, 2001 / Section-5). Out of the total sample size i.e. 1340, 214 respondents which was 15 per cent of the total sample size was selected for the present study (Table No. 1 &2)

Besides Seven Case Studies were recorded to collect in-depth and qualitative data from the study area. The stratified sampling method was used for the selection of sample for this study.

LIMITATIONS OF STUDY

The present research work detects the role of WiMAX technology for rural development. Following are the limitations of this study-

1) The most obvious limitation of the present research work is only found the role WiMAX technology in rural development.
2) The total sample for the present study comprised of 214 respondents from the experimental and non experimental villages. This sample is a very small proportion i.e. 5% of the entire population in these villages.

3) The geographical limitation of this study restricted only up to two villages i.e Katewadi is experimental village and Zargadwadi is non-experimental village.

4) This research work is case study and aims find the role of ICT for rural development limited to Katewadi.

5) This is comparative study of the two villages that were identical in nature but only ICT gap makes them different.

Table No. 1: Sample size according to the land holding, sex and caste category.

Sr. No.	Category of Peasant	Land Size Categories	Experimental Village (Katewadi)				Control Village (Zargadwadi)				Total
			Open		Backward Castes*		Open		Backward Castes*		
			Male	Female	Male	Female	Male	Female	Male	Female	
1.	Marginal Peasants	Up to 1 Acres	32	6	14	1	34	13	10	01	111
2.	Small Peasants	1 Acres to 2.19	17	2	1	1	18	06	01	01	47
3.	Medium Peasants	2.20 to 4.39 Acres	17	3	1	1	18	02	01	---	43
4.	Big Peasants	5.00 to Above Acres	03	1	--	--	08	01	--	--	13
		Total	69	12	16	3	78	22	12	02	214
		Grand Total				**100**				**114**	**214**

*The term Open refers Non-reserved caste and BC refers reserved caste.

Table No. 2. : Sample size according to the age, land holding, sex and caste category.

Sample Villages	Age in Yrs	Marginal Peasants Up to 1 Acres				Small Peasants 1 Acres to 2.19				Medium Peasants 2.20 to 4.39 Acres				Big Peasants 5.00 to Above Acres				Total
		Open		Backward Class		Open		Backward d Class		Open		Backward Class		Open		Backward Class		
		M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	
Katewadi	21-30	3	-	1	-	2	-	-	-	1	-	-	-	-	-	-	-	7 (7%)
	31-40	6	-	-	-	3	-	-	-	7	-	-	-	-	-	-	-	16 (16%)
	41-50	7	3	9	-	1	-	1	-	2	1	-	-	2	-	-	-	26 (26%)
	51-60	12	2	2	1	5	1	-	-	4	2	1	1	-	1	-	-	32 (32%)
	61 and above	4	1	2	-	6	1	-	1	3	-	-	-	1	-	-	-	19 (19%)
Zargadwadi	21-30	10	-	-	-	8	-	-	-	2	-	-	-	-	-	-	-	20 (18%)
	31-40	2	3	2	-	2	2	-	-	4	-	-	-	3	-	-	-	18 (16%)
	41-50	5	7	1	-	2	2	-	-	4	1	1	-	2	1	-	-	26 (22%)
	51-60	12	2	5	1	3	1	1	1	5	1	-	-	1	-	-	-	33(29%)
	61 and above	5	1	2	-	3	1	-	-	3	-	-	-	2	-	-	-	17 (15%)
Total		85		24		45		4		40		3		13				214 (100%)

*The term Open refers Non-reserved caste and BC refers reserved caste.

TOOLS AND TECHNIQUES OF DATA COLLECTION

The primary data were collected by using interview schedule. A pilot survey was conducted using an unstructured interview schedule in the areas, for correcting ambiguity, anomaly in the sequence of questions etc. Two interview schedules were developed for Experimental and Non-Experimental villages for comparative understanding. The information was collected from the landholders of the households.

The interview schedule, consisting of open-ended and structured questions, it was divided into four parts, viz., (i) Identification and background of the respondents, (ii) WiMAX and rural development, (iii) Communication in social sphere, (iv) Communication in economic sphere. The interview schedule had been translated into *Marathi* a local dialect, to avoid the communication gap while collecting information. Experience in the village proved that information could be obtained by informal chat, discussion, diary writing and observation rather than by asking only straight questions. To some extent, case studies have also been used for this study.

ANALYSIS OF DATA

The data were transferred to code sheets and statistical analysis was carried out. For open ended questions ,data were edited and coded, the whole data was analyzed by using SPSS Version13.1 (Statistical Packages for Social Sciences). Descriptive Statistics like Mean, Standard deviation, Mean Percentage Score etc. and inferential statistics like pair sample 't' test, were used for analyzing the data.

The next part deals to cover the communication media and rural development in India.

CHAPTER SCHEME

Chapter I: Introduction and Review of Literature.

The first chapter of thesis begins with the research problems which is one of the vital components of this study. The second section

covers the review of literature related to communication and genesis of ICT projects working for rural classes.

Chapter II: Research Methodology and Present Status of Communication Media.

This chapter focuses on two vital sections i.e. first is research methodology and second is history of communication media in India. The first section is Research Methodology explains the details of every step adopted for conducting this study. Whereas section two explores the history and development of communication media i.e. Press, Radio, Television, and Information and Communication Technology (ICT) in India.

Chapter III: Organisation and Management of WiMAX Project at Baramati.

This chapter covers the details of wireless technology in general and WiMAX technology in particular. Particulars of WiMAX system with its organisation and management in the Baramati region also examined in this chapter. Along with this, some case studies related to WiMAX projects around the world are added in this topic. The last part of the topic covers the different applications of WiMAX project in Baramati region.

Chapter IV: Profile and Communication Networks in Study Villages at Baramati.

The present research study also aims to find out the existing communication networks like ICT (WiMAX) and their role in rural development of India in general and Baramati region of Maharashtra state in particular. This chapter attempts to present a general profile of two selected villages i.e. experimental village (Katewadi) and non-experimental village (Zargadwadi), which set the stage for a more in-depth analysis in the next chapter (i.e. Chapter-V). This chapter analyse the role of communication network in rural development. The application of WiMAX in Baramati in following ways: WiMAX Kiosk,

Telemedicine, Computer on Wheels, E –Health and Wireless internet connectivity

Chapter V : Analysis of WiMAX Project for Rural Development at Baramati.

This chapter deals to find the role of modern ICT tool WiMAX in rural development at experimental village i.e. Katewadi and in contradictory its comparison with traditional communication networks at non-experimental village i.e. Zargadwadi. The rural development aspects are measure through various indicators like human resource generation, increasing crop production, income and saving behaviour, awareness of ICT, getting farm advocacy, economic activities of SHG and mobility of villagers, human resource generation and so on in the experimental and non-experimental villages. There are changes from a typical conventional practice of cultivation to modern agriculture reformation. Hypothesis testing also covered in this topic. However, first part gives the overview of WiMAX project at Baramati region.

Chapter VI : Conclusions and Suggestions

In this chapter an attempt has been made to mention vital suggestions to improve the role of communication networks in the process of development communication with special reference to rural society. The study has centered on the key issue of understanding the role of WiMAX / Information and Communication Technology (ICT) in rural development as well as socio-economic development.

CONCLUSIONS AND SUGGESTIONS

(1) Conclusions- Conclusions are mentioned separately in two parts. The first part deals with the role of WiMAX in Rural Development and the second part deals with the role of WiMAX in Social and Economic changes. These are mentioned below.

A) Role of WiMAX for Rural Development

1) WiMAX helps to find alternative paths of livelihood which is one of the essential prerequisite of rural development. It is found that, majority

of peasants of both villages are likely to continue with the traditional occupation i.e. agriculture. However, 68% of Experimental and 52.26% of Control village peasants do not like their children to continue with the same traditional occupation. It shows the high attitudinal changes among the peasants, relatively more among the Experimental village peasants due to higher exposure to different mass media Exposure and Communication channels. In context to this finding other related study shows, information is one of the vital aspects of development; hence through communication a person obtained the availability of different kinds of information that will be helpful to think on availability of different kinds of work. Once he has this type of information then he can easily choose between alternatives. After having the proper idea the person will be able to do the appropriate work for his livelihood. On the other hand due to lack of communication, peasant will remain in his traditional occupation, whether he is especially qualified for it or not (Rao, Y.V.L. 1966:98).

2) WiMAX improves economic status of rural poor. It is concluded that, when the person obtained proper information about alternative income-producing activities then he will tend to move into other jobs or set up small business. In the Experimental Village it was found that, most of the peasants are moving towards dairy co-operatives, poultry, emu culture and the young boys are either interested to set up small agro business and got jobs in different co-operatives sectors. Both communication and economic development, by helping each other in their growth, make the total process a self- perpetuates one. For with economic development, the mass media and the interpersonal communication patterns help to expand, leading to a great widening of horizons, aided by education, mobility and the like, all of which are parts of the total communication networks (ibid:100). Thus, this helps the person as well as his family to improve the economic condition (Epstein T.,1962; Deshmukh, C.D.,1957).

3) WiMAX avails the commerce and banking services for peasants and needy villagers in the Katewadi (experimental) village. It was found that, due to low rate of literacy, poverty and inadequate information in rural

area, peasants are always facing lot of problems especially about banking and commerce related issues. This picture is very common in Zargadwadi (non-experimental) village in contrast there are 95% peasants in the experimental village are taking advantages of commerce and banking activities. It is possible through communication where person obtain to know of the availability of different kinds of information that will create a condition to think rationally and take proper decisions. Most of the peasants opined that due to the different communication networks they can receive lots of information about banking and commerce through advertisements, programmes, news, articles and mainly though peer group's face to face interaction.

4) WiMAX creates a condition to think rationally and take proper decision about commerce and banking. The data also show that majority of marginal and small peasants of both villages are taking loan mainly from District Credit Co-operative (DCC) bank as reported by 29.8% of Experimental and 7.89% of Non-Experimental village peasants respectively. It was also found that ten years ago majority of peasants depended mainly upon moneylenders for loan. Now the situation has dramatically changed, peasants are more conscious about these issues. Thus, it can be conclude that communication helps people to learn and think rationally that will be beneficial for bringing further development in the individual and his family.

5) Traditional rural society was governed by big landlords, where the wealthy landlords were cornering the business and trade activities of a village community. Today in the 'open skies' era communication reaches all sections. Today, the village economy is more decentralized and diversified allowing villagers from all strata of the community to take active participation in the entrepreneurial activities. In this background, communication networks like WiMAX have helped for expansion of the entrepreneurial class. Therefore it is concluded that, WiMAX helps to build entrepreneurship qualities. By liberally informing and educating all

masses about markets and methods, it helps villagers of all caste and class to take advantage of growing opportunities. Information about markets and methods no longer remains a monopoly (See Hartmann et. al.,1989; Rao, Y.V.L., 1966; Johnson, K., 2000).

6) Access to information is of fundamental pre-requisite in any developmental process. For that it is necessary to create e-awareness among the beneficiaries in villages. In this context the present study proves that, 85% peasants of experimental village have agreed that computer and internet services i.e. WiMAX Kiosk is beneficial to them, out of which 73% were interested to learn it. It means that, WiMAX has been helpful to promote e-awareness especially among the rural peasants.

7) WiMAX helped to create positive conditions for development of modern agriculture in Experimental village. WiMAX Kiosks beneficiary peasants easily got advice related to purchasing of new machinery, pest control machines and pesticides, high yielding varieties crops, information of sugarcane billing, mobile recharge and so on.

8) Woman Self Help Groups (SHGs) in the Katewadi village is very active since implementation of WiMAX project. Marketing related information of their goods received from the WiMAX Kiosk. SHG groups in Katewadi applied and take grants for various governmental schemes through WiMAX Kiosks. Henceforth it is concluded that, WiMAX is one of the major reason growths of self-help group.

9) National Informatics Centre (NIC) is apex institutions of Government for information services have also indirect association with Intel's WiMAX project at Baramati. NIC only consult the Vidya Prathisthan's Institute of Information Technology for web enabling services and support some infrastructural needs. It is concluded that, NIC with Intel gives an opportunity to become use the information services like

B) Role of WiMAX/ (ICT) in Social and Economic Changes

1) WiMAX has created greater awareness and participation about Information and Communication Technologies (ICT's). Development is confirmed when the people for whom it has been proposed acknowledge its importance. The participation of people in the process of development enhances the rate at which development must progress. The WiMAX so far has been harboring this approach. In this context it is interesting to note that, 97 % of peasants of Experimental village (*Where WiMAX has been implemented*) know about computer, nearly 77% are familiar with WiMAX Kiosk. On the other hand only 49.99% of peasants of control village (*Where WiMAX has not been implemented*) know about computer and 44.74% are familiar at city level. The participation and awareness about ICT is high among the big and marginal peasants of Experimental village. However the frequency of visiting time to the WiMAX Kiosk mainly depended upon the sex, time and the information need. Similar findings were recorded by (Raina, M; 2004, Kolhli V.,1999).

2) Modern ICT tool i.e. WiMAX helps to increase agriculture production i.e. sugarcane, wheat and maize. Agricultural is a prime pillar of Indian economy, which contributes around 25% of G.D.P. and 69% of labourforce, is engaged in agriculture and allied activities. Baramati region sugarcane is considered as a major cash crop i.e. Sugarcane. Due to WiMAX it was found that, the production of sugarcane increased by 30 tonnes as compare to the past production. The above finding clearly proves that, WiMAX has helped to create positive atmosphere for promoting economic development which is faster, efficient and reduces inequality.

3) WiMAX is time saving ICT tool and is tremendously helpful to provide the information services in the experimental village. It is concluded that, through WiMAX enabled services; a peasant could save his traveling time and transportation costs by more than 80 to 90%. As a result of WiMAX, the mobility for farm advocacy is decreased. WiMAX saved time, labour and money of the peasants. Recent evidence shows that

peasants, including small holders are gradually shifting their production portfolios in favor of high-value commodities and are willing to take high risks. But they are confronted with a host of constraints such as high transaction costs in acquiring resources, marketing of tiny marketable surplus and inadequate information (Joshi et al., 2003; Ballabh and Sharma, 1989; Hiremath and Ballabh,1996). Peasants need reliable and timely information about best practices of production, processing, marketing etc.

Intel's WiMAX project is conducted by the Vidya Prathisthan's Institute of Information Technology (VPIIT). WiMAX base tower is situated and maintained from the Vidya Prathisthan's Institute of Information Technology at Baramati. It is supplying wireless signals to the respective WiMAX Kiosk. It is suggested that, Vidya Prathisthan's Institute of Information Technology manage more effectively to rise the internet connectivity and make sure updating hardware and software in every WiMAX Kiosk.

4) WiMAX has provided proper forum for healthy interpersonal communication. In experimental village WiMAX is providing e-information to the villagers which they are accessing satisfactory. At the same time it was also found that WiMAX has provided a proper forum for healthy interpersonal communication among the peasants. There were 92% peasants of experimental village believe that due to WiMAX Kisoks their interpersonal communication has increased. Rogers and Svenning (1969:10), found that in less developed countries where little or no mass media are available, other channels like personal trip to cities and interpersonal communication with change agents etc. provides information to the peasants. It is interesting to note that, here in the experimental village peasants are using ICT's but at the same time they are also dependent upon interpersonal communication. It means that, rural masses still prefer interpersonal communication as one of the important source of information and communication. The results of this study are in agreement with the earlier studies by Vijayaragavan,K,1981; Agrwal and Pandey,1985; Dube S.C.,1960.

5) WiMAX is playing a key role in human resource development. WiMAX has proved helpful in generating employment opportunities for the local population. The Kiosk got employment to operators of two qualified computer experts each to manage web and e-mail administration, Windows – NT and database administration. It shows that, WiMAX has been helpful in creating opportunities for local human resource development. It is found that, young people express great interest in computer training, as this will help them to find better job opportunities, it will create trained and skilled human resource.

Efforts at all level should be taken to improve the rural services like hospital, schools, SHGs, training to rural youth and peasants, banking and finance services and rural artisans. With an objective to make ICT project an idea which one can be considered and followed by others as role model.

6) For instance, among the various constraints reported by the beneficiaries of WiMAX, insufficient specific information (32%) and inadequate internet/phone connectivity (21%) were found to be prominent hurdles. In India, the utilization of ICT in agriculture and rural development is in the takeoff stage and obviously it is facing many ground level hurdles. However electricity was perceived to be a major factor. Thus, for ICT initiatives such as WiMAX, to be successful and sustainable in the long run, multi-pronged development strategy is essential.

WiMAX give platform of rural development. WiMAX set conditions for upliftment of rural society. From this study it is clearly witnessed that, WiMAX is clearly helping for rural development in Katewadi experimental village.

7) After examining WiMAX it was found that, the benefits of the rural ICT projects should be measured not only from the economic and financial point of view, but also in terms of the real benefits empowering the local communities. Value of the benefits in the long run towards poverty-eradication and social empowerment that are the ultimate goal of

any social venture should not be ignored. Just focusing on financial sustainability may distract the very objective of rural ICT endeavors. It is important to concentrate on making the rural ICT efforts self-sustainable through offering different income generating activities in addition to development and social services.

However, today communication networks have shown wonders in galvanizing the process of overall development. ICT's have facilitated the "real time" information exchange in fastest and quickest manner. That day is not far when every Indian peasant will click on a mouse looking ahead for a wide spectrum of information gateway that will provide him a place in the "global village".

8) Zargadwadi non-experimental village till date accessing the traditional media tools like news paper, radio and television where as another village Katewadi have modern ICT tools in the form of WiMAX. The WiMAX gives wireless internet connectivity as well as it have one Kiosk which is equipped with all modern facilities like internet connection to Computer and Laptop, Fax Service, Scanning Service, Printing Service provided to the Katewadi villagers. Therefore it is interesting to analyse the effectiveness of WiMAX over traditional media. Below mentioned findings analyses this hypothesis.

9) People of non-experimental villages (Zargadwadi) need WiMAX Kiosk similar to Katewadi. It is concluded that, 96% peasants of non-experimental village know the benefits of WiMAX project and they are like to implement one WiMAX Kisok in Zargadwadi.

This study finally concluded that, ICT project like WiMAX in the Katewadi village helping for rural development. WiMAX helping to raise the income and savings of peasant and rural poor, banking, trade and commerce facilities are easily reached to Katewadi villagers through WiMAX. It is concluded that, agriculture production increased in the Katewadi since proper farm advocacy delivered through WiMAX Kisoks. WiMAX gives employment opportunities as well as helping to strengthen

the woman self-help groups and cooperative sectors in Katewadi, Baramati.

It is further concluded that, WiMAX save time, money of peasants and provide quick and reliable information related to agriculture and allied industries. WiMAX revolutionize to raise the ICT awareness among the students, youth, peasants, labour and villagers in Katewadi Experimental village. Finally it is concluded that, the ICT tool like WiMAX playing main role in rural development and it is confirmed with Katewadi Experimental village in Baramati.

10) WiMAX is proved as cost saving tool in the process of rural development. After implementation of WiMAX at experimental village, will help to save up to Rs.7000 to 10000 annually. Initially money spent to visit the sugar factory and Kirishi Vigyan Kendra for various purposes. However, it is concluded that, WiMAX not only helping to rural development but also it is cost saving tool.

 (2) Suggestions-

After examining the (WiMAX) the following key suggestions are made.

1) This study suggests that, before implementing any ICT projects such as WiMAX, the information needs of a particular community should be thoroughly assessed. Development practitioners and software developers might have in mind a very wide range of resources and applications that are of potential use to a community. However it is information that has a direct impact on the livelihood of the people that matters most, and any application should be developed only after, an accurate assessment of these local needs. Participatory rural appraisal, participant observation and other survey instruments have been used for several years, to ensure community ownership of development programmes. These tools could be used in the context of ICT initiatives.

2) Before to implementation of any ICT project participatory beneficiary involvement is necessary during the development software. Once the information needs of the community are assessed, content and software

applications should be developed with continuous involvement and feedback from the beneficiary community. In connection to National Informatics Centre (NIC) has developed a software which is easy to use and all information is provided in Marathi, the local language. Due to lack of local participation in content creation, as well as in software development, it explains why much of the information including that on sugarcane growing and agricultural prices lies unutilized and has not been updated since 1998. If an incremental approach were followed, by which content that respondents to the most pressing information needs of the community and software that is appropriate for the local conditions, are developed in collaboration with local staff, the Baramati Group of Co-operatives (BGC) would have probably been able to update and make good use of the information initially provided by NIC(Simone.C,2004;4) At the same time, to develop capacity of mangers/operators of information services to identify and supply the information needs of the users.

3) Planning and management of ICT project and is very crucial for sustainability of project. This should be achieved through bottom up approach. For the successful implementation of any ICT related project effective planning is essential while a top down approach will most probably lead to a waste of resources in the initial period of the project without ensuring its future sustainability.

4)   It is suggested that, special attention should provide to Women and Deprived sections during launching of any ICT project. It is believed that ICT may have created a new class of untouchables living in information poverty at one extreme and a new cadre of high technology entrepreneurs at the other. As far as WIMAX concern in the experimental village, it was observed that women generally visit to the Kiosk to obtain sugar factories services. Without finding means to get women involved in the use of ICT and in particular to ensure that women are trained to become information operators then there is a less chance that they will be further marginalized. With regards to poor in the Experimental village, the Kiosk was mostly accessed by members of the sugar co-operatives.

The poorest landless laborers currently do not have a reason to visit the Kiosk, because they do not need the services connected with the sugar cane growing and harvesting. Hence it is suggested that information on government schemes offering employment or on educational opportunities for children, and health tips and care would be of great importance to the poorest. Once such kind of information is made available, efforts should then be made to improve access by the poorest to the WiMAX Kiosk.

5) Empowerment of grass root ICT operators. Finding people with the right mix of skills and motivation is a necessary condition for any project to succeed in bringing ICT to rural communities. In the case of WIMAX, operators at the village information centers generally come from the grass roots, and have a great faith in the potential of ICT to improve the standard of living of their community especially of the rural youth. Many operators have the capability of teaching computer skills and software to children and youth. If they are given the necessary incentives these grassroots operators can become masters for ICT in their concerned villages easing access to information for peasants, providing training to children, and creating new economic opportunities through ICT.

6) Integrated and collaborative approach is essential for ICT project to become a successful model. Therefore it is suggested that, integration and collectivism of rural folk must be raised before starting the ICT project. The use of ICT in agriculture in general and rural development in particular remains restricted in India. The use of ICT should not be restricted to simply establishing information flow channels; rather we should find a way to integrate it with the various livelihood needs (natural, social, human, physical and financial) of the rural community. The narrow ICT coverage is found to be financially non-viable. Further no single agency can effectively deliver this critical input. Besides the public sector, the need for a pro-active participation by the private sector, NGOs and other civil society organizations is being increasingly felt. These organizations should realize their social responsibility, finally it is

suggested that for any ICT initiative to be successful and sustainable, in the long run collaborative efforts are indispensable.

7)   It is suggested that, creating suitable infrastructure is factor to success the ICT project. The WiMAX Kiosk is facing the many problems because of unsuitable infrastructure and power failure. Hence any ICT related projects requires basic infrastructural requirements and systems development (such as dongle, modems, battery, super fast internet connectivity, input-output devices and furniture etc.) together with availability and responsiveness of technical support and expertise.

8) It is suggested that, inter linking the "Old with New" Communication network generate more attraction of ICT projects. There is a urgent need for developing new mechanisms to link ICT's with traditional face to face interpersonal communication; building on existing systems to develop more decentralized information management and exchange. Developing new ways of building on existing agricultural and rural information systems rather than building new ones. Promoting the integration of internet, ICT and traditional communication networks within the new pluralistic perspectives to agriculture and rural extension (Sharma, R., 1997:102).

9) Learning from success stories have creates vision for implementation of new ICT projects. The ICT vision and action plan must be based on success stories. Replication of visible success stories from other places should be given top priority.   It will reduce uncertainty around planning of resources, and will add to goodwill with higher chances of success. New systems implementation that may fail can delay the process of computerization for years by hardening the cynicism prevalent amongst staff as well as policy makers.

10)   Participate the local institutes in the ICT projects. It was found that (Bajwa, S.B., 2002; Sood, D.D., 2001; Bhaskar, G. and VenkteshwarRao, 1999; Francis, C., 1995) when the ICT related projects

are at the pilot stage they work fine (including WIMAX). But when they are implemented fully the question of sustainability arises as there exists a gap between the training provided to workers at pilot stage. Therefore, the need arises for redevelopment or learning in the application of tools for effective implementation of such type of projects as well as there is need on part of government to develop an overall strategy for the participation of local institutions such as the Grampnachayat and YuvakMandals to take the ICT to the rural masses.

11) Involve Universities and academic Institutions in the ICT projects. State, Central Universities and Research Institutes must implement ICT based evaluation research project also conduct M. Phil. and Ph.D. research on this subject while students can be effective 'no cost trainers' National Service Scheme(NSS) students can play key role in this context.

12) Find appropriate place for launching the ICT project. For any ICT project the planners should seriously think about the appropriate place which is more convenient to the whole user community. Especially for the rural ICT projects the implementing agency must select the appropriate place for WiMAX Kisok may be at the heart of place of Village / Taluka or nearby Grampanchayat office or Market place. Hence Villagers can easily get the multiple information and also helps to save time and money. During field work in Experimental village majority of beneficiaries reported that the present place of Village Information Centre (VIC) is not convenient. Hence they suggested that to change this place to the nearby village Grampanchayat.

13) Analyse the Socio-Cultural Sensitivity of the class who will going to use the ICT project. Government and policy maker should observe technological and social changes taking place due to ICT and must exercise their moral authority by framing appropriate policies and rules.

14) Maintain Co-ordination between the beneficiary and operator through the formal and informal discussion may reduce the hurdles of ICT project. Several studies (Bhatnager and Schware 2000; Kaimowitz D, 1990; Kumar G.M., 2001; Adhiguru, P. and Murthyunjaya, 2004) show that

there are serious problems of co-ordination between various implementation agencies and government departments. Since National Informatics Centre (NIC) is a central government organization with a separate administrative channel, some time the goals of NIC do not match with the state governments goals. It was found that there is not much grass root level co-ordination among the officers from various agencies and also between agencies and user departments.   This leads to implementation problems in large projects. Lack of sharing among officers buries much of the knowledge generated in the process of implementation without finding any use. As regard WIMAX we found that lack of proper co-ordination between the NIC and Baramati Group of Co-operatives, WIMAX has faced various problems. Only at the initial stage NIC has given much attention regarding WIMAX, as reported by Senior official of Baramati Group of Cooperatives Hence it is suggested that there is an urgent need to co-ordinate and concentrate serious efforts of both agencies i.e. Baramati Group of Cooperatives and NIC and to rethink about the sustainability of WIMAX.

15) ICT project must start within given time, delay in the launching the project may lose attention and faith of beneficiary. The project development and implementation cycle needs to be reduced. The delays not only waste critical resources, but cause loss of faith in stakeholders. Hence it is suggested that government and implementing agency should take maximum efforts to complete such type of projects within limited time.

16) ICT project come with some innovative ideas to attract more beneficiaries. ICT projects can definitely play a key role in this endeavor if the local Grampanchayat/Panchayatsmities are encouraged and supported to set up ICT based Village Information Centers(VIC). In this connection in an inaugural session of the ACCOCHAM (Associated Chambers of Commerce and Industry of India) Summit on "India in a Knowledge millennium" former Prime Minister, Mr. Atal Bhihari Vajpayee declared that, "knowledge based society will enable us to leapfrog in finding new and innovative ways to meet the challenges of

building just and equitable social order and seek urgent solution"(Venkatsubramaniam, 2000).

17) More than 70% people in India using mobile phones and it is proved that it is very effective tool for information and creating awareness. In context to rural information needs very few organizations came forward to launch mobile based applications related agriculture and rural development but it has limited life. However, project like WiMAX Kiosk are proved to be very efficient at Baramati and it have wide scope for future. It is suggested that, WiMAX project at Baramati should develop and launch mobile based application where village folk. This application may used in local language and easy to use which gives information of weather forecast, market rates, new varieties, new government schemes, farm advocacy and so on.

CONCEPTUALIZATION OF PRESENT ICT COMMUNICATION MODEL

This subsection deals with two vital suggestions regarding the present communication models of WIMAX and agro rural development.

1) The Proposed conceptual framework for WIMAX/ rural ICT projects

"*Agriculture is the backbone of the Indian economy and the villages are the life lines of growth if India*." G. Bhaskar (2001)

India covers vast geography of nearly 32.9 million sq. km. with population of 1027 million (2001,Census) distributed in 28 states and seven centrally administered union territories covering 6,00,000 villages. Agriculture continues to be the occupation and way of life for more than half of Indian population even today. The peasants, the land less agricultural labourers hold the key for improving the overall Human Resource Development scenario in the country. Indian agriculture had been on traditional lines till the first waves of Green Revolution in late

60s. The Green Revolution gave a sudden boost to the production and productivity of major cereals in the assured irrigated areas of Punjab, Haryana, and Western U.P. in north, and Godavari, Cauvery deltas in the south. Quick dissemination of technological information from the Agriculture Research System to the peasants in the field and reporting of peasants feedback to the research system is one of the critical inputs in transfer of Agriculture Technology. The communication support during last 55 years has mainly been conventional.

The extension personnel of the Department of Agriculture disseminated the technology manually. This approach has not been able to reach majority of the peasants who are spread across the whole country. This gap between socially privileged and socially deprived remains a challenge for the Communication and Extension system even today. To reach over 110 million peasants, spread over 500 districts and over 6000 blocks is an uphill task. The diversity of agro ecological situations adds to these challenges further. The success of Green Revolution was mainly achieved due to homogeneous extension approach, for the assured irrigated area. Now as we move to address the need of rainfed eco-systems the communications and extension strategy becomes more complex. Peasants needs are much more diversified and the knowledge required to address them is beyond the capacity of the grass root level extension functionaries. Today it is possible to find a solution to this situation by using the potential of Information and Communication Technologies (ICT) to meet the location specific information needs of the peasants. The Information and Communication Networks are expanding very fast. The number of internet connections in India has crossed the two million mark and the number of telephone connections is over 22 million. The internet connectivity has touched almost all the districts in the country and is moving down to the block and village levels. Pilot projects to connect rural community to the cyberspace are underway at various locations. The initial response of the rural people, particularly women has been very encouraging. National Institute of Agriculture Extension and Management (MANAGE) has established internet connectivity in 28

districts of 7 states namely Andhra Pradesh, Bihar, Himachal Pradesh, Jharkhand, Maharashtra, Orissa and Punjab under National Agricultural Technological Projects(NATP).Over200 blocks have already been connected on internet under N.A.T. P. (Sharma, V. P., 2004:2)

Harnessing ICT for Agriculture and Rural development: Indian Cases

Besides WIMAX project there are around 20 successful cases of application of ICT that have made a difference in the delivery of services in rural India. ICT is emerging as an effective and efficient tool to support the agrarian base livelihood of the rural people as outlined below.

1) More subject matter coverage

Able to disseminate knowledge intensive information such as market intelligence weather forecast, post-harvest processing, etc.

2) Decision support

Can provide alternative solutions to a set of problematic situations/scenarios and therefore improve the quality of decision making.

3) Minimize time and distance barriers

Can virtually link the national and global knowledge systems.

4) Empower rural intermediary organizations

Enhance the capacity of local governments, local extension service centers, peasants unions/associations, NGO's, community radio stations, agro processors, agricultural input providers, rural credit organizations.ICT will provide an alternative path for agriculture and rural development. The tenth five year plan states that the use of ICT is an important pillar of agriculture and rural extension.

The government's supportive policy has contributed to the emergence of a pluralistic extension system in India with emphasis on application of ICT in agriculture also. Public sector institutions (e.g. Department of Agriculture Research Institutes, MANAGE, NIRD, State

Agricultural University. NGO, Co-operatives and various private farm related input marketing firms, are actively venturing into ICT based initiatives for providing information in the areas of agriculture technology, production, processing, marketing and other farm related aspects (Murthunjaya et al. 2005:2). These initiatives vary in purpose, type and nature of information, funding agencies, facilitation, methodologies and modes of implementation, some innovative projects involve setting up of information centers at the village level such as WiMAX that provide facilities of using computer with access to the internet and offer several other multipurpose services. Some other initiatives involve developing networks, connecting research and extension organizations for effective and need based information. At the same time several studies show that some of the rural ICT projects are facing lots of problems including WiMAX. The present model of WiMAX clearly indicates its weakness, presently WiMAX has been providing e-information mainly only about sugarcane. Also at this stage WIMAX has not fully able to provide internet and V-SAT facility due to financial problem. Hence the proposed conceptual framework suggests that rural ICT projects should collaborate with public- private partnership (such as E-choupal, M.S. Swaminathan Research Foundation).

Empowerment of deprived sections through ICTs

During field work it was also observed that, the backward caste and weaker section people are mostly deprived from the mainstream ICT revolution. Therefore the present conceptual model suggests that, Ministry of Agriculture, Rural Development and Social Empowerment, Human Resource Development and Information Technology, should jointly think and plan to start special Village Information Centers (VICs) exclusively for the empowerment of such communities. Now a days information is one of the important indicators of development. Once they will start to use this e-information, it will create dramatic socio-economic changes among these communities.

Employment through ICTs

At this juncture millions of jobs are available in the IT sector, if government should introduce short term computer training courses for young educated students from deprived sections through these Village Information Centres (VIC) it will increase self employment opportunities in the rural society in general and among the deprived section in particular.

Thus the present study suggests that the proposed conceptual framework will be beneficial for the sustainability of rural ICT projects, if the project implementers will follow this framework as a guiding model.

2) The proposed Communication Model for Agriculture and Rural Development

Given the central role of communication in development, it will be important for an agriculture and rural agency to have small communication support groups, if feasible directly under its own control to help the local extension agent or agro-rural information officer[6]. Such groups perform or arrange for the performance of four tasks.

1. The production of messages using appropriate media.
2. The transmission of that message to the locations where they are needed.
3. The necessary utilization support or co-ordination with the ultimate receivers of the information so that the development task is effectively carried out.
4. Bringing feedback and evaluation information from the recipients and intermediaries back to the attention of the extension agent or managers of the development activity so that not only the communication support activities but the development programmes itself can be modified to ensure that it effectively meets the development goals.

It might be more helpful to think of the ultimate goal of development support communication as providing the means for people to have, on demand access to the information they wish to utilize for developing themselves. This implies that the message produced are relevant and understood within the context and view points of the receivers, giving

them a choice of information content so that they can receive rural and agricultural information. Moreover Roger's six point communication component, can further supplement the communication strategy for agro-rural development.

Roger's six point communication strategy

1) Use the traditional media as creditable channels to reach the most disadvantaged audiences.

2) Identify the key communicators among the disadvantaged/deprived segment of the total audience, and concentrate development efforts on them.

3) Use change agent aides who are selected from the disadvantaged to work for development agencies.

4) Provide means for the disadvantaged audience to participate in the planning and execution of development activities and in the setting of development priorities.

5) Establish special development agencies that work only with disadvantaged audience. An example is the Small Farmers Development Agency (S.F.D.A) in India, founded in 1970 to provide agriculture information and credit to small scale farmers only.

6) Produce and disseminate communication messages that are redundant to the 'ups' because of their ceiling effect but which are of need and interest to the 'downs' (Rogers E.M. 1962: 271)

Role of Extension Agents

Especially at block and village level the real communication task starts from the extension agent, an integral part of most of the agro - rural extension services throughout the world, which is expected to implement agro-rural programme at grass root level. However, if an individual does not fit into a particular local as linker or extension agent, he could indeed become a negating factor in villagers adopting new ideas. On the other hand many people claimed that several agro-rural information officers, change agents pay special attention to the opinions and suggestions of the

rural elite and ignore the poor and deprived people. Hence, it is suggested that the extension agents should not confine himself only to the feedback from community leaders. He should give due consideration to the opinions of the people at the grass root level while making plan for agriculture and rural development. Henceforth for an ideal agro-rural development plan, interaction is required between the disadvantaged masses and the change agent. Lack of proper interpersonal communication between these two components, may cause the failure of the agro rural projects.

Tactics for Extension Agent

1. The extension agents must serve as a mediator between the different central organizations and beneficiaries. He has to collect information about the people and disseminate information (message) to the villagers so that they can receive understand and interpret it in accordance with the message. At the same time he has to initiate communication with key communicators in order to get their support. After getting feedback a ,b, & c from individual and the audience, he with his communication support teams should re-evaluate the communication strategy in order to provide his agency with the information needed for further activities.

2. For the effective feedback and communication between the extension agents and villagers it is necessary that the change agent must interact and involve with the villagers of all strata utilizing all his social and personal influence.

3. Sometime due to several (religious, beliefs, customs traditions) reasons extensions agents are not able to communicate and disseminate his ideas in the society. Hence it is suggested that he can form a group with prominent villagers to discuss new techniques. Once this groups of important members at the village have adopted new techniques this can help the adoption for the other villagers, even if the new practices are not fully in accordance with the existing social values (Uddin M., 1990:28)

Group of Small Media

In many ways, extension agents serve as an important bridge between the development agencies and the peasants. Thus, ways and means should be identified to equip these agents with the necessary skill and knowledge, especially in the task of information transfer. It is widely accepted that effectiveness in message dissemination is dependent on the technical knowledge and communication skills of the information source. By and large extension agents are equipped with the necessary technical know-how. However many of them lack the skill in communicating the information to the receivers (See Abdul Azizal 1983:286-291). The use of Audio Visual Aids (AVA) has been found to facilitate information transfer (See Musa, and Kamsha, 1990 Rahim 1986). In this proposed model focused on the small media utilization in the information dissemination process. Small media refer to such items like slide projectors, overhead projectors, videos, posters, photographs, flipcharts audio cassettes, slide tape series and the like. Information and Communication Technologies (ICTs) are also playing vital role in rural context. In other words, the term 'small media' as used for this model refers to both the hardware and software. Several studies show that small media are relatively durable and are easy to update the dynamic nature of knowledge and require constant updating of available information. Thus efforts should also be made to formulate an appropriate and situationally relevant media mix. Such information will facilitate media planners and development workers to develop a comprehensive and effective communication strategy especially for rural development programmes.

Traditional Media

Traditional media still survive and are used as meaningful channels of communication in traditional or developing societies. Their unobtrusive nature is, perhaps the reason why they have been ignored for most of the time by the mass media oriented communication experts and development planners (Costeng, 1988:151).

Fortunately, many development planners and decisions makers in the Third World now appreciate the value of using traditional media as an alternative communication channel. Hence due to the traditional nature of the India rural society, we have selected traditional media as one of the major network of information dissemination for the proposed model. Thus now the time is to rethink and realize the positives and productive use of this ignored medium of communication.
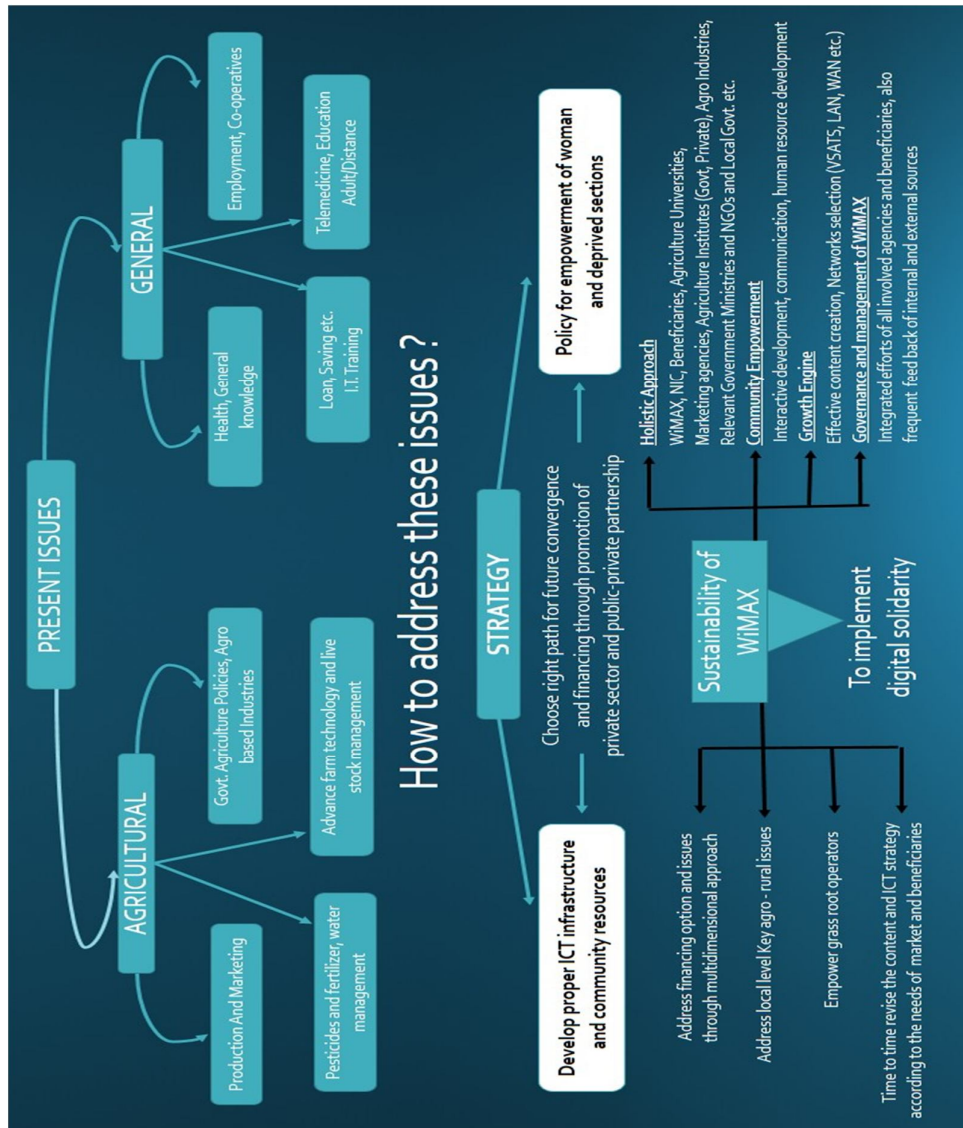
Figure No.1 : Conceptual model of WiMAX project for Rural Development

SCOPE OF FUTURE STUDY

1) Already it is found that, ICT like WiMAX governing the rural development in the Katewadi Village. However, other such ICT projects for rural development in run by the MS Swaminath Foundation in the villages of South India and e-choupal, WiMAX project run by the Andhra Pradesh state government, WiMAX enabled internet service provided by the Vigyan Ashanram near Pabal in Pune district of Maharashtra have further scope to analyse the role and sustainability in rural development of these ICT based projects. Therefore this study's out come with the benchmark helped to find the advantages of WiMAX in rural development.

2) ICT project like WiMAX have very big scope to implement in the e-Governance acticities. Therefore it is interesting to take study on various application of WiMAX in e-governance.

3) Many European nations starts mobile WiMAX project in the rural areas. This study has relevant to check the impact and hurdles in the operation and management of governing mobile WiMAX project.

4) Rural American peasants use WiMAX networked systems to monitor crops and animals or even operate certain equipment from a distance, saving peasants time and inconvenience. It also can take to monitor land in person or control all devices manually (Codr, Rajan;2008). It is note that, still scientific study of such projects is not done so far. Therefore, it is need to undertake to study of technical profile, management, applications and hurdles of such WiMAX project operated in the rural America.

5) Infrastructure up gradation is necessary in the old ICT projects. Therefore for it is need to undertake future study on limitation and infrastructure reformation of old ICT projects.

CHAPTER – I
INTRODUCTION AND REVIEW OF LITERATURE

1.1 Introduction

Application of ICT communication for development is not a new concept but the modern ICT technology like WiMAX is very powerful tool to consider using in the rural development. This chapter also covers the review of literature and development of genesis of ICT projects and its applications in rural development.

Communication is a fundamental pre-requisite of all living beings. The development of human civilization is directly dependent upon refinement and growth of forms, mechanisms and quality of the contents of communication. Sociologically it is possible to construct both processes and structures of culture and society through communicational contents and networks (Sharma, S. C., 1987:5).

A characteristic feature of the Third World countries is that they are predominantly rural in character and their economy is agrarian and subsistence-oriented. The transformation of these countries by structural changed in the total society has been the major emphasis in all models of development. Communication is now one of the central issues in Third World countries like India where 72.22% (2001 census) people live in villages.

Communication networks have been considered as potential agencies for the development of people primarily because their reach is very wide. Further, television and radio have the power to overcome the literacy barrier and hence their interaction with the illiterates may be higher. Consequently Information and Communication Technologies (ICTs) are suitable instruments for the rapid development of underdeveloped and developing countries like India.

Michiels and Van Crowder (2001) have defined ICTs "as a range of electronic technologies which when converged in new configurations are flexible, adaptable, enabling and capable of transforming organisations and redefining social relations." The range of technologies is increasing all the time and "there is a convergence between the new technologies and conventional media."

In recent times, ICT is playing a role of catalyst in rural development. It is used in every aspect of information, management and governance of development. Therefore to taking this notation in the mind present study raising some fundamental questions on the application of WiMAX for rural development with the help of case study.

From the past studies it is proved that, Information and Communication Technology (ICT) has earned its reputation to be the key to information-flow for intensifying the development efforts in rural India and is being considered as an imperative strategy for achieving the goal of sustainable rural development (Ghosh Abhijeet, 2011). Application of ICT has the potential to improve living standards of people in remote and rural areas by providing important commercial, social and educational benefits. By expanding the use of government services – ICT strengthens the livelihood opportunities for rural India (Anup Hazara, 2012)

With the background of rural development WiMAX pilot project at Baramati poaching to conduct the study. The key questions in this study attempts to answers: how organization and management of WiMAX project for rural development? What is the role of WiMAX in the rural development? What is the application of WiMAX project at Baramati? In spite of the fact that much research has been undertaken on communication in Western countries, the peculiar problems of various communication networks operating in the transitional societies, such as India are yet to be located and analysed. Turning to the Indian context one comes across very few studies which seek to explore the impact of communication networks

on various field of interest. The present study is only limited up to analyse the role of ICT i.e. WiMAX in the rural development at Baramati in general and in the experimental village (Katewadi) in particular. For analysing the rural development through ICT following indicators are selected for measurement. These are a) human resource generation, b) crop production, c) livelihood, d) mobility, e) income and saving and f) agriculture allied activities.

1.2 Review of Literature

The review of literature is categorized into five following sub-headings:

A) Communication Media and Rural Development
B) Electronic and Print Media and Rural Development
C) Interpersonal /Traditional Media and Rural Development
D) Information and Communication Technology (ICT) and Rural Development
E) Hurdles in Development Communication and Rural Development

A) Communication Media and Rural Development

Present study is mainly focuses on the role of communication networks in the process of development with special reference to rural society. Agriculture is the mainstay of a rural economy. Hence agricultural development is inevitable for rural development. Researchers on rural development do not disagree on this principle.

1) The classical economists also felt that the proper path of growth for a country to pursue is to develop its agriculture first, manufacturing industries second and commerce last (Adam Smith Quoted in Bhatia, 1927: 23).

2) Schramm also is of the opinion that in economic and social development, change often begins with agriculture (Schramm, 1964). In a developing country like India must have an effective communication for development.

3) Emphasizing the role of communication in development, Dube remarked that a well drawn project is sure to fail unless it is supported by an imaginative communication programme (Dube, 1967).

4) On the other hand Rao Y.V.L. (1966) came up with the theory that, *"Communication helps people to find new norms and achieve a balance during a period of rapid change."* He hypothesized that communication plays a significant role in national development and that the relationship between communication and development is a constant and cumulative one.

5) Schramm (1964) states that communication and economy are the means of development that creates the condition for the emergence of an active national system. McQuail also supports the opinion of Schramm that Communication contributes to several of what W.W. Rostow terms as preconditions for take off.

6) Schramm (1977) is of the opinion that only when media channels can mix with interpersonal channels and with organization in the village the expected development will occur. The University of Leicester has undertaken keen interest in the communicational studies of the Indian rural society with particular reference to mass media.

7) Hartmann Paul (1983), and others made an in-depth study on the socio-economic consequences of mass media as one of the potential factors of communication of innovation in the rural society. These scholars emphasized the importance of social, structural and mass communication.

8) One of the classic study of Hartmann Paul, Patil B. R. and Dighe Anita (1989), too confirms that media exposure emerged as a significant factor influencing better agricultural and health practices. Positive attitudes towards woman and an important source of political and other news. In their study 'Mass Media and Village Life An Indian Study.' It assesses the actual and potential contribution of mass communication media to the process of development in the third world in general and India in particular.

9) Kuppuswamy (1976), in his study 'Communication and Social

Development in India' opines that through mass media information can flow to the people. This is why the U. N. Commission on Human Rights looks upon information as one of the basic human rights. It should help the village people to discuss their problems with their fellow villagers.

10) Furthermore Rogers and Shoemaker (1971), argue that *"nothing is more important for India's development today than the transfer of ideas from one person to person. It is essential to discover effective channels of communication in rural India. A combination of media is the most effective way of reaching people with new ideas."*

11) Mass media are valuable means to convey information to the broad means of rural farmers for its effective adoption, says Chavan N. B. (2004), in his study 'Mass Media and the Physiology of the Farmers.' He also found that radio and newspaper might have also done something excellent to change the attitude of the farmers towards modern methods of farming by comparing results of modern technology with traditional one through giving chance to the successful farmers to tell their experience on radio and newspaper.

12) Similarly Sharma S. C. (1987), study on 'Media Communication and Development', admirably brings out the role of communication and media in development. It shows how media can be effectively used for increasing literacy and socio-economic status in rural and urban sectors.

13)In the light of Sharma's findings Kamsah H. M. and Hassan M. A. (1990), in their study 'Utilization of small media in development works', also emphasized that small media is very useful for developing rural sector. Small media refer to such items as slide projectors, overhead projector, videos, posters, photographs, audio-cassettes etc. Small media production can make use of locally available technologies that are indigenous to both the source and the receiver. In advancely, knowledge transfer becomes more meaningful to the interacting parties.

14) In this connection Dubey V. K. and Pandey K. N. (2004), in their study 'Communication Strategy for Rural Development', found that the desired behavioral change in rural society can be achieved by multimedia (e.g. Print, Electronic, Traditional etc.) strategy for communicating and re-enforcing the new and appropriate local practices. Before developing and using a communication strategy the information need of the community needs to be identified.

15) Likewise Yadava J. S. (1986), 'Mass Media and Social Change in India', has pinpointed that despite limitations, mass media play a very significant role in rural India. However, he feels *"the mass media are not as effective as they should be as a catalyst in ushering development and change in rural areas"* and stresses the need for rural character of the mass media both in approach and content. This in turn, would help create and develop a sense of involvement, participation and cooperation among the people.

16) Ambekar J. B. (1994), on the other hand presented an indigenous or integrated perspective on communication and rural development like economics, social, cultural and ecological components. He has studied Pothnal village in Manvi taluka of Raichur District, Karnataka in 1975-76 and again in 1988. The researcher concluded that an integrated approach to rural development could be adopted through appropriate technology, which is different for different socio-economic groups. For this purpose there must be close interaction and exchange of ideas and knowledge between agricultural scientists, extension officials, social scientists and the people.

17) In this context Mathur R. (1989), focused that though very few, yet there are instances of co-ordinated and integrated communication strategy employed to achieve desired goals. The MASAGANA-99 project in the Philippines provides perhaps one of the best examples in this direction. Its success mainly to the integrated communication approach. All media organizations such as radio, TV, news paper, film and government and

private organizations including banks had joined hands to achieve a phenomenal increase in rice production.

18) Mathur (1999) also found that, need based and participatory approach should be adopted by media personnel and organization for programme production or message designing. Print media should use simple words and local terminology in publishing materials or information for rural farmers and farm families. Both electronic and print media should use participatory message designing for development communication.

19) Subramanyam V. (2003) studied 'Development and Communication in Visakha Agency of Andhra Pradesh.' He also supports that this problem can be solved only through creating proper motivation and participation with effective communication channels. The results obtained on communication and participatory approach concurred with the findings of (Nair: 1995, Vekaria and Pandya: 1995, Singh and Mishra: 2004).

20) Subbarayan (1994), in his study, 'Mass Media, Social Change and Social Responsibility,' describes the relation between mass media and social change. He suggests some guidelines that the Indian mass media need to play in bringing about social change. 1) Media should not only provide information but also motivate people in participating in development oriented efforts. 2) Media should play its part in communicating messages on family planning, adult education, primary health care and rural development programmes. On the basis of above literature review it can be found that communication networks play an important role in rura development but there is a need of participatory and integrated approach.

B) Electronic and Print Media and Rural Development

1) Prabhakar N. (1998), found that electronic media e.g. radio and T.V. (Television) technology offer great potential for the communication of anything man can hear or see more quickly and cheaply to a large audience

at one time. Similarly, the print media can perform as a basic communication tool for the total population.

2) Sharma (1994), in his study 'Role of Media in Science and Technology', revealed that electronic media is a very powerful and popular medium particularly a colour T.V. which attracts the attention of the illiterate, its visual impact makes it much effective. Radio is another powerful medium to educate and influence the rural masses. The documentary films are an effective communication to the public for better awareness about nutrition, agriculture, pollution control etc. Similarly video film can be played with the help of a house owner of a village by utilizing his T.V. set so that communicators could reach door step of the people.

3) Likewise Sharma S. C. (1987), in his study, 'Media Communication and Development', argues that rural broadcasting has demonstrated the linkage between the radio and the social change. Since the vast majority of the people are illiterate, the only mass media that could reach them are the radio and the T.V. Rural Programmes generally consists of talks; dialogues and discussions on agriculture, rural health and other problems. Film music is one of the features of the programme.

4) As a communicator in rural areas one has essentially to depend on intra-personal and other conventional means of communications, viz. field-publicity, exhibitions, demonstration and extension education programmes. T.V. and AIR can play a useful role of working as catalyst, as concluded by Kumar A. (1995) in his study 'Rural Communication the Challenge.'

5) Kumar Ashok (1999)'s study 'Social Dimensions of Communication and Rural Development', admirably brings out the role of communication in social change in rural India. As a comparative study of two villages, in central Karnataka. He found that Lingayats (upper caste) and Madigas (scheduled cast) dominate the 'developing' and the 'backward' village respectively. Higher the caste status, better the accessibility to developmental programmers and communication networks.

6) Agrawal Binod and Malek M. R. (1986), 'Television in Kheda: A social Evaluation of SITE'. This study provides an in-depth analysis of the effects of television on *Kheda* rural viewers. It was observed that TV programmes on agriculture, animal husbandry and poultry raised viewer's level of awareness, created a desire to try new things and raised consciousness about the availability of infrastructure which they could use.

7) Likewise Johnson Kirk (2000), 'Television and social change in Rural India,' has set about the important task of finding out what impact this type of media has had in the villages of India. He selected the village of Danwli in Maharashtra. Johnson found that the relationship between media and culture is both all-pervasive and symbiotic and that television is arguably the most powerful agents of change than other media. Farm telecast has emerged as one of the potential sources of agricultural communication in our country.

8)Television has tremendous ability in creating and maintaining interest of the audience, Rathakrishanan T., Chandrakant K., Ravichandran V. (1996) in there study on, 'Impact of farm Telecast programmers on viewers', the study was conducted in four villages of Modakurichi block in Periyar district of Tamilnadu. They found that nearly 80.00 % of the viewers indicated that they liked farm telecast programmes. Viewers desired to be informed well in advance about the content of the telecast. Similarly Chaudhary A. G. (2001), 'Interactive Television in India opportunities and challenges', noticed that Indian traditional T.V. receivers are being transformed in to interactive television. Because digital interactive television services represent tremendous opportunities for economic, social, educational, agricultural, industrial and cultural development in India e.g. peasant and local businessmen can avoid exploitation by the middle man because they directly interacting with the concerned parties with the help of interactive T.V. and it is also greatly enhance distance education in rural India.

9) Regarding Anju's view Ishadi S. K. (1989), in his study, 'Towards the Information Revolution Era: Using satellites in Indonesia', too stated that television broadcasts using the palapa satellite have increased the public's national awareness considerably and improved the rural community's ability to speak the national language. It has also proven to be an effective agent of innovation in the sectors of agriculture, education, family planning and public health. The use of satellite for television broadcasting has also succeeded in narrowing the gap between Urban and Rural of Indonesia.

10) Henceforth Chauhan K. (1998), in his study, 'Impact of T.V. on social Transformation', revealed that the majority of the respondents have benefited by all three TV programmes of rural development such as family welfare (84.0 %) Krishi Darshan (74.4 %) and health hygiene (67.6 %) respectively. This means that T.V. is producing positive effect on the rural development programmes.

11) However Kumar N.K. (1995) observed that video can be effectively used in the present era of rural development efforts. In his study, 'Video Technology and Rural Development; specific programs for the identified target group can be shown to motivate and arouse the beneficiaries. Video has been used to develop agricultural production skills of farmers and extension agents. Video project initiated by National Dairy Research Institute (Karnal) is yet, another land mark in the use of video for the cause of dairy development.

12) The similar findings were recorded by (Uddin: 1990, Joshi: 2001 Bhardwaj: 1995). In this context radio also playing vital role in rural development.

13) Schram Willber and Lerner Daniel (1967), emphasized that radio may be the first communication technology to achieve 100 % coverage in developing countries. Radio has much technical advantage when compared to print media and television. It can be programmed in local languages, it does not require literacy to understand, it is highly portable (e.g. farmers

can take small transistor radios in to their fields) and for a wide variety of subject matters, has been demonstrated to be effective a teaching medium as television and at a much lower cost.

14) Likewise Mathur and Neurath (1959), in there study, 'An Indian experiment in farm radio forum', discuss about special programmes for rural listeners [in case of radio] have been introduced in some of the Asian countries. "as an education for action to improve the economic and social condition of rural people" is a unique example.

15) Patil Jagannath, (2004), in his study 'Media and Tribal Development', found that however during National calamities, elections, and sports commentaries are most favorable occasion when large present people listen radio. He also found that entertainment was the largest function of the radio which is fructuous point of media production and development communication policy. He suggests several ways to improve the performance of radio broadcasting and the role of NGOs especially in the rural and tribal belt.

15) Like wise Pavarala Vinod (2003), 'Building Solidarities: A case of community Radio in Jhrakhand', this study is based on an evaluation of '*Chala Ho Gaon Mein*', the community radio project in palamu district of Jharkhand focusing on the tangible and intangible benefits of the programme for the community. In palamu most of the villages contact with the outside world through radio. He notes that the programmes popularity is to a large extent because of its focus on locally relevant issues e.g. dowry, allcohlism, superstition, beribery etc. and local language e.g. Bhojpuri, Magadhi. Pavarala concludes that '*Chala ho Gano Mein*' is indeed a unique experiment in using media technologis, especially radio for development and empowerment of marginalized rural communities.

16) Similarly Pavarala Vinod (2003), in his study focused that community radio is a resent idea in India. In February 2003, the small village of Orvakal in Kurnool district of Andra Pradesh, where UNDP had launched

an innvoate experiment in community media called '*Mana Radio*' (Our Radio) run under the aegies of the (Society for Elimination of Rural poverty), this project used a tiny transmitter that covered a radius of half a kilometer to enable rural women members of self-help groups to communicate with each other and with other residents of the village. It is a unique example of using community radio for empowerment of rural people. In this context many researchers clearly emphasized that, electronic media playing key role in rural development. However print media also playing effective role in rural development.

17) Furthermore Nataraju M.S. and Perumal (1995), reported that the use of print media as compared to other media is more advantageous in rural and agricultural field because realistic and scientific information in simple language on a specific topic and generally illustrated with pictures can reach a large number of learners quickly and simultaneously. They focused that recognizing the importance of farm publications inrural development, Government is spending lot of money on printing extension literature and publication of farm journals.

18) Nijalingappa (1983), who found that majority of the rural farm magazine readers satisfied with thickness, attractiveness and appropriateness of cover pages.

19) Like wise, Balasubramaniam (1983), revealed that farm and newspaper articles were short, practical useful and conveyed latest technology and it is very useful for creating awareness in rural society.

20) Readership of a farm magazine in rural society is greatly influenced by the perception of readers about the magazine as observed by (Levy and Windahi, 1984). However Mathew (1998), described in detail the manner in which '*Malayala Manorama* ' serves the cause of the rural people and provides sufficient feed-back to the government authorities. In addition, a different cadre of newspaperman is needed who can gauge the rural problems, as well as the values and aspirations of the rural people and talk

and write in the language known best to his audiences. This will break many barriers and increase the effectiveness of newspapers in rural area immeasurably. Thus the above literature shows that, still print media have some limitations in the process of rural development; therefore some efforts should be made to improve the present status. In this context electronic media also rethink about their policy and programmes in context of Indian rural society.

C) Interpersonal /Traditional Media and Rural Development

1) Kumar K. (1998) emphasized that mass media are most effective in creating awareness and interest and interpersonal sources playing the same role in convincing the rural people for acceptance and adoption of various innovations.

2) Furthermore Pandey R.K, Kumar B. (1999), in their study, 'Interpersonal sources of farmers Top the List', clearly indicate that there are a number of sources existing in the rural areas but the poor farmers are able to use only interpersonal sources which are locality in nature like friends, relatives, fellow farmers and shopkeepers.

3) This has been indicated by many studies in the past (Thakur : 1986, Rajput : 1993, Singh : 1982) in a significant study comparing use of communication sources in U.P. also found that overall mean score for interpersonal channels of communication was greater than that of mass media channels of communication.

4) Nita and Khandekar Prakash (1995), in their study 'Media source preference in F.P. among farm women', it was reveled that the interpersonal channels both locality and cosmopolite were utilized the most and were preferred over mass media by the farm women as they regarded them as the most credible sources of communication. The results of this study are in agreement with the earlier studies by (Sandhu: 1966, Agrawal and Singh: 1983) who also reported similar finding in the rural situations.

5) On the other hand Pandey P.G. (2000), in his study, 'Traditional Media and Development', describes the role of traditional media in rural development. The mass media continues to be limited largely to the urban areas because high rate of illiteracy and poverty in rural India. The researcher examines that the mass media proved to be glamorous, impersonal and unbelievable in comparison with the familiar performance of traditional artist whom the villagers could not only see and hear even touch emotionally. He notes that India is the biggest user of traditional media in its development programmers. He suggested that the traditional media can be used to reach these people in process of change and development of the country.

6) Likewise Khanna Harish (1974), 'The interaction between folk media and mass media', he remarks that traditional media provide immediate and instantaneous feedback. Furthermore, mass media public is weary of faceless broadcasting and man produced films and television input which largely draws its strength from the element of sensational fantasy. Folk arts have continued to play meaningful role in rural areas, in educating the rural people about the consequences of social evils like alcoholism, illiteracy, untouchbility, and dowry and so on.

7) Even today in the midst of hi-teach media scenario the traditional performing arts continue to be popular as reported by (Murthy, 1994).

8) Besides for a developing country like ours, folk media can reach the rural masses were other mass media can not, e.g. to areas that have no electricity, were equipment cannot be brought inexpensively and where most of the population is illiterate (Phad : 2000).

9) Rogers and Venning (1969), they also remark that in less developed countries where little or no mass media are available, other channel like folk, personal trip to cities, conversation with change agents etc, may provide information to opinion leaders. Cardozo Nicky (1994), 'Communication and Rural Development', argues that many rural

development efforts have failed due to absence of communication between all those involved in the development programmes. He concludes that the role of folk media in the present context of rural development cannot be ignored.

10) Similarly Nawal (1998), emphasized that in designing a communication system for sharing of indigenous technology, we should rely heavily on the traditional media channels particularly in rural areas, because, despite modernization and industrialization, the rural people continue to rely on human and oral communication.

11) Henceforth Parmar, (1975), believes on the fact that use of traditional media involves an act communication by employing vocal, verbal, musical and visual act forms transmitted within a society from one generation to another. In his study 'Traditional Folk Media in India; these media include theater plays, songs, puppet shows, story telling and other forms of entertainments.

12) Traditional media have a remarkable impact on the rural society because of there acceptable idioms, functional significance and entertainment component as observed by (Intoda and Uppadhya, 1991).

13) The same observations are found by (Intoda and Uppadhya: 1999, Chapke and Sontakke: 2004, Usha N.: 1995). *Today more than ever before, there is a need for striking a balance between the folk media and modern mass media to obtain the goal of growth and development*. It is not a marriage of convenience but a marriage of two realities –one inseparable from the other in the context of communication and development in rural Asia, Sharama S. (1999).

D) Information and Communication Technology (ICT) and Rural Development

Information and Communication Technologies (ICTs) has emerged as an effective tool for rural development in many developing countries like

India. In India after 1999s several rural ICT based projects are implemented for the empowerment of rural sector especially in the area of agriculture, health, cooperatives, panchayat raj etc. Now the time is to study the role of ICTs in rural development process. In this context after reviewing the literature on this subject it can be found that very few studies have been conducted especially in India.

1) Mruthunjaya and Adhigaru (2006), in their study, 'ICT for livelihood security: A Reality Check', they have studied some innovative rural ICT based initiatives in India. For e.g. E-Choupal, I-Kisan, Helpline. The study regarding I-Kisan portal of Nagarjuna group, Andhra Pradesh and Help-line (Kanpur) initiative, found that both I-Kisan and Help-line initiatives improved the access to information for farmers and they could use improved varieties adopt innovative pest and nutrient management practices at critical stages of crop growth and reduce frequency of application of agro-chemicals. As a result, there was reduction in cost of cultivation by 14 per cent and three percent in the case of I-Kisan and Help-line initiatives respectively.

2) A study conducted by UNESCO (2001), the users in the three knowledge centres of M. S. Swaminathan Research Foundation, Pondicherry have saved a travel distance of around 100,000 Kms and 4000 hours amounting to imputed value of Rs. 16,000. Time is a valuable commodity for the landless labourers and women in the rural areas (particularly during working seasons) and therefore time saved means money-earned. This timely availability of Information saved both time and money (Rs. 80, subsidy for 40 Kg seeds). Thus, it should be noted that the asset-less, ultra-poor families are among the major users of the village knowledge centre. Access to and control of information by poor women is a step towards empowerment.

3) The study results Adhigaru *et al.* (2003), found that certain unique features of the initiatives have contributed to their success and

sustainability. For instance, the *e-choupal* initiative has drawn strength by involving existing rural institution, 'the e-houpal' redefining the role of traditional intermediaries for facilitation and information gathering so as to help both the farmers and ITC. The study revealed that, the e-choupal is supply driven, by supplementing the information service with correct weighing of the produce and immediate payment of dues at the ITC collection unit; it is encouraging higher participation of farmers.

4) In India, the utilization of ICT in agriculture and rural development is in the takeoff stage and obviously it is facing many field problems according to the study on, 'Information and Communication Technology (ICT) and Rural Development A Study of Some Prominent Initiatives', among the various constraints reported by the beneficiaries in different initiatives subject matter, inadequacy and lack of content in local language were found to be prominent constraints as reported by Abbasi A (2005).

5) In one another study especially conducted to understand the constraints involved in the rural ICT based projects, Ballabh M. (2005), he has studied three major ICT based projects i.e. *Gyandoot*, Computer on Wheels and E-Choupal. He concluded that, about half of the respondents expressed irregular internet connectivity as one of the major constraints, except in the case of initiatives like e-choupal and Computer on Wheels (COW). These two initiatives use solar cell and battery back up for the regular power supply and the e-choupal has VSAT connectivity whereas COW had GPRS.

6) This study mainly conducted to suggest suggestions for the effective implementation of rural ICT projects in India, Singh J. (2003), 'A Study of Strategies for Effective Utilization of ICT Projects in Rural India', suggested following strategies, 1) Content development, 2) Bridging the divide : strategic development of ICT to address socio-economic dividers (age, gender, land holding, geography) is essential, 3) Socio-cultural sensitivity : Government and societies should observe technological and

social changes taking place due to ICT and must exercise their moral authority by farming appropriate policies and rules.

7) Bhaskar, G. and Rao Venkateshwar (2001), 'The ICT Community: Warana Wired Village Project', a study was based on one of the vital rural ICT project in Western Maharashtra i.e. 'Warana Wired Village Project' District Kolhapur, (W.W.V.P) sponsored by National Institute of Agriculture Extension Management (MANAGE) Hyderabad. The study team concluded that the W.W.V.P. providing all necessary information on sugarcane cultivation technology, marketing, soil testing, fertilizers and one important service i.e. regarding loans and insurance for rural farmers in 70 connected villages in local language. One interesting finding is that W.W.V.P. is not only beneficial for big farmers but also for marginal and small farmers. The study suggested that there is a need to give some other information because W.W.V.P. is mainly providing information about sugarcane, so the farmers are eager to access other information e.g. legal documents, birth certificates, farm related information etc.

7) Likewise Vijayadita. N (2000), has also studied on, 'A Wired Village : The Warana Experiment', this study was conducted by National Informatics Centre (NIC) New Delhi, the study revealed that in Warana there is a vast opportunity for human resource development, especially in ICT context. Because W.W.V.P. covered 70 villages it requires operators for handling the information centres it means this project is helpful in generating employment opportunities for the local population.

8) 'Information and Communication Technology in the Globalization Era: The Socio-Economic Concernes', Dhameja A. and Medury V. (2006), the study examine the impact of ICT efforts on the rural society; they have selected seven rural ICT based projects such as Warana Wired Village project (Maharashtra), *Gyandoot* Programme (Madhya Pradesh), Gramset Pilot Project (Orissa), FRIENDS Project (Kerala), TWINS and APSWAN (Andhra Pradesh), Raj Nidhi information KIOSKS (Rajasthan). They

emphasized that each success story shows that ICT provides ample opportunities for a consistent and continues control by the people and other stakeholders over the governance processes and output. The study also found that information technologies do not necessarily support beneficial change, it precipitate disparities between the haves and have-nots, the governors and the governed.

9) Agrawal (2006), in his study, 'Information and Communication Technology (ICT) in Development: Case Studies from Rural India' concluded that ICT projects have many poignant questions one of the sociologically important question is, has it helped the poor to get rid of their debt rap? Is the change process through e-governance uneven or is it creating inequalities? Also in many cases, the specific e-processes initiated are not as per the people's expectations. These are largely executed at the government's convenience.

10) Cecchini C. (2002), 'Warana: The Case of an Indian Rural Community Adopting ICT', was the study conducted by World Bank and IIM, Ahmedabad jointly. He observed that, In Warana, the information Kiosks are mainly accessed by members of the cooperatives. But the poorest, landless labourers and tribal groups currently do not have a reason to visit the information Kiosks because they do not need the services connected with sugar cane growing and harvesting. Once such kind of information is made available, efforts should be then be made to improve access by the poorest to the Kiosks. In conclusion they emphasized that; 'Warana Wired Village Project' has empowered the Warana Community. Warana Community will be able to use ICT to further streamline other services offered by the cooperative and to give its people wider access to knowledge and information through the Internet.

11) Singh K. (2006), in his study, 'A Comparative Study of ICT Projects in Andhra Pradesh and Madhya Pradesh State', revealed very significant suggestions for the effective utilization of ICT projects especially in rural

sector. The suggestions are that, now ICT initiatives must focus on the socially deprived and economically disadvantaged sections that have not received adequate attention so far. The governments should recognize ICT as an instrument of poverty reduction. The private sector should also realize its social responsibility and target the rural poor.

E) Hurdles in Development Communication & Rural Development

1) Singh (2002) found that, in India the mass media have to be rural oriented for 72.22% of the population lives in rural areas. Despite the enormous expansion of communication facilities over the years, the reach of mass media is limited, especially in the rural areas and amongst the weaker sections of the society. This is mainly due to five mutually reinforcing factors, a) Low literacy rate b) Language barriers c) Low purchasing power d) Poor means of transportation for timely delivery of newspapers or maintenance of radio or T.V. sets. 5. Lack of relevant information if communication is the aim of media policy.

2) Likewise Singh Ranjit (1993), in his study, 'Communication Technology for Rural Development', found that many rural development projects proved to be unsuccessful due to the absence of appropriate communication strategy. Most of the projects are usually planned by technical specialists who are not trained in social communication. One reason for this failure is that communication messages used in this process is not receiver oriented.

3)The study by Ranganath H. K. (1981), 'Communication and Traditional Media,' emphasizes on the fact that message, medium, and masses are the three major factors in the context of communication. Failure of effective communication in India has been traced to be ineffective use of the message, improper handling of the medium (mass / electronic / folk) and inadequate understanding of the want and needs of the masses. All the three M's need to be studied and treated with painstaking care in order to make

communication draw the desired results in terms of practical achievement. 4) Furthermore B. Neelam, (1995), emphasized on the fact that in India new communication technologies have urban bias, and when used for rural people, is advantageous to only a section of the population of rich farmers. 5) As past studies (Khan, 1999; Sharma, 1993; Patel, 2000; Khanna J., 1974) showed that most of the benefits derived from technological advancement are grabbed by rich farmers there by widening the gap between rich and poor. Communicators in rural areas are best with another type of chains between promise and performance. It has been found from a number of studies that enough information is already available in rural areas, but people do not have adequate means to translate those ideas in to actions. There are scores of instances where extension workers and mass media such as radio and television have passed on needed information to the farmers with respect to adoption of various agricultural innovations as concluded by Gelia C. (1993).

6) Kumar A. (1995), in their studies. They focused that proper planning and execution of various schemes on one side and an equal amount of awareness, will and capacity to participate in this process on the part of the villagers were important for rural development. Thus the role of a mass communicator as a bridge between the policy makers and beneficiaries assumes a great significance.

7)Bhat Vighnesh, N. (1994), in his study 'Mass Media in Rural Development : The Indian Scenario', revealed that, the best mix for effective communication for the mass media in our present context appears to be to join hands with other media of communication of issues of national and regional importance.

8)Regarding Bhat's view, Coseteng V. (1988), in his study 'Using Folk Media in Development Programmes', argued that traditional media still survive and are used as meaningful channels of communication in traditional or developing societies. Their unobtrusive nature is, perhaps, the

reason why they have been ignored for most of the time by the mass media oriented communication experts and development planners.

9)Pavarala Vinod (2003), in his study, 'Breaking Free Battle over the airwaves', points out the barriers in development communication in rural development with reference to 'Community Radio' in India. Focused Broadcasting in our country continues to be governed by archaic laws and uncompromising bureaucracy. Several NGOs in the country have now developed an active interest to start community radio stations in rural and weaker sections and some in the absence of an independent license.

10) Tripathi R. C. and Nair P. (2003), in their study 'Internet : A Tool for Rural Development in Developing Countries' have dealt with rural development in developing countries through Internet. They state that in some countries it is possible to have farmers and rural residents as direct internet users (e.g. Chile, Mexico). But other countries face the challenge such as linking community information centers to internet (e.g. India, Zambia, and Zimbabwe). The study indicates a few barriers in using internet for rural development in developing countrie i.e. illiteracy, language, intercultural differences and physical isolation.

11) Nataraju M. S. 1996), in his study 'Analysis of farm Radio Programmes for Rural Women', focused on the farm radio programmes of All India Radio Bangalore. He selected '*Gramalaxmi*' a special programme for rural women and found that out of 44 topics agriculture enjoyed the largest share (15.91%) and horticulture (13.63%). Only one topic was broadcast on dairying. The researcher recommends listnership survey in order to know the needs, interests, and preferences of rural masses.

12) Likewise Raghupati D. (1998), in his study 'Media Preference and its Impact' found that most of the T.V. and Radio respondents expressed that the level of farm knowledge, adoption and yield level remained same and was uninfluenced by the media. The researcher suggests introduction of farm quiz competitions and incentives to the winners; regular interview

programmes of progressive farmers, frequent farm and community visits by media personnel for the full plantation farmers.

Summary

The first chapter deals with the basics of communication and its role in the social development in general and rural folk in perticular. Communication is a fundamental pre-requisite of all living beings. The development of human civilization is directly dependent upon refinement and growth of forms, mechanisms and quality of the contents of communication. A characteristic feature of the Third World countries is that they are predominantly rural in character and their economy is agrarian and subsistence-oriented. The transformation of these countries by structural changed in the total society has been the major emphasis in all models of development. Communication networks have been considered as potential agencies for the development of people primarily because their reach is very wide. Further, television and radio have the power to overcome the literacy barrier and hence their interaction with the illiterates may be higher.Consequently Information and Communication Technologies (ICTs) are suitable instruments for the rapid development of underdeveloped and developing countries like India. Present study is mainly focuses on the role of communication networks in the process of development with special reference to rural society.

Agriculture is the mainstay of a rural economy. Hence agricultural development is inevitable for rural development. Researchers on rural development do not disagree on this principle. The earlier studies have been reviewed and accordingly it divided five categories. These are:A) Communication Media and Rural Development, B) Electronic and Print Media and Rural Development, C) Interpersonal /Traditional Media and Rural Development, D) Information and Communication Technology (ICT) and Rural Development. Emphasizing the role of communication in development, Dube remarked that a well drawn project is sure to fail unless

it is supported by an imaginative communication programme (Dube, 1967). Schramm (1977) is of the opinion that only when media channels can mix with interpersonal channels and with organization in the village the expected development will occur.

The University of Leicester has undertaken keen interest in the communicational studies of the Indian rural society with particular reference to mass media. Hartmann Paul, Patil B. R. and Dighe Anita (1989), too confirms that media exposure emerged as a significant factor influencing better agricultural and health practices. Positive attitudes towards woman and an important source of political and other news. In their study 'Mass Media and Village Life An Indian Study.' Mass media are valuable means to convey information to the boad means of rural farmers for its effective adoption, says Chavan N. B. (2004), in his study 'Mass Media and the Physiology of the Farmers.' He also found that radio and newspaper might have also done something excellent to change the attitude of the farmers towards modern methods of farming by comparing results of modern technology with traditional one through giving chance to the successful farmers to tell their experience on radio and newspaper.

Sharma (1994), in his study 'Role of Media in Science and Technology', revealed that electronic media is a very powerful and popular medium particularly a colour T.V. which attracts the attention of the illiterate, its visual impact makes it much effective. Mruthunjaya and Adhigaru (2006), in their study, 'ICT for livelihood security: A Reality Check', they have studied some innovative rural ICT based initiatives in India.

Bhaskar, G. and Rao Venkateshwar (2001), 'The ICT Community: Warana Wired Village Project', a study was based on one of the vital rural ICT project in Western Maharashtra i.e. 'Warana Wired Village Project' District Kolhapur, (W.W.V.P) sponsored by National Institute of Agriculture Extension Management (MANAGE) Hyderabad. Vijayadita. N

(2000), has also studied on, 'A Wired Village : The Warana Experiment', this study was conducted by National Informatics Centre (NIC) New Delhi, the study revealed that in Warana there is a vast opportunity for human resource development, especially in ICT context. Singh K. (2006), in his study, 'A Comparative Study of ICT Projects in Andhra Pradesh and Madhya Pradesh State', revealed very significant suggestions for the effective utilization of ICT projects especially in rural sector.

Thus, in this introductory chapter it is examined the all available literature related to communication and rural development. Let us now go to the next chapter on Research Methodology and Present Status of Communication Media.

CHAPTER – II
RESEARCH METHODOLOGY AND PRESENT STATUS OF COMMUNICATION MEDIA

2.1 Introduction

This chapter focuses on two vital sections i.e. first is research methodology and second is history of communication media in India. The first section is Research Methodology explains the details of every step adopted for conducting this study. Whereas section two explores the history and development of communication media i.e. Press, Radio, Television, and Information and Communication Technology (ICT) in India.

2.2 Research Methodology

This part covers the theoratical prespectives, statement of problems, key concept, objectives, hypothesis and research framework used for conducting this research work.

2.2.1 Theoretical Perspective:

When communication technologies are spreading to the most isolated regions of the world, the development of the poorest of the poor is a dominant political issue, many Third World nations see development communication as a visible strategy for modernization. This link between communication and modernization dates back to the 1950s and 1960s. Many countries in the Third World during that time had recently gained or were gaining their independence, and were considering various development options (Johnson, K. 2001: 51).

Development was seen as a process of change 'to be set in motion and guided towards the objective of eradicating the hunger, disease, injustice, exploitation and related ill's that afflict the majority of the planet's population (Hartmann *et al.* 1989:17). Development Communication is a interdisciplinary perspective and various social

scientists (Lerner, D. 1958; Schramm W. 1964; Hartmann *et al.* 1989; Regers and Schramm, 1972; Singhal and Rogers, 1989; Nair and White 1987; Quebral N. 1973; Melkote S. R. 1991) studied in various ways depending on their views regarding development and the field of their working. For the present study Singhal and Roger's (2001) perspective of development communication has been used 'D*evelopment as a widely participatory process of directed social change in a society to bring about both social and material advancement'*.

Following is the New Development Paradigm is main theortical prespective used in this study to check the role ICT i.e. Wi-MAX in development in the Baramti area.

The New Development Paradigm: The new development paradigm suggested and used by Professor Rogers and Singhal (1989, 2001) has guided our notion of development. This new paradigm pluralistic in that it recognize many pathways to development. It is also less western in its cultural assumptions. Key elements in the new development paradigm include;

1) *Greater equality*: means the distribution of development investments, information and the consequent socio-economic benefits of focusing on weaker sections in society.

2) *Popular Participation* : means knowledge-sharing and empowerment to facilitate self-development efforts by individuals, groups and communities

3) *Self-reliance*: becomes a key concept at both the national and local levels, implying that every nation and perhaps every village could develop in its own way.

4) *Integrated Communication System*: means integration of traditional and modern communication networks in order to facilitate development.

2.2.2 Statement of the Problem:

The impact of communication networks on socio-economic development has not received as much attention among social scientists as other means of development. This is more so in India were 72.22% (2001, Census) of the population live in the villages. The villages epitomize the soul of India, rural India reflects the very essence of Indian culture and tradition, where majority of population are illiterate. This inhibited the use of newspapers for mass communication. The radio became cheap in India in the 1950s and television entered India in the beginning of the 1960s and from 1990s the Information and Communication Technology (ICT) has emerged as a key instrument for influencing the process of development. It is because of this, there is a paucity of studies in this area. An examination of available literature on communication indicates that not much work has been done especially in management on the impact of communication networks on the development process in the context of a ural society. Hence it is motivation for the researcher to broach the present study.

However, the study has concentrated on two vital issues, first to understand the role of WiMAX/Information and Communication Technology (ICT) in socio-economic development. Secondly, the present study also aimed at understanding the role of other Communication networks such as T.V., Radio, Newspapers and Telecommunication in the life of the peasants of rural Maharashtra in general and Southern Maharashtra in particular.

2.2.3 Conceptualization of Key Concepts:

1) *Communication:*

Communication has been defined by many scholars (Merton, R. K. 1968; Dewey J. : 1930; Ellwood C. : 1944; Schramm, W. : 1955; Cherry C.: 1967; Hall E. : 1959; Homans, G. C. : 1951; Sorokin, P. A. : 1947).

A consolidation of their views shows that, 'the term communication refers to the transfer of ideas of knowledge in ways that enable the recipient to understand, react to, and act upon the information received.'

In this study, Communication, refers to a social process the flow of information, the circulation of knowledge and ideas in human society the propagation and internalization of thoughts. It is through communication that people can learn about new ideas, can be stimulated by change which is conveyed to them or be cognizant of change and what it means, and can understand what is going on around them (Rao Y. V.L., 1975 :5)

2) *Communication Networks*:

The term communication networks as used here refers, interpersonal as well as to modern communication networks (i.e. Press, Radio, Television and Information and Communication Technologies such as Computer and Internet), Telecommunication networks (Fixed land line and mobile phone)

3) *Information Communication Technology:*

ICT refers to technologies that provide access to information through telecommunications. It is similar to Information Technology (IT), but focuses primarily on communication technologies. This includes the Internet, wireless networks, cell phones, and other communication mediums (ICT Forum, 2010).

4) Categories of Peasants:

On the basis of Government of Maharashtra, Ministry of Agriculture (Survey Report, 2001/ Section-5) the researcher has developed following categories of peasants according to their land holding pattern i.e. marginal peasant, small peasant, medium peasant and big peasant as follows :

a) Marginal Peasant: who holds land measuring up to 1 acre.

b) Small peasant: who holds land measuring more than 1 to 2.19 acres.

c) Medium peasant: who holds land between 2.20 to 4.39 acres.

d) Big Peasant: who holds land measuring more than 5.00 to above acres.

2.2.4 Operationalization of major Concept

The major concept of the present study is "Development" as we defined earlier in this section, 'development means the complicated pattern of social, economic and political change.' Many researchers (Chapin : 1935; Dube S. C. 1957; Rogers E. : 1969; Singh Y. : 1973; Golding : 1974; Rao Y. V. L. : 1975; Nair P. K. B. : 1976; Shrinivas, M. N. and Parthasarathy V. S. : 1977; Sharma S. L. : 199; Ambekar J. B. : 1992; Johnson K. : 2001; Adhigaru P. : 2004) have developed indices for measuring the change in social, economic and political sphere. After a detailed search from literature and discussion with the experts 15 indices were listed. The operationalization and procedure followed for the measurements of each variable along with the indices used for measurement are presented in Table No. 2.1.

Table No. 2.1: Variables and their indices.

Sr. No.	Variables	Indices
1.	Social	1) Awareness of Computer 2) Education 3) Health 4) Status of Woman 5) Weaker sections 6) Interpersonal Communication
2.	Economic	1) Sugarcane Production 2) Mobility and Cost 3) Human Resource generation 4) Occupation 5) Loan 6) Saving 7) Cooperative and Agrobased practices

2.2.5 Objectives of the Study

The main objective of this case study is the management of ICT for rural development through WiMAX pilot project at Baramati. With this main objective in mind the study has following other objectives.

1) To find out Organization and Management of WiMAX project in Baramati.

2) To analyse the profile and existing communication networks in Experimental and non-experimental villages.

3) To find out social and economic changes after implementation of WiMAX in the Baramati, Katewadi experimental village.

4) To understand the role of WiMAX to create awareness in the use of information and communication technology in experimental and non-experimental villages.

5) To draw conclusions and make suggestions if any for improvement.

2.2.6 Hypothesis

1) Modern ICT tool i.e. WiMAX helps to increase agriculture production i.e. sugarcane, maize and wheat.

2) WiMAX is time saving ICT tool and is tremendously helpful to provide the information services in the experimental village.

3) WiMAX is cost effective tool for rural development.

4) People of non-experimental villages (Zargadwadi) needs WiMAX Kiosk

5) WiMAX is an effective ICT tool for rural development.

6) WiMAX is better than traditional media for rural development.

2.2.7 Research Design and Universe of the Study

As regards the nature of this kind of study, an experimental type of research design was used. As the present study has its focus on the, "ICT and Rural Development: Study of Wi-MAX Pilot Project Baramati." Here it is attempted to find the Baramati region in the Pune District was treated as

the universe of study. The purposive sampling method is used to select two villages respectively as experimental and non-experimental villages i.e Katewadi and Zargadwadi.

2.2.8 Sampling Design

WiMAX Kisok is only running at the Katewadi village in Baramati though this village is selected for proposed study whereas for comparison similar nature village (i.e. Zargadwadi) near to Katewadi is selected by using following indicators. For the purpose of the proposed study the researcher selected two villages. Out of that one village was selected as a Experimental village were 100 respodents (i.e.5%) are selected through quota sampling method and another was considered as a Non-Experimental village were 114 respodents (i.e.5%) are selected through quota sampling method.

2.2.9 Selection of the Sample Villages

Following strategy was adopted for the selection of sample villages.

a) Experimental Village:

i) Criteria for selection of experimental village.

    1) The experimental village has to come under Baramati region.

    2) The experimental village has successfully implemented the Wi-MAX Kisok.

ii) Selection Procedure of Experimental Village:

The WiMAX Project includes Kisoks in 5 villages in Baramti tahsil in Pune district. The present study is restricted to only Katewadi villages connected with WiMAX Kisoks were included for the selection procedure of Experimental village. To give preference for the selection criteria of Experimental village, the researcher has personally observed and discussed with *Grampanchayat* and WiMAX officials about such villages that successfully implemented WiMAX. The researcher selected 1 village

(Katewadi) as an Experimental village by using random sampling technique by adopting lottery method.

b)   Non-Experimental:

For comparison and to examine the role of communication networks in development the researcher has selected one Non-Experimental Village from Baramati region by using following procedure.

i)   Criteria for selection of Non-Experimental village

  1)   Non-Experimental village should not be very far from Experimental village.

  2)   Non-Experimental village should be of the same socio-economic status and geographical conditions.

  3)   Non-Experimental village should not have implemented the WiMAX Project.

ii)   Selection Procedure of Non-Experimental Village:

For the selection of Non-Experimental Village the researcher has conducted a small survey to fulfill the criteria's for the selection of Non-Experimental village. After the survey researcher has selected one village as a Non-Experimental village. Purposive sampling method was used for the selection of Non-Experimental village. The Non-Experimental village is Zargadwadi in Baramati tahsil.

2.2.10 Selection of Respondents

To collect in-depth data from the heterogeneous peasant groups from the selected villages, the researcher has referred Land holding, Sex and Caste category wise report of Government of Maharashtra, Ministry of Agriculture (Survey report, 2001 / Section-5). Out of the total sample size i.e. 1340, 214 respondents which was 15 per cent of the total sample size was selected for the present study (Table No. 2.2)

Besides Seven Case Studies were recorded to collect in-depth and qualitative data from the study area. The stratified sampling method was used for the selection of sample for this study.

2.2.10 Limitations of Study

The present research work detect the role of WiMAX technology for rural development. Following are the limitations of this study-

1) The most obvious limitation of the present research work is only found the role WiMAX technology in rural development.

2) The total sample for the present study comprised of 214 respondents from the experimental and non experimental villages. This sample is only a very small proportion i.e. 5% of the entire population in these villages.

3) The geographical limitation of this study restricted only up to two villages i.e Katewadi is experimental village and Zargadwadi is non-experimental village.

4) This research work is case study and aims find the role of ICT for rural development limited to Katewadi.

5) This is comparative study of the two villages who were identical in nature but only ICT gap make them different.

Table No. 2.2 : Sample size according to the land holding, sex and caste category.

Sr. No.	Category of Peasant	Land Size Categories	Experimental Village (Katewadi)				Control Village (Zargadwadi)				Total
			Open		Backward Castes*		Open		Backward Castes*		
			Male	Female	Male	Female	Male	Female	Male	Female	
1.	Marginal Peasants	Up to 1 Acres	32	6	14	1	34	13	10	01	111
2.	Small Peasants	1 Acres to 2.19	17	2	1	1	18	06	01	01	47
3.	Medium Peasants	2.20 to 4.39 Acres	17	3	1	1	18	02	01	---	43
4.	Big Peasants	5.00 to Above Acres	03	1	--	--	08	01	--	--	13
		Total	69	12	16	3	78	22	12	02	214
		Grand Total				**100**				**114**	**214**

*The term Open refers Non-reserved caste and BC refers Reserved caste.

Table No. 2.3 : Sample size according to the age, land holding, sex and caste category.

Sample Villages	Age in Yrs	Marginal Peasants Up to 1 Acres				Small Peasants 1 Acres to 2.19				Medium Peasants 2.20 to 4.39 Acres				Big Peasants 5.00 to Above Acres				Total
		Open		Backward Class		Open		Backward Class		Open		Backward Class		Open		Backward Class		
		M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	
Katewadi	21-30	3	-	1	-	2	-	-	-	1	-	-	-	-	-	-	-	7 (7%)
	31-40	6	-	-	-	3	-	-	-	7	-	-	-	-	-	-	-	16 (16%)
	41-50	7	3	9	-	1	-	1	-	2	1	-	-	2	-	-	-	26 (26%)
	51-60	12	2	2	1	5	1	-	-	4	2	1	1	-	1	-	-	32 (32%)
	61 and above	4	1	2	-	6	1	-	1	3	-	-	-	1	-	-	-	19 (19%)
Zargadwadi	21-30	10	-	-	-	8	-	-	-	2	-	-	-	-	-	-	-	20 (18%)
	31-40	2	3	2	-	2	2	-	-	4	-	-	-	3	-	-	-	18 (16%)
	41-50	5	7	1	-	2	2	-	-	4	1	1	-	2	1	-	-	26 (22%)
	51-60	12	2	5	1	3	1	1	1	5	1	-	-	1	-	-	-	33(29%)
	61 and above	5	1	2	-	3	1	-	-	3	-	-	-	2	-	-	-	17 (15%)
Total		85		24		45		4		40		3		13				214 (100%)

*The term Open refers Non-reserved caste and BC refers Reserved caste.

From the above table it was observed that, majority i.e. 32% of the respondents in the Katewadi belongs to the age 51-60 years and only 7% respondents are age group of 21-30 years. It is also found that, 26% respondents have age of 41-50 year. From this it is evident that, peasants in the Katewadi belong to the middle age. On contrary to this non-experimental village Zargadwadi, proportion of the young respondents is little higher than the Katewadi. However, middle age respondents are more even in the Zargadwadi.

2.2.11 Tools and Techniques of Data Collection

The primary data were collected by using interview schedule. A pilot survey was conducted using an unstructured interview schedule in the areas, for correcting ambiguity, anomaly in the sequence of questions etc. Two interview schedules were developed for Experimental and Non-Experimental villages for comparative understanding. The information was collected from the landholders of the households.

The interview schedule, consisting of open-ended and structured questions, it was divided into four parts, viz., (i) Identification and background of the respondents, (ii) WiMAX and rural development, (iii) Communication in social sphere, (iv) Communication in economic sphere. The interview schedule had been translated into *Marathi* a local dialect, to avoid the communication gap while collecting information. Experience in the village proved that information could be obtained by informal chat, discussion, diary writing and observation rather than by asking only straight questions. To some extent, case studies have also been used for this study.

2.2.12 Analysis of Data

The data were transferred to code sheets and statistical analysis was carried out. For open ended questions such data were edited and coding, the whole data was analyzed by using SPSS Version13.1 (Statistical Packages for Social Sciences). Descriptive Statistics like Mean, Standard deviation,

Mean Percentage Score etc. and inferential statistics like pair sample 't' test, were used for analyzing the data.

The next part deals to cover the communication media and rural development in India.

2.3   Present Status of Communication Media and Development in India

2.3.1   The Role of Press in Development

The first printing press was brought to India almost by accident on September 6, 1556. This press was being shipped to Abyssinia (now Ethiopia) for use of the Christian missionaries there. The Jesuit priest who accompanied the press, however, died during a brief stopover in Goa (southwest India) and the press remained there. It was eventually installed and used to bring out the first book printed in India, Doctrinal Christiana, by St. Francis Xavier, a catechism in Portuguese for children. The second printing press in India was set up in 1578 at Punikael, a village in Tinnevelly district, South India. It was also used for printing religious materials for the missionaries. The Third printing press- and the first non-missionary press – in India were established in 1674 in Bombay, by an enterprising Indian businessman from Gujarat was printed in India.

News Paper Press in India:

The first man who picked up the idea of disseminating news in India, was William Bolts (Moses and Maslong, C., 1978 : 41). Bolts conceived a plan for starting a news paper press in India. In 1767 an attempt was made by Bolts to start a newspaper but it was nipped in the bud as the Government deported the author of the enterprise. The Court of Directors sitting at Fort William directed that Bolts should be asked to "Quit Bengal and proceed to Madras on the first ship that was to set Sail from that Presidency in the month of July next in order to take his passage from there to Europe in September."

Enter Hicky :

In January 29, 1780 an English adventurer named James Augustas Hicky dared to start his weekly paper called *Bengal Gazette* (also called *Hicky's Gazette or Calcutta General Advertiser*) which described itself as a "Weekly political and commercial paper, open to all parties, but influenced by none." It consisted only of two sheets, about 12 inches by eight, of which major space was occupied by advertisements. It was in the main a lampooning sheet and caused considerable annoyance to many and great commotion and excitement in the small Anglo – Indian community (Ghosh S. N., 1993 : p 11).

Origin of Indian Language Press:

The first non-English language publication in India was probably the Dig Darshan, a Bengali monthly founded in 1818 by the *Serampore* Christian missionaries. The following year the same missionaries put out a weekly, the *Samachar Darpan*, which lasted 20 years. But the first Indian fighter for press freedom and social reforms in the modern period was Raja Ram Mohan Roy. The first of his publications was the *Mirat-ul-Akhbar,* founded in 1821. The object of Ram Mohan Roy, the social reformer, in Starting the paper was to lay before the public such articles of intelligence as may increase their experience, and tend to their social improvement; and to 'indicate to the rulers a knowledge of the real situation of their subjects, and make the subjects acquainted with the established laws and customs of their rules.' Roy ceased publishing his paper later in protest against the government Press Regulations. The *Bombay Samachar*, a Gujarat newspaper, appeared, in 1822. It was almost a decade before daily vernacular papers like *Mombai Vartaman* (1830), the *Jan-e-Jamshed* (1831), and the *Bombay Darpan* (1850), began Publication.

Among the Indian Journalistic figures during this period, in addition to Raja Ram Mohan Roy were : Gopala Krishna Gokhale, Bala Gangadhra Tilak and the great Mahatma Gandhi and Dr. B. R. Ambedkar. Gokhale stood out as the champion of social reform. Tilak, editor of *Kesari*, was a

political agitator. The storm centre of this Indian nationalist movement was a man called Gandhi. Gandhi began his journalism in South Africa, where he founded '*Indian Opinion*' on returning to India, he converted existing weeklies and called them *Young India* and *Navajivan*. The first was in English and second in Gujarathi. Gandhi began another English weekly, *Harijan* in 1933 which were followed by reproductions of the same in other dialects. (Ibid : 13)

Table No. 2.4: Indian Press the Present Profile : 2003-04.

Sr. No.	Top Dailies in India	Language	Circulation
1.	The Times of India*	English	23,63,626
2.	Dainik Jagran*	Hindi	17,55,529
3.	Dainik Bhaskar*	Hindi	16,89,415
4.	Malayla Manorama	Malayalam	12,96,360
5.	Hindustan Times	English	11,52,575
6.	Gujarat Samachar	Gujarathi	10,49,280
7.	The Hindu	English	9,81,565
8.	Ananda Bazar Patrika	Bengali	9,61,114
9.	Enadu	Telagu	9,56,088
10.	Daily Sakal	Marathi	5,23,813
Weeklies			
1.	The Sunday Time of India	English	20,09,803
2.	Malayala Manorama	Malayalam	10,01,776
3.	Mangalam	Malayalam	5,77,765
4.	India Today	English	4,64,723
5.	Kumudam	Tamil	3,85,925
Fortnightlies and Monthlies			
1.	Saras Salil	Hindi	10,17,627
2.	Vanitha	Malayalam	4,92,892

3.	Meri Saheli	Hindi	3,34,067
4.	Grih Shobha	Hindi	3,13,155
5.	Grehlakshmi	Hindi	2,61,541
Annuals			
1.	Kalnirnay	Marathi	50,76,148
2.	Kalnirnay	Hindi	5,22,528
3.	Malige Panchanga Darshini	Kanada	2,62,024
4.	Manorama Yearbook	English	2,09,505
5.	Sharadia Bartaman	Bengali	1,51,811

Source: Audit Bureau of Circulation, July – Dec. 2003.

*For editions for which July-Dec. 03 figures are not available averages of two previous periods available are used.

2.3.2 The Role of Satellite Communication in Development

I)   *Role of Radio:*

Radio broadcasting began in India as a private enterprise when, in 1927, Indian businessmen, enthused by the entertainment and profit potential of radio, cobbled together existing amateur radio clubs in Calcutta, Madras, Bombay, and Lahore to from the Indian Broadcasting Company (IBC). This event was perceived as so momentous that Lord Irwin, Viceroy of India, personally inaugurated IBC's services. However, IBC lost money and was closed down three years later. In 1930, the British government took over radio broadcasting, establishing the Indian State Broadcasting Service, which was renamed *All India Radio (A.I.R.)* a few years later (Kumar, 1998: 46).

Indian Radio after Independence 1947

When India gained independence in 1947, All India Radio had an infrastructure of six radio stations, located in metropolitan cities. The country had 280,000 radio receiver sets for a population of 350 million people (Graph No. 2.1). Post –independence, the Nehru government gave priority to the expansion of the radio broadcasting infrastructure, especially

in state capitals and in border areas. Programming on AIR in the late 1940s and 1950s in India consisted mostly of news, current affairs, drama, and music.

Diagram No. 2.1: Growth of Radio Sets in India
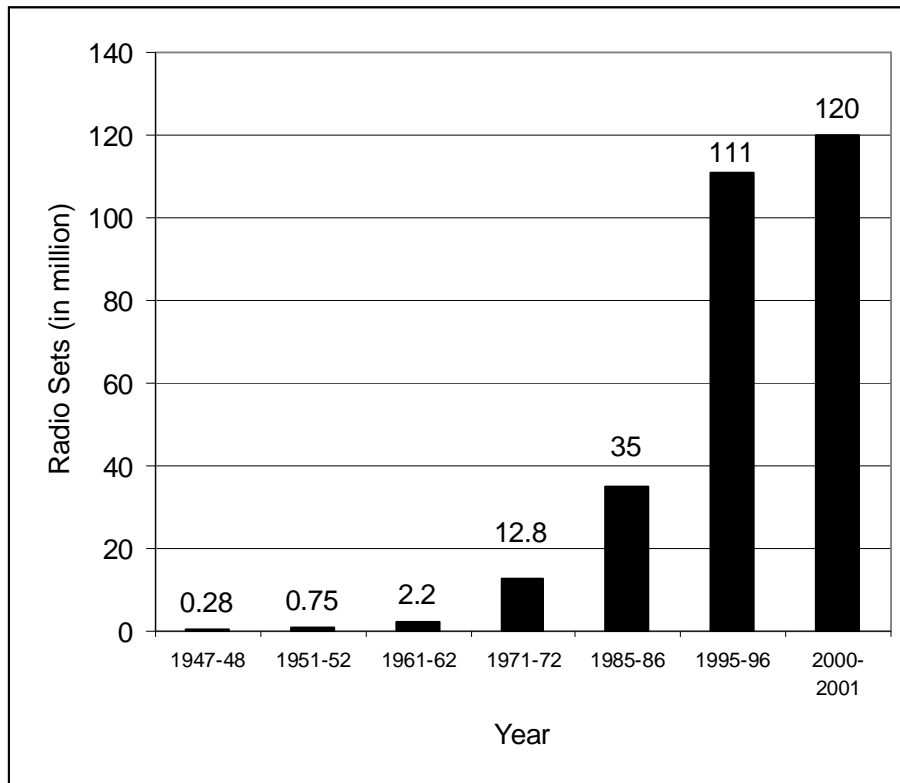
Source : All India Radio (1996); http//air.kode.net/;kumar(1998)

Radio and Development Communication in India

Radio has certain unique advantages for development communication under Indian conditions. However, this potential has largely gone untapped. Unlike the press, radio gets through to on illiterate population.

1) *Farm Radio Forum (Pune):*

It was not until 1956 that another milestone in the development of community radio was reached in this year, Farm Radio Forums were set up in 150 villages across five districts of the Western Indian state of

Maharashtra. Based on a Canadian model, it was a collaborative effort between All India Radio and UNESCO.

These worked as follows:

1) With the support of community leaders and field workers.

2) Selected village farmers would meet at an appointed hour.

3) Listen to the radio broadcast collectively via a community radio set and then discuss the content.

This was moderated by a convener. The programming was, "to place emphasis on the practical aspects of rural life, and stimulate lively discussions among the listeners without raising controversial political issues." (Mathur and Neurath, 1959: 22).

2) Radio Paddy:

During the Green Revolution in the 1960s, there was a sudden, ubiquitous need for information. Agricultural practices in Indian have largely remained unchanged for generations. In response to the need for information, All India Radio began in 1966 to broadcast for farmer. The success of these broadcasts can be gauged by the fact that it led to the new variety (of rice) becoming known as 'Radio Paddy' (Page and Vrawley, 2001: 328).

3) Community Radio:

In early 1995, India's Supreme Court declared the airwaves as public property, to be utilized for promoting public good and ventilating plurality of views, opinions and ideas (http://www.mib.nic.in/supreme.htm.)

The Campus Community Radio Anna FM there are only four community radio initiatives in India : The Pastapur initiative of the Deccan Development Society of Andhra Pradesh, the Kutch Mahila Vikas Sangathan in Bhuj, the Alternative for India Development, Bihar and the VOICES initiative '***Namma Dhwani***' in Budikote (Karnataka). The

Campus Community Radio Anna FM has recently extended its broadcasting times to eight hours. Recently in the month of May, 2005 the University of Pune (Maharashtra) starts the campus radio named as **"Vidyawani".** This shows the great success of such a radio programme, the people seem to be waiting for it, they are curious and they want to be informed according to their needs. The extending of Anna FM's broadcasting hours means a small step on a still long way to go.

II)   Role of Television:

The Indian television system is one of the most extensive systems in the world. When we focuses the revolution of Indian television we realize that, the pioneer of Indian satellite communication revolution Dr. Vikram Sarabhai, is a visionary technocrat and founder of India's space program, began arguing in policy – making circles that a nationwide satellite television system could play a major role in promoting economic and social development.

First Step of Television in India:

In 1959, Philips (India) made an offer to the Government of a transmitter at a reduced cost. Earlier, Philips demonstrated its use at an exhibition in New Delhi. The Government gave in, with the aim of employing it on an experimental basis to train personnel, and partly to discover what TV could achieve in community development and formal education' (Mody B., 1988: 51). A UNESCO grant of $ 20,000 for the purchase of community receivers and a United States offer of some equipment proved much too tempting to resist, and on September 15,1953 the Delhi Television Center went on air (ibid : 25).

Entertainment and information programmes were introduced from August 1965, in addition to social education programmes for which purpose alone TV had been introduced in the capital. The Federal Republic of Germany helped in setting up a TV production studio. The first major expansion of television in India began in 1972, when a second television

station was opened in Bombay. This was followed by stations in Srinagar and Amritsar (1973), and Calcutta, Madras and Lucknow in 1975.

Table No. 2.4: Growth of the Doordarshan Network.

Year	No. of Transmitters	No. of T.V. sets (In Million)	Total Population with access to TV (in Million)
1976	8	0.5	2.9
1977	13	0.5	2.9
1986	179	11.0	52.5
1987	197	13.2	65.0
1996	792	54.0	270.0
1997	921	57.7	296.0

Source: Doordarshan – 1997

Television and Development Communication in India

In one of his basic documents entitled 'Television and Development', the late Dr. Vikram Sarabhai' wrote "We felt that there was a necessary to gain insights on the manner in which television can be used as a direct instrument for promoting the development task of the Government, so that it can be regarded as an investment rather than an overhead."Since the inception of T.V. network, television has been perceived as an efficient force of education and development communication in India. Some of the major development communicational television projects are discussed as hereunder;

1)   *Secondary School Television Project (1961)*

This project was designed for the secondary school students of Delhi. With an aim to improve the standard of teaching on views of shortage of laboratories, space, equipment and dearth of qualified teachers in Delhi this project started on experimental basis in October 1961.

2)   *Delhi Agriculture Television (DATV) Project (Krishi Darshan)*
       (1966)

The project named *'Krishi Darshan'* was initiated on January 26, 1966 for communication agricultural information to the farmers on experimental basis for the 80 selected villages of Union territory of Delhi through community viewing of television and further discussions among themselves. Experiment was successful and that there was substantial gain in the information regarding agricultural practices (IG NOU, 2000: 98).

3)   Satellite Instructional Television Experiment (SITE) (1975)

In 1969 the Department of Atomic Energy entered into an agreement with the National Aeronautic and Space Administration (NASA) of the United States for the loan of a satellite free of cost for one full year starting from August 1975 (Ambekar J. B., 1992: 5). This project, is one of the largest techno-social experiments in human communication was commissioned for the villagers and their primary school going children of selected 2400 villages in six states of India. It started on August1, 1975 for a period of one year in six states Rajasthan, Karnataka, Orissa, Bihar, Andhra Pradesh and Madhya Pradesh. The main objectives of this experiment were to study the process of existing rural communications, the role of television as new medium of education, and the process of change brought about by the community television in the rural structure.

4)   Post – SITE Project (1977)

The target group for this post SITE project was the villagers of Rajasthan. This was a SITE continuity project and was initiated in March 1977 when a terrestrial transmitter was commissioned at Jaipur.

The main objectives of post SITE continuity project were to;

1)   Familiarize the rural masses with the improved and scientific know how about farming, the use of fertilizers and the maintenance of health and hygiene.

2)   Bring about national and emotional integration.

3)   Make rural children aware of the importance of the education and healthy environment (IGNOU : 2000 : 101).

5)   Indian National Satellite Project (INSAT) (1982)

The prime objective of the INSAT project was aimed at making the rural masses aware of the latest development in the areas of agricultural productivity health and hygiene. It was initially targeted at villagers and their school going children of selected villages in Orissa, Andhra Pradesh, later other States namely Bihar, Gujarat, Maharashtra and Uttar Pradesh.

6)   UGC –Higher Education Television Project (HETV) (1984)

University students were the beneficiaries of this project. The University Grants Commission in collaboration with INSAT started educational television project, popularly known as ***Country Wide Classroom*** on August 15, 1984 with the aim to update, upgrades and enrich the quality of education while extending their rich (ibid : 99).

7)   Kheda Communication Project (1986-87)

Kheda is a small district in central Gujarat. 607 community T.V. sets have been installed here in 443 villages and are owned by the community, but maintained by the state Government. The sets are kept in the buildings of the Milk Producers, Co-operative Society or the Panchayat Ghar.

It promoted rural development and social change at the local level. Audience participation was aggressively encouraged at all levels (Mody, 1991: 85).

8)   The Jhabua Development Communication Project (1990)

The *Jhabua* Development Communication Project an innovative broadcasting experiment is presently under way in the rural, hilly hinterlands of *Jhabua* district in India's Madhya Pradesh State. Jhabua's people are India's poorest and 85 per cent population is tribal and its literacy rate is 15 percent.

The *Jhabua* Development Communication Project (JDCP) was launched in the mid 1990s the purpose of JDCP is to experiment with the utilization of an interactive satellite-based broadcasting network to support development and education in remote, rural areas of India (Singhal and Rogers, 2003 : 11).

9)   Gyan-Darshan Educational Channel (2000)

Ministry of Human Resource Development, Ministry of Information and Broadcasting, the Prasar Bharti and IGNOU launched *Gyan-Darshan* (GD) jointly on 26th January 2000 as the exclusive Educational TV channel of India. It started out as a two – hour daily test transmission channel for students of open and conventional universities. By 1st November it turned out to be 19 hours channel. Within one year of its launching 26th January 2001, it became non-stop daily 24 hours transmission channel for educational programmes (Yadav, J. P., 2004: 108).

10)   Direct To Home Television (DTH) (2004)

In the month of December 16, 2004 Government of India and Ministry of Information and Broadcasting was started the mega television channel known as D.T.H. Viewers can easily watch many Doordarshan and some selected private channels e.g. Sun TV, **Eenadu TV** etc. as well as they also listen India's most popular Radio channel 'Vivid Bharti' on Television through D.T.H. (Times of India, December 17, 2004: 4)

11)   EDUSAT (2004)

Millions of illiterate people in remote, rural India could soon have access to an education, as a satellite devoted exclusively to long distance learning. It is the world's first dedicated educational satellite, according to the Indian Space Research Organization (ISRO). India launched the $20 million, 2-tone EDUSAT from the Satish Dhawan Centre at Sriharikota, a tiny island in the Bay of Bengal in August 2004. The Satellite is the heaviest ever launched by an Indian-made rocket – the new

Geosynchronous Satellite Launch Vehicle (GSLV) which cost $33 million (Rao, M, 2005: 5).

III.   Role of Satellite Channels

The Gulf War of 1991 which popularized (CNN) and launching of STAR-TV in that same year by the Whampoa Hutchison Group of Hong Kong, signaled the arrival of private satellite channels in India. STAR-TV broadcast through the Chinese satellite ASIASAT 1 offered five 24-hours channels in 38 countries of Asia. In 1992, Zee-TV, a Hindi based satellite entertainment channel, also began beaming programs to cable television systems in India this is a first Indian satellite channel. By 1995, over 12 million Indian households were watching cable and satellite channels; by 2000 this number had risen to over 35 million.

Diagram No. 2.2: The rapid growth of Satellite television in India
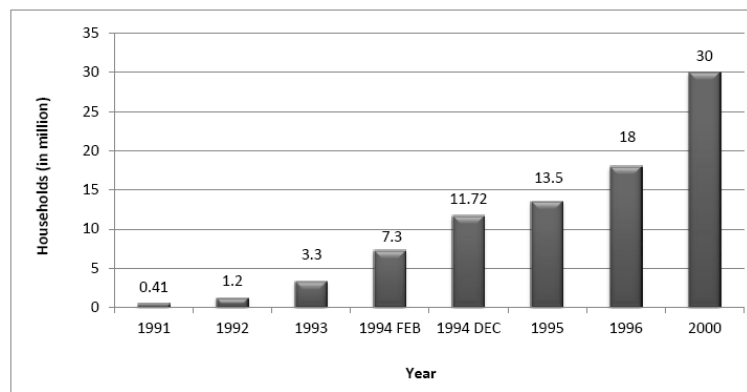
Source : Cable Quest (1998)

A private television revolution occurred in India during the 1990s as over 40 private television broadcasters began operations. Typically a private network like STAR-TV, Zee-TV, or SONY produced its programs in India, couriered them to Hong Kong or some other place for up linking to satellite, and then beamed them to cable television operators who distributed them locally (Singhal and Rogers, 2003 : 105).

Over 100 private cable and satellite channels were available to Indian audiences, including several that focused exclusively on regional

language broadcasting like *Sun-TV, Eenadu-TV, Udaya-TV Raj-TV, and Asianet.* By 2000, Zee-TV also launched several regional networks broadcasting in Marathi, Bengali and other languages (Rao, S., 2001: 120).

2.3.3 Role of Information And Communication Technology (ICT) in Development

Especially in 21st Century Information and Communication Technology (ICT) has emerged as an effective facilitator in the development of any society and it is a prime driving force in the growth of economics worldwide. The most conspicuous development in the globalization context has been the (ICT) influx. It seems to have turned the world into a global village. Hence, the developing world is gradually catching up with the technological advancement to solve its socio-economic problems. In a vibrant democracy like India which is marked by plethora of languages and diverse cultures ICT assumes greater significance to develop the rural sector. The *Organization for Economic Co-operation and Development* **(OECD)** defines, ICT as the set of activities that facilitates, by electronic means, the capturing, storage, processing, transmission and display of Information. In India, the path towards technology induced development, especially associated with ICT, was given a vent in 1984 by the Congress Government under Rajiv Gandhi and the technologist Sam Pitroda. They assumed power and adopted Informatization of Indian society as an effective route to development. A high power *National Task Force on Information Technology and Software Development* was set up in 1998 by the B.J.P. Government. This Task Force prepared the blue print for making the adoption of IT as a National Movement, by establishing a wide network of empowered taskforce at all governmental and non-governmental levels. The New Telecommunication Policy 1999 has stipulated targets in terms of establishing a telecom network with a view to achieving tele-density of 7 per cent by 2005 and 15 per cent by 2010 for a knowledge society (Bajwa, 2006:49). In common parlance, ICT denotes computing and

telecommunication technologies that provide automatic means of handling information with the object of improving governments or any other Organizational methods of operation. The concept of Information Systems underlying is defined as a system of human and technical components that accept, store, process, output and transmit information. The role of ICT in fostering development needs to be looked at from a broader perspective that showcases its place in Information systems. The most conspicuous of all the technological advances is the Computer and Internet, which is believed to have the capacity to redefine the possible.

1) *Computer*

The world's first computer, ENIAC was developed in 1945 funded by the U. S. Department of Defense and used for military purposes (Rogers, 1986: 19). The Indian statistical institute in Calcutta acquired the first computer in India in 1955. Additional computers were purchased in India, mainly from IBM. By 1972, there were 172 computers in India and three-fourths of these were made by the IBM. After 1984, Prime Minister Rajiv Gandhi changed government policies to encourage an indigenous microcomputer industry. A boom in microcomputers began to take place in India during the 1980s and expanded rapidly in the 1990s. The computerization of the railway passenger reservation system in 1996. Sales of personal computer in India crossed the one million mark in 1999. The installed base of PCs in the country was about five million in 2000, translating into about five computers for every 1,000 people (Singhal and Rogers, 2001: 98).

By 2000, India had 4.5 million technical workers trained at some 1,900 universities. The Indian software industry employed about 400,000 people in the year 2000, some 70 per cent of whom were directly involved in software development.

2)   *Internet*

The connectivity between people, made possible by the spread of the internet, has impacted strongly on people's lives and communication behavior (Bennet and Klopfenstein, 2000: 10). The example of the 'Information Superhighway' is the Internet which had its root in the need during the mid – 1960s for linking military computer researchers in the United States (Golding, P. 1996: 70). This was the origin of Arpanet the network of the Pentagon's Advanced Research Project Agency (ARPA). In the 1980s the National Science Foundation developed its own academic networks (NSFNET) by 1990s NSFNET had replaced Arpanet.

Diagram No. 2.3   Internet users by segment in India
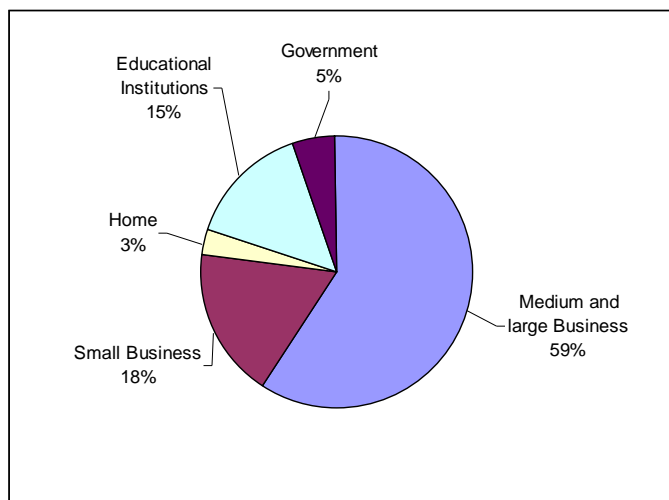
Source: Cable Waves (1998)

This later developed in to the INTERNET was 'universal' and free in academic and research institution. The Department of Science and Technology (India) established the ERNET in India, serving to link the institutes of science and technology and across the nation. Later Government of India established some other major networks such as NICNET, Railnetect (Rao, and Chinna, 1999: 99) Global Internet users were expected to rise to more than 325 million by 2000. While Asia is expected to have 64 million Internet users by 2003 (Ramanathan, 2001 :

10). By early 2000 India had an estimated three million internet subscribers and about 15 million users.

Prominent ICT Initiatives for Development Communication in India:

The government's supportive policy has contributed to the emergence of a pluralist extension system in India with emphasis on application of ICT in agricultural and rural development. Public sector institutions (e.g. Department of Agriculture, Research Institutes, State and National Universities). NGOs, co-operatives and various private farm related input marketing firms, are actively venturing into ICT-based initiatives for providing information in the areas of agricultural, health, education, women empowerment, *Panchayat Raj*, co-operative sector etc. *(Some examples of such initiatives are listed in Table No. 2.7).*

These initiatives vary in purpose, type and nature of information, funding agencies, facilitation, methodologies and modes of implementation. Some innovative projects involve setting up of information centres at the village level, which provide facilities of using computer with access to the Internet offer several other multipurpose services. Some other initiatives involve developing networks, connecting research and extension organizations for effective and need based information. Before going to deal with the role of ICT particularly in rural development we will examine the actual experiments of ICT in India (Table No.2.6 and 2.7).

Table No. 2.5: ICTs in Developing Countries application and benefits.

	Applications	*Benefits*	*Organization*
Healthcare	1.Telemedicine (audio/image transmission, collaboration, e.g.for radiology) 2. Digital publication of medical research 3. Outsourcing or ervices	1. Increased productivity, reduced travel costs 2. Broader service reach for experts 3. More responsive healthcare services for citizen	World Health Organization Medine (NLM), MaterCare
Agriculture	1. GIS system for planning 2. Tele-education, scientific	1. More awareness of innovative approaches	FAO, WFP,CGIER, Developing Countries Farm

	database 3. Telecentres, information services for pricing	2. Improved food production 3. Seasonal planning risk mitigation	Radio Network, MAYAnet, FarmNet, Famine Early Warning System, GAINS, AgriWatch
Education	1. Distance education 2. Teacher training 3. Indigenous education	1. Improved visualization skills 2. Up-to-date course materials accessible from remote areas 3. Cost savings, on-demand education	OLSET programme (South Africa), TeleSecundaria (Mexico), African Virtual University, Orbicom, SchoolNet ,RCP
Business	1. E-banking,e-stockbroking 2. Logistics management 3. Global trading platforms	1. Efficiency, less delays 2. Lower costs of marketing 3. Global exposure	UNCTAD, UNTPDC,WTO, trade compass
Media/cultural Industries	1. Digital newspaper 2. Archival technology, mehtodlgies, standards 3. New media formats	1. More responsive news cycles 2. Preservation of local cultural forms via archives, interactive CD-ROMs and websites 3. Global projection of local media cultural	UNESCO, OneWorld, DigitalPartners, WorldSpace, Drink
Environment	1. GIS mapping 2. Networking of environmental activities 3. Databases of crop patterns	1. Better management of resources 2. Planning for disaster aversion 3. Improved awareness among activities	World Bank GIS Laboratory, One World, IntelSAT,ESRI, ICLEL, WorldWatch, VITA APC,CDT
Governance	1. Online information for citizens, business, NGOs 2. Planning and management of transportation 3. Simplified procedure for international business	1. Less wastage of citizens time, better access to crucial information 2. Improved accountability of government officials 3. Simplified tax procedures for business	USAID, ActionAID, Transparency International, APC, CDT
Urban development	1. Urban planning, service delivery 2. Public telecom, Internet facilities 3. Urban telecentres	1. Shared infrastructure for multiple sectors 2. Better coordination of digging up roads. 3. Urban telecentres	International Healthy Cities Foundation, SNDP, ICLEI, ADB
Rural development	1. Rural community networks, public call office 2. Rural tourism 3. Healthcare	1. Rural community networks become economic drivers 2. New employment opportunities 3. Access to government services from remote location	APDIP, SDNP,ITU, Grameen Bank CIDA

Source- Rao, M, 2005:125

Table No. 2.6: Some Innovative Rural ICT Based Initiatives in India

Initiatives	Sponsor (organization)	Important features	Major Thrust area of Development
Public Sector			
Cyber extension project	National Institute of Agricultural Extension Management (MANAGE). Hyderabad	Village information centers, institutional support to other ICT projects	Post harvest processing women and child welfare.
Agricultural Technology Information Centres (ATICs)	Indian Council of Agricultural Research (ICAR), New Delhi	Call centers, expert systems, researchers-farmers linkage.	Agronomic practices, technologies, inputs
Agricultural Gateway of India	National Academy of Agricultural Research Management (NAARM) (ICAR), Hyderabad	Portal, links to other sites/ portals on agriculture	Profile of agricultural research and extension organizations.
Help-line service	Chandra Shekhar Azad University of	Helpline service through telephone,	Cultivation practices, plant protection, new

	Agriculture and Technology (CSAUAT), Kanpur	researcher-farmers linkage.	technologies.
Warna Wired Village Project	NIC, Warana Cooperative Complex, Warana, Dist. Kolhapur (Maharashtra)	Wide area network, Computer booths	Cultivation practices, pests and diseases, marketing, processing etc.
Gyandoot project	Gram Panchayat, Dhar district, Madhya Pradesh	Soochanalayas, Portals, Partial recovery, Panchayat-community partnership.	Agriculture produce, market intelligence, auction rates, land records.
Intractive Touch Screen Information Kiosk	Department for International Development (DFID) Rajiv Gandhi College of Animal Sciences (Pondichery) University of Reading (U.K.)	Information Kiosks text, Pictures with sound backup.	Information about important cattle diseases and management of cattle.
Lokmitra Project	National Informatics Centre, Gram Panchayat, Hamirpur district, Himachal Pradesh.	Lokmitra Soochana Kendras, in 25 Panchayats	Classified complaints, job vacancies, market rates, tenders, etc.
Sustainable Access in Rural India (SARI)	Government of India (NIC), IIT Chennai, Massachusett Institute of Technology, Harvard University	Public Access Internet Kiosks, Wireless Local Loop (WLL)	Easily access caste, birth and death certificates and also voice mail, chatting and e-mail in under privileged village.
SETU	National Informatics Centre, Government of Maharashtra (Maharashtra)	Citizen facilitation Centre. Computers with LAN (Local Area Network)	Total 34 types of certificates are providing e.g. domicile, caste, solvency income etc.
VoGRAM	Indian Institute of Science (IISc) Bangalore	Internet, Vogram call Centre	Vice Telegram for India's largely rural illiterate masses.
Internet Kiosk for Slum Kids	Government of Delhi	Slum-computer Kiosks	Self-learning and for self-training in Hindi and English language
INFOTHELA	Indian Institute of Technology (Kanpur), BSNL (Kanpur) (Uttar Pradesh)	IT Kiosks, Internet, Telecom facilities	Education, health, weather, agriculture, and employment information to the villagers.
Fully Computerised Gram Panchayat	Village development Committee (VDC) village Belandur Bangalore (Karnataka)	Software pakage for e-governance	Gram Panchayat provides, property record, land revenue, land dimensions etc.
GIS for Development	UNDP and Ministry of Science and Technology Government of India	Geo-referenced Area Management or the GRAM++ GIS package	Water resources management, land use planning, energy budgeting etc.
Digital smart cards	Shri Chhatrapati Shahu Co-operative Sugar Factory, Kagal district-Kolhapur (MS)	Personal Digital Assistance (Smart Cards)	Details of Shares, deposits, sugarcane reg. Weight, bill etc.
Private Sector :			

E-Choupal	Indian Tobacco Company, Madhya Pradesh	e-choupal, crop specific intranet	Market price, cultivation practice, weather etc.
Rural Information Kiosks	EID Parry, Tamil Nadu	Farmers managed kiosks, portals, public-private partnership in applying ICT innovations and content development.	Farm practices, Farm advisory, market intelligence, weather etc.
I-kisan portal	Nagarjuna group, Andhra Pradesh	Portal in regional languages	Agricultural practices, plant protection, animal husbandry, weather etc.
Tarahaat (Village Bazaar)	The Development Alternatives Group (Delhi)	Portals, TARAhaat.com, Franchised network of village cybercafes	Provide, market price, products, connect rural families to their abroad relatives in Hindi and English.
APOLLO Telemedicine	Apollo Hospitals Telemedicine Enterprise Ltd. (Delhi)	Telemedicine software, Video conferncing	Doctors opinion, interpretations, complex medical cases, patient data in remote rural areas.
NGOs			
Village Knowledge Centre	M S Swaminathan Resarch Foundation (MSSRF), Chennai	Knowledge center, pro-poor, pro-nature, pro-women and community ownership	Agronomic practices, cattle feed and weather, schemes.
Computer on wheels (cow)	Pingali Rajeshwari-entrepreneur, Andhra Pradesh	Internet on motor bikes, portals, remote area, resource poor.	Market, weather, plant protection and animal health.
www.doctoranywhere.com	Tata Council for Community Intialitives (TCCI) Pune (MS)	Telemedicine Service through websites and computer	Medical council, Medical treatment in PHC.
Jal Chitra	The Ajit Foundation Jaipur, Barefoot College of Tilonia	Jal Chitra, Software	Villagers can get water maps, records, water source, water quality testing and demand through Jal Chitra software

Source: Adhigaru et al. (2003), Patil D. A. (2006).

Rural ICT Initiatives in public sector

Box- 1

Cyber Extension Project (Andhra Pradesh)

National Institute of Agriculture Extension Management (MANAGE) Hyderabad, an autonomous organization of the Ministry of Agriculture, Government of India, has undertaken a project on providing "Information Technology at the Farmers Doorstep" in Rangareddy district of Andhra Pradesh. Computers were installed in 11 villages in the Rangareddy district in 2000. One system with one printer a modem a 1 KVA UPS was provided to each village. The project covers 11 villages thus the total reach of the project is around 250-300 villages. The project provides "Basic IT Training" to the farmers and farm families. MANAGE has arranged to host the *rythu bazar* (farmers market) prices on its web-site and all farmers can have access these prices very early in the morning everyday. The rural community has become eligible for housing loans, crops loan and other schemes and they are able to inform the concerned officers about their demands with full supporting documents, very much in time due to information availability through the web-sites.Source: www.manage.gov.in

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BOX-2

Warana Wired Village Project (Maharashtra)

Waarananagar, a cluster of 70 villages in Maharashtra is an eye of the 'Wired Villages" project. The 'Wired Village" project initiated in 1998 has been jointly implemented by the Government of India and National Informatics Centre (NIC). Government of Maharashtra and Warana Co-operative Society (for more details see chapter IV). The Village Information Centre (VIC) provides information relates to crops, cultivation practices, pesticides, marketing details, bill payments, positions of sugarcane it is very useful to sugarcane cultivator farmers.

Source : www.warana.org

BOX-3

Gyandoot-Cyber-Café-Cum-Cyber-Offices

On 1st January 2000, Dhar district, in Madhya Pradesh State in India began the new millennium with a mass-based information revolution. Computers in 21 major centers in five blocks of the district were connected through an intranet network. These computers have been established in *Gram Panchayats*. They have been called *Soochanalayas*. From the *Soochanalaya*, user charge-based services are given to the people and at the same time the IT-related development needs of government departments and *Panchayats* are met free of cost. This intranet has been named Gyandoot. The *Gyandoot* network benefits over half a million population living in 311 *Gram Panchayats* and over 600 villages. The person operating the *Soochanalaya* is a local matriculate operator and is called *Soochak*. The following information is available at the *Soochanalaya*. 1) Commodity Prices 2) Copies of Land Records 3) Online Registration of Applications 4) Public Grievance Redressal, 5) Hindi E-mail 6) Interactive Multimedia Training.

Source: www.gyandoot.net

BOX-4

Interactive Touch Screen Information Kiosk

Under the Animal Health Project funded by Department for International Development (DFID) Rajiv Gandhi College of Veterinary and Animal Science Pondicherry in collaboration with University of Reading, UK, has installed a Interactive Touch Screen Information Kiosk in one of the rural region of Pondicherry on a trial basis. It has information on important cattle diseases in addition to management of cattle and methods of acquiring information. Illiterate livestock keepers can easily access the information with touch of the screen, which has text and pictures with sound backup.

Source: www.livestock.net.nic.in

BOX-5

Lokmitra-Himachal Pradesh

The Lokmitra Yojna is the Himachal version of the Gyandoot Pilot Project in Dhar district of Madhya Pradesh. Under the NABARD sponsored project, 25 information centres have been opened in various parts of Himachal Pradesh. People of the district, especially those living in villages, will be able to send their complaints by paying a nominal fee to the owner of the centre. The person managing the centre will send the complaint to the district headquarters. Through these Yojna market rates of vegetables, fruits, and other items will also be made available at all information centres. Moreover, people will also be able to send and receive information regarding their land records, income and caste certificates and other official documents. National Informatics Centre of the State has supplied necessary software and hardware to the owners of the centres.

Source: The Tribune, May 9, 2004 pp.2

BOX-6

Sustainable Access in Rural India (SARI)

Pathinettangudi some 35 Kms from Madurai, which presents the look of just another underprivileged village. However a silent IT revolution is brewing in the tiny hamlet where the illiterate farm workers use webcams, vice mail and e-mail regularly. Similar is the communication technology spread in at least 30 other villages around Pathinettagudi, paving the way for the caste-conscious Melur (State Tamil Nadu) to become the first cyber taluka in the country-courtesy the Sustainable Access in Rural Internet (SARI) Project. Villagers no longer run from pillar to post to get caste, birth and death certificates here. They simply download the application online and forward it through e-mail to the tahsildar. Earlier, we had to shell out at least Rs. 250 to get an income certificate or old age pension. Now, the cost is only Rs. 29, which includes a printout of the e-mail acknowledgement from the tahsildhar, says 70 year old Mondi of Parthinettangudi. The agricultural labourers get their queries clarified online as well, thanks to the Madurai Agriculture College. The villagers also get close-up colour pictures of their eyes examined by specialists in the Aravind Eye Hospital in Madurai. The man behind this achievement is Prof. Ashok Jhunjhunwala of the IIT Channai, who developed the Wireless and Local Loop (WLL).

Source: The Hindu, Monday, April 22, 2002, pp. 5

BOX-7

Setu-Maharashtra

SETU or the Citizen Facilitation Centre, is a one-step service centre for citizens who have to visit government offices for certificates, permits, affidavits and other services. It was set up by the government of Maharashtra State in India. The centre has 15 computers 10 printers and a staff of 28 persons. The Citizen Facilitation Centre started in October 2001. A total of 34 types of certificates were identified that are issued by the district and sub-district offices. The most important and frequently issued certificates are the ones related to domicile, nationality, caste, age verification, character verification etc. *Apulki Seva Sanstha*, an NGO, has been given the job of running the centre, charging a small fee for its services. This organization also spent US $14,500 out of its own funds to purchase computers and related accessories works on holidays and after office hours on a two-shift basis.

Source: www.egov4dev.org

BOX-8

VoGRAM

VoGram is an application that allows a person to send a vice telegram, could change the communication scene by connecting India's largely rural and illiterate masses. Scientists at the Indian Institute of Science (IISc) have sold license for the application to a private company that would enable the emotion of vice to be conveyed in a telegram. "VoGram" would improve connectivity in rural India, where some 85,000 post offices without a telephone connection cater to the needs of the people. India has 115,000 post offices, the largest in the world, but only 25,000 have a telephone connections, making telegrams take that much longer to reach the recipient.

Source: http://ece.iisc.ernet.in/Vogram

BOX-9

Internet Kiosk for Slum Kids (Delhi)

The project has been conducted in the Ambedkar nagar colony of the capital. In this colony the families are big- there is no concept of family planning here due to lack of literacy. To help improve the conditions of these slums as well as to spread computer awareness; the Government of Delhi initiated a "*Slum-Computer Kiosk Project*" in November 2000. The slum computer kiosks providing self-learning and for self training in Hindi and English language. The mother willingly sends the kids away to the Kiosk for self learning and for self-training. They feel overwhelmed after their kids started going to the Kiosk; their grades have improved in Math's as well as in Science.

Source: www.itdelhi.gov.in

BOX-10

Infothela-Uttar Pradesh

In pursuit of the technology at your doorstep, mantra scientists of the Indian Institute of Technology (IIT) Kanpur, in Uttar Pradesh, have developed a battery powered 'infothelal' or 'IT Kiosk' equipped with an assortment of Internet and telecom facilities to impart the benefits of Information Technology to people in remote area. The villagers can access information about education, health, weather, agriculture and employment and keep him abreast of new development.

Source: Time News Network, Nov., 16, 2002 pp.4

BOX-11

Fully Compuerised Gram Panchayat

Situated about 25 Kms from Bangalore, Belandur gram panchayat is the first in Karnataka to computerize its administration. What makes this project unique is an independent initiative funded by the *village development committee* (VDC). Belandur's e-governance project started with a single computer that was brought to the village in 1998 to replace the panchayats old typewriter. At present the panchayat office has three computers, one for each of the bill collectors. Working closely with the panchayat members and village residents, compusol managed to devise software packages to suit the needs of panchayat administration, handling the recording of property details, tax collection, and data management and so on. The only investment made by the panchayat was towards the purchase of hardware, a total of around Rs. 70,000. Property related records such as land revenue details and land dimensions are now stored in the computer. Records of bills paid are made available to members of the public. Since the software uses the local language, ordinary residents have experienced no problem for getting involved.

Source: www.belandur@mantramail.com

BOX-12

GIS for local-Level Development Planning

The UNDP assisted project on GIS-Based Technology for local-level development Planning was executed and implemented by the Union Department of Science and Technology during November 1996 and December 2000 in association with leading academic institutions, data generating agencies and Non-Governmental Organizations (NGOs) in the country. Through the efforts of this centre a digital catographic database was established in the country. Prior to this the Indian Council of Agricultural Research (ICAR) was assisted by UNDP to establish facilities for remote sensing technology for land development at the All India Soil and Land Use Survey Organization.

Source: www.undp.org.in

BOX-13

Shetkari (farmer) smart cards to bridge digital divide

The Shri Chhatrapati Shahu Co-oprative Sugar Factory, Kagal district-Kolhapur (MS) will issue smart cards to over 27,000 of its members, who can access information through the personal digital assistance(PDAs) installed in the village. The *Shetkari smart cards* scheme of this factory is set to enable farmers to get all information about sugarcane at their door stapes in their respective villages. The factory has adopted modern technology, like a 4000 meter optical fiber cable, used for networking, and structured cabling the factory has also installed IVRS facility to provide4 information over Telephone. The digital smart cards will be issued to the factories to over 27000 members and non-members who supply sugarcane to the unit. Apart from personal information, the cards contain details of shares, deposits, sugarcane registrations, weight of the registered cane, bills, different cane development schemes and the quantity of sugar offered to the member.

Source:The Times of India, Dec.9, 2006 pp5

Rural ICT Initiatives in Private Sector

BOX-14

E-Choupal

The Indian Tobacco Company (ITC) has started *e-Choupals* in Madhya Pradesh, Uttar Pradesh and Maharashtra State. E-Choupal means the village information centre which provides information regarding market price, cultivation, marketing, weather etc. ITC which exports Rs. 700 crore worth of agricultural commodities (and hopes to increase this to Rs. 2,000 crore by 2006) has discovered a way to bypass the age-old-*mandi* system and buy directly from farmers. The farmer too stands to gain much more than he would if he sold through the mandi. For a long time, farmers had no other option but to hit the local *mandis*, where they realized only 70-75% of the end prices. But now they can hope to do better. For India's antiquated agricultural system, that's a big deal. Every *E-Choupal* have a battery powered Internet enabled Pentium desktop computer along with a printer.

Source: www.businessworld.com

BOX-15

Rural Information Kiosk – EID Parry (Tamil Nadu)

EID Parry (a company of Murgappa Group in South India) in association with-n-Logue Technologies, a rural communication technology diffusion firm set up under the team of IIT (Indian Institute of Technology) Madras has connected 38 villages in Nellikuppam taluka of Cuddalore district of Tamil Nadu. 38 Internet connections have been given in the villages surrounding the area. The core DECT system was deployed with the Access Centre at Nellikuppam the town where the 150 years old Parry Sugar Factory is located. Parry has developed an agri-portal www.indiaagriline.com that can be accessed by farmers through the Kiosks. The content of the portal covers seven topics such as details about farm practices, farm business, farm advisory services, community details such as price of different crops in nearby markets, weather reports etc. It also offers detail information about six crops including sugar, banana, cashew, taploca and groundnut.

Source: www.indiaagriline.com

BOX-16

TARAHAAT

This project named *"TARAHaat"* after all purpose haat (meaning a village bazaar) comprises a commercially viable model for bringing relevant information, products and services via the Internet to the unserved rural market of India from which an estimated 50% of the national income is derived. The Development Alternatives Group promotes TARAhaat, the D. A. Group available for the design, implementation and operating management of the portal and its associated services.

Project Description:

TARAhaat combines a mother portal, TARAhaat, supported by franchised networks of village cybercafes and delivery systems to provide a full range of services to its clients, the subsidiary units include:

- *TARAdhaba* – will provide the villager connectivity and access to a new world.

- *TARA bazaar* – will provide access to products and services needed by rural households, farmers and industries.

- *TARA van* – will deliver goods ordered.

- *TARA guru* – a decentralized university will provide mentoring and consulting to village based minienterprises.

- *TARA vendor* – will run the store that will cater to products available at Tarabazaar.

- *TARA card* – will enable the villagers to order goods and service on credit.

There is no instrument more effective than the Internet for bringing both jobs and information to the rural economy – bringing the buyer and seller together and creating an efficient market place.

Source: www.digitalpartners.org/tara

BOX-17

Telemedicine From Apollo

Apollo Hospitals Telemedicine project, started in 2000 in a sleepy village in Andhra Pradesh at present in over 11 remote locations in India, connecting them to centres of medical excellence in Delhi, Hyderabad and Chennai. The project has already benefited over 3749 patients. In a move that will strengthen the reach of medical excellence to the North-East region of the country, Apollo Hospitals Group recently launched its telemedicine link between Indraprastha Apollo Hospitals at Delhi and Naga Hospital at Kohima (Nagaland) the third consecutive link by the group to the region. The link will enable medical practitioners of the State to access expert advice from specialists at Indraprastha Apollo Hospitals, allowing for live and real time discussions of cases, ready transferability of medical records and images and even real time assistance from Delhi for complex procedures being undertaken at Kohima.

Source: www.expresshealthmgmt.com

Rural ICT Initiatives of NGOs

BOX-18

The Information Village Project: Pondicherry

The Information village project, implemented by the M. S. Swaminathan Research Foundation (Chennai) in collaboration with International Development Research centre (IDRC) is aimed at bringing the benefits of modern ICTs to rural development. The specific objectives of the project are : 1) to set up village knowledge centres that enable rural families to access modern ICTs 2) to train educated youth especially women in rural areas in operating information shops 3) to train rural youth in the organization and maintenance of a system that generates locally relevant information from generic information 4) to maintain, update and disseminate information on entitlements to rural families 5) to build models of information dissemination and exchange in rural areas that use advanced ICTs. The project is located in the Pondicherry region in South India. A *Value Addition Centre* (VAC) has been established at Villianar village and is functional since February 1998. It acts as the hub of the communication network in the project. Four village knowledge Centres have been set up at Kizhar, Mangalam, Embalam and Veerampatinam.

VAC – The premise is that value addition by professionals to networked information is an important step in enabling rural familes have access to it. A small office in Vallianur serves as a VAC. Provides variety of locale-specific information on health, transport, public events, subsidies, prices, weather etc. Information on developmental programs (entitlements, credit, inputs etc.) and markets is maintained here.

Village Knowledge Centres: Provide information related to health, credit, input price and availability, transport, market information, meterological information, information for pest survellance and agronomic practices, data on entitlements to rural families. Each Centre also has a board to display bulletins received on e-mail from the VAC. The centre also enables a visitor to make voice call within the region. A circulating library of educational CD-ROMs is maintained by VAC for use in the Centres.

- In Embalam village all volunteers are women. Each of them spends half-a-day at the centre and takes turns to attend work. In addition to bulletins by e-mail this centre also receives real audio files containing the same information to facilitate its use by illiterate women.
- In Veerampatinam village, where majority are fishermen families. Three volunteers, two women and one man are handling the centre; it receives data on fish aggregation off the coast of Tamil Nadu and Pondicherry from National Remote Sensing Agency.

Source: www.mssrf.org

BOX-19

Computer in Wheels

Computer on wheels, provides information regarding market, weather, plant protection and animal, health through Internet on motor bikes, portals, in rural areas of Andhra Pradesh. Due to poor electricity this initiative use solar cell and battery back up for the regular power supply it have also GPRS (General Package Radio System) connectivity.

Source: www.conucheels.com

BOX-20

Telemedicine Service in Pune Primary Health Centres

Those living in interior Pune villages will now be able to avail expert medical well within their means, thanks to a unique telemedicine program. The Pune district administration has teamed up with www.doctoranywhere.com and Tata Council for Community Initiatives (TCCI) to launch a telemedicine service from a government Primary Healthcare Centre (PHC). The villagers rush to big cities to meet specialist doctors. Since their relatives often acompany the patients, the cost mounts up. The service launched at three primary health centres is targeted at the rural masses. The telemedicine project will ultimately connect all the PHC's in the district. In the first phase three PHC's in Wagholi, Chakan and Paud regions would be linked with the district administration of Pune and the specialists.

Source: www.doctoranywhere.com

Just think of the potential of a software that allows users to create an interactive water-map of the village. This means villagers would be better equipped to cope with drought called *Jal-Chitra* this software has been developed by Jaipurs Ajit Foundation, in close collaboration with the Barefoot College of Tilonia. According to the Ajit Foundation, the advent of personal computer together with the development and expansion of Internet has provided us with a unique opportunity to bring the tools of scientific modelling and computation to rural development. Jal-Chitra basically creates an interactive water map of the village enables the community to keep records of the amount of water available from each water source, can record water quality testing, water demand and shows the amount of community need met through rainwater harvesting systems.

Source: www.infochangeindia.org

Summary

This topic covers the research methdology and present status of communication development and different examples related information and communication technology for development in genral and rural upliftment in perticualr. At a time when communication technologies are spreading to the most isolated regions of the world, the development of the poorest of the poor is a dominant political issue, many Third World nations see development communication as a visible strategy for modernization. Development was seen as a process of change 'to be set in motion and guided towards the objective of eradicating the hunger, disease, injustice, exploitation and related ill's that afflict the majority of the planet's population. The new development paradigm suggested and used by

Professor Rogers and Singhal (1989, 2001) has guided our notion of development. Information and Communication Technology (ICT) has emerged as a key instrument for influencing the process of development. It is because of this that there is a paucity of studies in this area. An examination of available literature on communication indicates that not much work has been done especially in management on the impact of communication networks on the development process in the context of a ural society. Hence it has motivated the researcher to broach the present study.

However, the study has concentrated on two vital issues, first to understand the role of WiMAX / Information and Communication Technology (ICT) in rural development and second to find the social and economic development in Katewadi experimental village. In this study, Communication, as used here refers to a social process the flow of information, the circulation of knowledge and ideas in human society the propagation and internalization of thoughts. The main hypothesis of this research work is-ICT i.e.Wi-MAX is hepling to rural development in Baramati i.e. Katewadi. However, the main objective of this study is ICT i.e. Wi-MAX in Baramati is main tool for rural development. For the purpose of the proposed study the researcher selected two villages. Out of that one village was selected as a Experimental village were 100 respodents (i.e.15%) are seleted through quota sampling method and another was considered as a Non-Experimental village were 114 respodents (i.e.15%) are selected through quota sampling method. To collect in-depth data from the heterogeneous peasant groups from the selected villages, the researcher has referred Land holding, Sex and Caste category wise report of Government of Maharashtra, Ministry of Agriculture (Survey report, 2001 / Section-5).

Besides the above methodology some Case Studies were recorded to collect in-depth and qualitative data from the study area. The stratified

sampling method was used for the selection of sample for this study. The primary data were collected by using interview schedule. A pilot survey was conducted using an unstructured interview schedule in the areas, for correcting ambiguity, anomaly in the sequence of questions etc. Two interview schedules were developed for Experimental and Non-Experimental villages for comparative understanding. The information was collected from the landholders of the households. The data were transferred to code sheets and statistical analysis was carried out. For open ended questions such data were edited and coding, the whole data was analyzed by using SPSS Version13.1 (Statistical Packages for Social Sciences). Descriptive Statistics like Mean, Standard deviation, Mean Percentage Score etc. and inferential statistics likep pair sample 't' test, were used for analyzing the data.

Thus, this chapter gave insightful details of the methodological aspects which are scientific base of the present doctoral study; it also showed the journey of development communication in India. Now let us familiarize with the organisation and management of WiMAX pilot project were the researcher was engaged over a period of about eight month for field work in the coming chapters.

CHAPTER - III

ORGANISATION AND MANAGEMENT OF WIMAX PROJECT AT BARAMATI

3.1 Introduction

This chapter gives detailed information of wireless technology in general and WiMAX technology in particular. Particulars of WiMAX system with its organisation and management in the Baramati region also examined in this chapter. Along with this, some case studies related to WiMAX projects around the world are added in this topic. The last part of the topic covers the different applications of WiMAX project in Baramati region. The application of WiMAX in Baramati can be done in following ways:

1) WiMAX Kiosk,
2) Telemedicine,
3) Computer on Wheels,
4) E –Health and
5) Wireless internet connectivity.

3.2 Edges of Wireless Technologies in ICT

3.2.1 Wire-Less Technologies for internet access

Demand for internet is growing both in urban and rural areas, across individuals and corporate, which is expected to remain robust in the future. Statistics reflect that there were about 81 million internet users in the country (growth of 1,520% during the period 2000-2008), making India home to the 4th largest number of internet users in the world, after USA, China and Japan. According to "The 'I-Cube' (Internet in India) study", the number of PC owners (Households) in India grew by 46% in 2008, with 62% of all household PC owners, owning an internet subscription. With the DOT setting aggressive targets of reaching 500 million internet users and 100 million broadband subscribers by 2012, ('Digital Vision – 2012'), significant price declines in

terminal equipment and monthly subscriptions coupled with the growing use of internet for education and commerce means that internet numbers should dramatically rise over the next 2 to 4 years, a trend, which is expected to continue, well into the next decade. Following are the few wireless internet access services which were used before WiMAX.

(A) ISDN - Integrated Services Digital Network : Integrated services digital network (ISDN) is an international communication standard for sending voice, video, and data over digital telephone lines or normal telephone wires. Typical ISDN speed ranges from 64 Kbps to 128 Kbps.

(B) B-ISDN - Broadband ISDN: Broadband ISDN is similar in function to ISDN but it transfers data over fiber optic telephone lines, not normal telephone wires. SONET is the physical transport backbone of B-ISDN. Broadband ISDN has not been widely implemented.

(C)DSL – Digital Subscriber Line: DSL is frequently referred to as an "always on" connection because it uses existing 2-wire copper telephone line connected to the premise so service is delivered simultaneously with wired telephone service -- it will not tie up your phone line as an analog dial-up connection does. The two main categories of DSL for home subscribers are called ADSL and SDSL. All types of DSL technologies are collectively referred to as xDSL. xDSL connection speed ranges from 128 Kbps to 9 Mbps.

(E) Wireless Internet Connections: Wireless Internet, or wireless broadband is one of the newest Internet connection types. Instead of using telephone or cable networks for Internet connection, radio frequency bands are used. Wireless Internet provides an always-on connection which can be accessed from anywhere — as long as one is geographically within a network coverage area. Wireless access is still considered to be relatively new, and it may be difficult to find a wireless service provider in some areas. It is typically more expensive and mainly available in metropolitan areas.

(F)Internet over Satellite: Internet over Satellite (IoS) allows a user to access the Internet via a satellite that orbits the earth. A satellite is placed at a static point above the earth's surface, in a fixed position. Because the enormous distance signals must travel from the earth up to the satellite and back again, IoS is slightly slower than high-speed terrestrial connections over copper or fiber optic cables. Typical Internet over satellite connection speeds (standard IP services) average around 492 up to 512 Kbps.

(G) Wi-Fi: Wi-Fi is the popular name for the wireless Ethernet 802.11b standard for WLANs. Wire line local area networks (LANs) emerged in the early 1980s as a way to allow collections of PCs, terminals, and other distributed computing devices to share resources and peripherals such as printers, access servers, or shared storage devices. One of the most popular LAN technologies was Ethernet. Over the years, the IEEE has approved a succession of Ethernet standards to support higher capacity LANs over a diverse array of media. The 802.11x family of Ethernet standards is for wireless LANs (IEEE, 2008).

Wi-Fi LANs operate using unlicensed spectrum in the 2.4GHz band. The current generation of WLANs supports up to 11Mbps data rates within 100m of the base station. Most typically, WLANs are deployed in a distributed way to offer last-hundred-meter connectivity to a wire line backbone corporate or campus network. Typically, the WLANs are implemented as part of a private network. The base station equipment is owned and operated by the end-user community as part of the corporate enterprise, campus, or government network. In most cases, use of the network is free to the end-users (that is, it is subsidized by the community as a cost of doing business, like corporate employee telephones).

(H) 3G: 3G is a technology for mobile service providers. Mobile services are provided by service providers that own and operate their own wireless networks and sell mobile services to end-users, usually on a monthly

74

subscription basis. Mobile service providers use licensed spectrum to provide wireless telephone coverage over some relatively large contiguous geographic serving area. Historically, this might have included a metropolitan area. Today it may include the entire country. From a user perspective, the key feature of mobile service is that it offers (near) ubiquitous and continuous coverage. That is, a consumer can carry on a telephone conversation while driving along a highway at 100 km/h. To support this service, mobile operators maintain a network of interconnected and overlapping mobile base stations that hand-off calls as those customers move among adjacent cells. Each mobile base station may support users up to several kilometers away. The cell towers are connected to each other by a backhaul network that also provides interconnection to the wire line public switched telecommunications network (PSTN) and other services. The mobile system operator owns the end-to-end network from the base stations to the backhaul network to the point of interconnection to the PSTN (and, perhaps, parts thereof).

(I) Bluetooth: Bluetooth, also known as the IEEE 802.15.1 standard is based on a wireless radio system designed for short-range and cheap devices to replace cables for computer peripherals, such as mice, keyboards, joysticks, and printers. This range of applications is known as wireless personal area network (WPAN).

3.2.2 Limitations of Wireless technologies over WiMAX

(A)Radio Channels: Wireless technologies like Bluetooth, ZigBee and Wi-Fi protocols have spread spectrum techniques in the 2.4 GHz band, which is unlicensed in most countries and known as the industrial, scientific, and medical (ISM) band.

(B) Coexistence Mechanism: Since all wireless technologies use the 2.4 GHz band, the coexistence issue must be dealt with. Basically, Bluetooth and UWB provide adaptive frequency hopping to avoid channel collision, while ZigBee and Wi-Fi use dynamic frequency selection and transmission power control.

(C)Network Size: The maximum number of devices belonging to the network's building cell is 8 (7 slaves plus one master) for a Bluetooth and UWB piconet, over 65000 for a ZigBee star network and 2007 for a structured Wi-Fi BSS.

(D) Security: All the four protocols have the encryption and authentication mechanisms.In 802.11, Wi-Fi uses the RC4 stream cipher for encryption and the CRC-42 checksum for integrity.

(E) Transmission time: The transmission time depends on the data rate, the message size, and the distance between two nodes. Therefore transmission time of all other wireless technologies is very slow as compared to the Wi-Max technology.

The main problems with broadband access are that it is expensive and it does not reach all the areas. The main problem with the Wi-Fi access is that hot spots are very small, so coverage is sparse. WiMAX has potential to do broadband internet access what cell phone has done to phone access. In the same way that many people have given up their 'landlines' in favor of cell phone. WiMAX is also painless it directly connects your computer onto the closest WiMAX antenna. An important aspect of the IEEE 802.16 is that it defines a MAC layer that supports multiple physical layer significations.

3.3 Organisationof WiMAX

3.3.1 Introduction to WiMAX

The WiMAX emerges as the quintessential answer to these problems, given its superior performance and lower costs as compared to the existing 4G technologies and futuristic Long Term Evolution (LTE) equivalents. WiMAX was developed for high speed wireless BB data access and is a 4G technology available today at 4G prices (Proviti, 2010).

The 802.16d standard is a fixed broadband wireless access mainly intended for BS to SS communication. Newly introduced 802.16e standard (which supports mobility and many other features) has been dominant for a

while now. WiMAX forum (www.WiMAXforum.org) is one of the main supporters of 802.16e. This new standard will allow individual users to directly connect with Base Station and will speed up the process of adaptation. 802.16e expects users to have WiMAX card in their laptops and other devices. As this is newly introduced protocol, current cost of such card is very high (Chandarana et al; 2007).

WiMAX (Worldwide Interoperability for Microwave Access) is a wireless communication standard designed to provide 40 to 40 megabit-per-second data rates, with the 2011 update providing up to 1 Gbit/s for fixed stations. The name "WiMAX" was created by the WiMAX Forum, which was formed in June 2001 to promote conformity and interoperability of the standard. The forum describes WiMAX as "a standards-based technology enabling the delivery of last mile wireless broadband access as an alternative to cable and DSL" (Carl Weinschenk,2010).

WiMAX refers to interoperable implementations of the IEEE 802.16 family of wireless-networks standards ratified by the WiMAX Forum. (Similarly, Wi-Fi, refers to interoperable implementations of the IEEE 802.11 Wireless LAN standards certified by the Wi-Fi Alliance.) WiMAX Forum certification allows vendors to sell fixed or mobile products as WiMAX certified, thus ensuring a level of interoperability with other certified products, as long as they fit the same profile.

WiMAX was available in 2006 for commercial deployment. The infrastructure requirements are backhaul to feed wireless networks and base stations. The spectrum uses both licensed and unlicensed bands. WiMAX is strong contender for high mobility enterprise applications. As the cost of WiMAX approaches Wi-Fi, WiMAX becomes the next generation of wireless broadband technology. WiMAX targets multiple site mass metropolitan applications. WiMAX is a lot like Wi-Fi, but unlike Wi-Fi's 200meter range, WiMAX has reach of 25 to 40 km, offering way to bring the internet to entire communities without having to invest billions of dollars to install phone or

cable networks. WiMAX can deliver favorable cost, reach, security and usability. During the aftermath of Hurricane Katrina in the U.S. of Gulf Coast, the communication infrastructure collapsed, except for WiMAX, putting a spotlight on market opportunities for broadband wireless system for all major metropolitan areas (Rao and Radhamani, 2008).

3.3.2 Need of WiMAX

India is projected to become the 4rd largest economy after China and USA. With continued GDP growth in the range of 6% to 8% pa, expansion of business, consequent rising disposable incomes and one of the youngest population profiles (more than 60% people below the age of 40 years4), there is a burgeoning demand for broadband services by individuals and corporate users which has not been met by the currently deployed wire-line, cable and wireless technologies like GSM/Edge/CDMA 1X/EVDO /4G etc.

Existing fixed infrastructure (wire-line, cable etc.) in both urban and rural areas is grossly inadequate to meet this growing demand for broadband as only 17.11% of the existing wire line infrastructure is capable of broadband provisioning through Digital Subscriber Line (DSL) which would restrict the penetration of broadband. Further, growing inability of the existing 2G and 2.5G mobile networks in satisfying the broadband hunger due to spectrum and capacity constraints means, deployment of new wireless networks to offload data-intensive fixed/mobile broadband applications is inevitable. Thus, there is a crying need for deploying a cost effective and scalable wireless broadband technology across the length and breadth of the country to suffice the broadband hunger of the classes as well as the masses while fulfilling policy objectives of the Government. While 4G and BWA spectrum auctions in the 2.4 and 2.5 GHz bands announced by the Government in 2008 is a giant step towards enabling mass proliferation of broadband in India.

The demand for wireless is increasing day by day. Presently, the networks are only available in commercial buildings, homes etc. But people want wireless internet access wherever they go like shopping malls, airport,

roaming around the city etc. They want to have all the facilities that a cable broadband provides like surfing the web, downloading files, video conferencing etc. with higher data rates. In the context WiMAX is positioned as an excellent option. Moreover, the possibility of offering broadband services in combination with voice services will gradually lead to narrow band WLL substitution (Rao R.K., 2010).

3.3.4 Features of WiMAX

IEEE Project 802, the LAN/MAN Standards Committee is responsible for developing the 802 family of standards. Project 802 first met in 1980 and has subsequently specified LAN/MAN standards for a diverse array of networking environments and media. Working Group 802.11 is responsible for WLAN standards.

WiMAX is a great invention in wireless technology providing 40 miles broadband access to mobile users. WiMAX technology based on IEEE 802.16 standard and it is a telecommunication protocol offering full access to mobile internet across cities and countries with a wide range of devices. WiMAX technology has salient features as described below:

(A) WiMAX support multipath: WiMAX technology is offering OFDM-based physical layer which is based on orthogonal frequency distribution. The WiMAX technology is providing confrontation to multipath. Due to its good architecture it allows the user to operate in NLOS condition. Now WiMAX is familiar as a technique of multi path for wireless network.

(B) WiMAX broadband access: WiMAX technology is offering very high speed **broadband access** to mobile internet. When you are using 20MHz the data rate can be high up to 74Mbps. Generally 10MHz with the TDD scheme provides 4:1 up and down link ratio. WiMAX provides very good signals therefore higher data rate can be achieved with multiple antennas. Antennas are used for beam forming, space time coding etc.

(C) **WiMAX offer high speed data rate:**Another feature of WiMAX Technology is high speed data rate. The scalable architecture of physical layer

is offering high speed data rate. WiMAX technology is providing easy scaling of data with possible bandwidth of channel. If the bandwidth of channels vary from 1.25MHz to 10MHz then a system can use 128, 512, 048 bit FFTs which provide dynamic roaming across numerous network having dissimilar bandwidth.

(D) **WiMAX offer modulation and error correction:** The use of WiMAX technology is increasing rapidly because it supports lots of modulation and error correction facility to user. It also allows a user to change the scheme according to channel condition. (AMC) **Adaptive Modulation and Coding** is a valuable method to exploit throughput in a varying channel.

(E) WiMAX support reliability of data: Automatic retransmission of data supported by WiMAX at data link layer for link is a great feature. It is not only improving reliability but also enabled ARQ which necessitate each broadcast packet to be recognized by the receiver, and if any unacknowledged data packets are found unspecified then they are retransmitted.

(G) WiMAX support TDD and FDD: Another significant feature of WiMAX technology is that it supports **Time Division Duplexing** (**TDD**) and **Frequency Division Duplexing** (**FDD**). They both are offering low cost system accomplishment.

(H) WiMAX TDM scheme: The WiMAX technology holds all system therefore any data may be in form of uplink or downlink checked by scheduler from the base station. The total capacity shared between several users according to their demand. And it is done by **WiMAX TDM** (**Time Division Multiplexing**) scheme.

(I) WiMAX MAC layer: The architecture of WiMAX technology is based on MAC layer which is a connection oriented layer. Through MAC layer a user can perform a variety of functions such as various type of application including multimedia and voice can be used. It also supports best efforts for data traffic as bit, real time, traffic flaws etc. The aim to design WiMAX technology is to facilitate large number of user with a variety of connection per terminal.

(J) WiMAX strong encryption: WiMAX technology also facilitates the user with strong encryption. By using AES (Advanced Encryption standard) a user can get strong privacy and administration. The EAP protocol offers flexible substantiation architecture which enables a user to get access to username, password, certificates, and smart card.

(K) WiMAX mobility: The basic and most important feature of WiMAX technology is to support mobility applications as VoIP. The power saving mechanism of WiMAX technology is used to extend the battery life of handheld devices. It supports mobile applications including channel estimation, sub channelization, power control etc.

To get access to WiMAX base station is not a huge task now because the wide range of connectivity of WiMAX provides access to base station from home. Installation of hardware is also very easy with WiMAX technology. With the growth of WiMAX technology its more features may also come up.

3.3.4 Architecture of WiMAX

WiMAX technology is based on IEEE standard for high layer protocol such as TCP/IP, VoIP, and SIP etc. WiMAX network is offering air link interoperability and vendor for roaming. The multi-vendor access from WiMAX focusses on higher level networking specifications for fixed WiMAX, mobile WiMAX, and portable WiMAX. The Architecture of WiMAX technology is based on all IP platforms. The packet technology of WiMAX

needs no legacy circuit telephony. Therefore it reduces the overall cost during life cycle of WiMAX deployment. The main guide lines of WiMAX Architecture are as under:

- The WiMAX architecture supports structure of packet switched. WiMAX technology including IEEE 802.16 standard and its modification is suitable for IETF and Ethernet.
- WiMAX architecture allows decoupling and also sustained topologies for connectivity purpose like IEEE 802.16 radio specifics.
- WiMAX architecture offers flexibility to accommodate a wide range of deployment such as small to large scale. It offers licensed to unlicensed opportunity. WiMAX also supports urban and rural radio propagation. The use of mesh topologies make it more reliable. It is the best co existence of various models.
- WiMAX architecture offers various services and applications such as multimedia, Voice, mandated dogmatic services as emergency and lawful interception.
- WiMAX architecture provides a variety of functions such as ASP, mobile telephony, interface with multi internetworking, media gateway, delivery of IP broadcasting such as MMS , SMS, WAP over IP.
- WiMAX architecture supporting roaming and internetworking. It support wireless network such as 4GPP and 4GPP2.It support wired network as ADSL, MSO based on standard IETF protocols.
- WiMAX architecture also supports global roaming, consistent use of AAA for billing purposes, digital certificate, subscriber module, USIM, and RUIM.
- The range of WiMAX architecture is fixed, portable, nomadic, simple mobility and full mobility.

WiMAX Forum industry represents a logical representation of the WiMAX architecture. The main objective behind WiMAX architecture is to provide amalgamated support needed in a range of network models. The NRM makes

out well-designed entities and allusion points accomplished between functional entities. The WiMAX architecture consists of three logical entities MS, ASN, and CSN and reference point for interconnection. All three correspond to a grouping for functional entities which may be single or distributed physical device over several physical devices which may be an implementation choice. The manufacturer chooses any implementation according to its choice which can be individual or combined. The NRM is based on the designation of communication protocol and management of data sketch to attain end to end function. It allows manifold implementation for specified useful entity such as mobility and security management.

(A)Base station (BS)-The responsibility of Base station (BS) is to provide the air interface to the MS. The other functionality of BS is micro mobility supervision functions, the handoff prompting, supervision of radio resource, classification of traffic, DHCP, keys, session and multicast group management.

(B) Access Service Network (ASN)-The ASN (Access Service Network) is used to describe an expedient way to explain combination of functional entities and equivalent significance flows connected with the access services. The ASN offers a logical boundary for functional of nearby clients. The connectivity and aggregation services of WiMAX are personified by dissimilar vendors. Planning of functional to logical entities are represented in NRM which may execute in unusual ways. The WiMAX forum allows different type of vendors implementation that is interceptive and well-matched for a broad variety of deployment necessities.

(C) Connectivity Service Network (**CSN**) – It is a set of functions related to network offering IP services for connectivity to WiMAX clients. A CSN may include network fundamentals such as AAA, server, routers, and user database and gateway devices that support validation for the devices, services and user. The Connectivity Service Network also handles different type of task such as management of IP addresses, support roaming between different NSPs,

management of location, roaming, and mobility between ASNs. The WiMAX architecture is offering a flexible arrangement of functional entities while constructing the physical entities, because AS may be moulded into BTS, BSC, and an ASNGW, which are equivalent to the GSM model of BSC, BTS and GPRS Support (SGSN).

3.3.5 WiMAX setup and working

WiMAX Setup- WiMAX equipments are not well known because there are very limited subscriber demands for WiMAX Products and equipments. Most WiMAX equipments are installed with WiMAX Technology chip which are certified by WiMAX forum. WiMAX forum is leading the way in support and setting standards in WiMAX technology and its deployment. There are many WiMAX products and equipment available in market with limitations. The necessary equipment required for WiMAX Technology consists of WiMAX base stations, WiMAX receiver, WiMAX antenna, and WiMAX backhaul.

(A) Base Station- WiMAX base station consists of indoor WiMAX equipment and a WiMAX tower. The common range of WiMAX base station is up to 10km radius, while a base station can cover 50km or 40miles but in practice it is 10km and 6 miles only .Any node inside the coverage area would be capable to access the internet. WiMAX base station works as a media access control layer and allocates uploading and downloading bandwidth according to the subscriber requirements.

(B)WiMAX receiver- The WiMAX receiver is a standalone box or PCMCIA cards which is located in your computer or laptop. It is also called customer promise equipment.

(C)WiMAX Antenna- WiMAX antenna is also a standalone box and sits in laptop or computer .WiMAX antenna is just like a WiFi network but the coverage area of WiMAX is much larger than WiFi wireless network. WiMAX antenna is used to get better signal strength of WiMAX user from base station. The WiMAX's external antenna is mostly required in dense areas and high,

mountain areas. WiMAX antenna is connected with the indoor unit via wire to make stronger signals.

(D)WiMAX Backhaul- WiMAX backhaul is in fact a link system from the access point. It is used to connect system to the backbone. You can connect numerous base stations with one another with the high speed backhaul microwave links. A backhaul allow WiMAX user for roaming from one base station to another base station just like a cellular phone.

(E) WiMAX Future Products &Equipment- There are many other products which are significant in common use for general community such as WiMAX cards used for desktop and laptops computers within an installed microchip. WiMAX products are under testing procedure therefore very uncommon in market. No doubt in coming days WiMAX deployment takes over the older technologies through WiMAX product.

Working of WiMAX- WiMAX stands for Worldwide Interoperability for Microwave Access offering internet access point to point or point to multipoint or path. It is based on IEEE 802.16.WiMAX make possible the broadband access to conservative cable or DSL lines. The working method of WiMAX is little different from WiFi network, because WiFi computer can be connected via LAN card, router, or hotspot, while the connectivity of WiMAX network constitutes of two parts in which one is WiMAX Tower or booster also known as WiMAX base station and second is WiMAX receiver(WiMAX CPE) or Customer Premise Equipment.

The WiMAX network is just like a cell phone. When a user send data from a subscriber device to a base station then that base station broadcast the wireless signal into channel which is called uplink and base station transmits to the same or another user is called downlink. The base station of WiMAX has higher broadcasting power, antennas and enhanced additional algorithms. WiMAX technology providers build a network with the help of towers that enable communication access over many miles. The broadband service of

WiMAX technology is available in coverage areas. The coverage areas of WiMAX technology is separated in series of over lied areas called channel.

When a user sends data from one location to another the wireless connection is transferred from one cell to another cell. When signal transmit from user to WiMAX base station or base to user (WiMAX receiver) the wireless channel faces much attenuation such as fraction, reflection, refraction, wall obstruction etc. These all attenuation may cause distortion, and split towards multi path. The target of WiMAX receiver is to rebuild the transmitted data perfectly to make possible reliable data transmission.

The orthogonal frequency division multiplexed access (OFDMA) in WiMAX technology, is a great technique used to professionally take advantage from the frequency bands. The transmission frequencies of WiMAX technology from 2.4MHz to 4.5 GHz make it low price wireless network. Each spectral profile of WiMAX technology may need different hardware infrastructure. Each spectrum contains its bandwidth profile with resolved channel bandwidth. The bandwidth signal is separate in OFDMA (Orthogonal Frequency Division Multiplexed Access) which is used to carry data called sub carrier.

Transmitted data is divided into numerous data streams where everyone is owed to another sub carrier and then transmitted at the same broadcast interval. At the downlink path the base station broadcasts the data for different user professionally over uninterrupted sub-carriers.

The independency of data is a great feature of OFDMA (Orthogonal Frequency Division Multiplexed Access) that prohibits interfering and multiplexing. It also makes possible power prioritization for various sub carriers according to the link quality. The sub carrier having good quality carry more data since the bandwidth is narrow. But those who have low quality carry no data. WiMAX is provides quality of service (WiMAXQoS) which enables

high quality of data like VoIP or TV broadcasts. The data communication protocol from base station is alternative of quality of service (WiMAXQoS) application and offers video streaming. These types of data are translated into parameters or sub carriers per user. All type of technique are carrid out together to speed up coverage, bandwidth, efficiency and number of users. The base station of WiMAX has ability to cover up 40 miles. WiMAX technology supports various protocols such as VLAN, ATM, IPv4 Ethernet etc.

3.3.6 Applications of WiMAX

WiMAX network provides the ability for service provider to deploy new era broadband service. WiMAX applications are most effective. It provides a broad customer base, while adding up a mobility feature to those services. WiMAX technology applications are a means of service providers to present data, video, voice, mobile and internet access. There are various benefits of WiMAX technology such as it provides simple based prospective cost saving and service efficiency but to be capable to allow VoIP calling, mobile devices, video making and high speed data transfer

WiMAX technology brings a new ingredient to today's mobile community. The most important application offered by WiMAX Technology is business, consumer connectivity, and backhaul. WiMAX Technology carries real augmentation to communication through which you can get benefit not only from voice but also video and data transmission to get quick response to situation. Through WiMAX Technology a client can deploy a temporary communication services and speed up their network to support events and circumstances. WiMAX technology applications enable you to get temporary access to media, visitors and employees. If you exist in tower range then you can get easy access to premises equipment for such events. The basic strength behind the WiMAX Technology applications are high bandwidth, high quality services, security, deployment, full duplex including DSL and versus cable, and

its cost. The bandwidth and range of WiMAX make it suitable for the following potential applications.

(A) Cellular Backhaul-The market for cellular services is becoming more and more competitive. To stay in the business, cellular operators are constantly looking for ways to reduce operating costs. Backhaul costs for cellular operators represent a significant portion of their recurring costs. WiMAX can provide Point-to-Point links of up to 40 miles (50 km), with data rates capable of supporting multiple E1/T1s Cellular operators can therefore use WiMAX equipment to backhaul Base Station traffic to their Network Operation and Switching Centers.
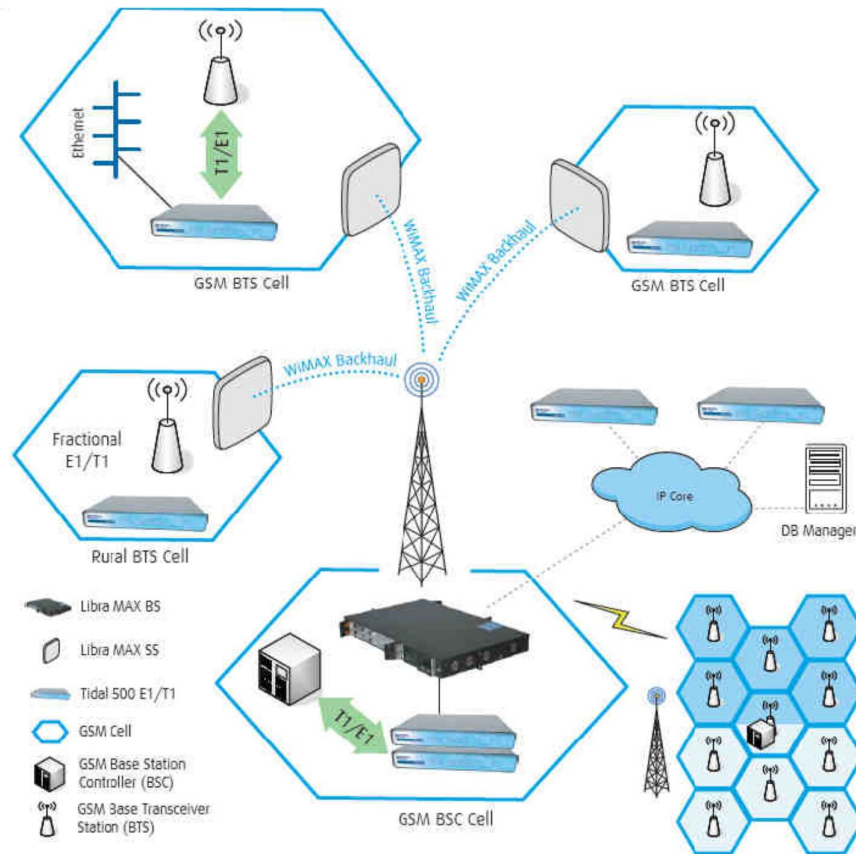
Diagram No.3.1 Backhaul network of WiMAX.

Cellular traffic is a mix of voice and data, for which the built-in QoS feature of WiMAX is highly suited. Leasing backhaul facilities from local telephone companies can be cost prohibitive, and deploying a fiber solution,

which is both costly and time consuming, could negatively impact rollout of service. Wired solutions for providing cellular backhaul are seldom cost-effective in rural or suburban areas and most versions of DSL and cable technology cannot offer the required bandwidth, especially for backhauling upcoming 4G networks.

(B) Internet access: WiMAX can provide at home or mobile internet access across whole cities or countries. In many cases this has resulted in competition in markets which typically only had access through an existing incumbents DSL operator. Additionally, given the relatively low costs associated with the deployment of a WiMAX network (in comparison with other service networks), it is now economically viable to provide last mile broadband internet access in remote locations especially suitable for villages in India.

The WISP could be a CLEC (Competitive Local Exchange Carriers) that is starting its business with little or no installed infrastructure. Since WiMAX is easy to deploy, the CLEC can quickly install its network and be in position to compete with the ILEC (Incumbent Local Exchange Carrier). The WiMAX built-in QoS mechanism is highly suited for the mix of traffic carried by the CLEC. The QoS MAC also offers multi-level service to address the variety of customer service needs. A common network platform, offering voice, data and video, is highly attractive to end customers, because it presents a one-stop shop and a single monthly bill. Support for multiple service types allows for different revenue streams, yet it reduces customer acquisition cost and increases ARPU (Average Revenue Per User). The WSP needs only one billing system and one customer database.

(C) Banking Networks-Large banks can connect branches and ATM sites to their regional office through a private WiMAX network carrying voice, data and video traffic. These banks are normally spread over a large area and need high security and bandwidth to handle the traffic. WiMAX data encryption offers excellent link security, however, banks will most likely also need end-to-end security, such as that provided by SSL, to protect against undesired interception and manipulation of sensitive banking traffic. The broad coverage

and high capacity allows the bank's regional office to be connected to a large number of diversely located brand offices and ATM sites. WiMAX networks also offer a high degree of scalability, so that low-data-rate traffic between the regional office and ATM machines can co-exist with the high level of traffic needed to support branch-to-regional office communications. This is made possible by the WiMAX QoS, which is used to prioritize voice (telephony among branches), data (financial transactions, email, Internet, and intranet) and video (surveillance, CCTV) traffic.

It is desirable for banks to own their own networks, for a number of reasons. Besides eliminating the repeat costs charged by telephone companies, this will provide banks the ability to quickly redeploy their network if an ATM or branch is temporarily or permanently relocated. In addition to their inability to be quickly deployed, most versions of DSL and cable technology will not provide the bandwidth required to support and sustain branch-to-regional office communications.

(D) Educational Networks: School boards can use WiMAX networks to connect schools and school board offices within a district, as shown below. Some of the key requirements for a school system are NLOS, high bandwidth (>15 Mbps), Point-to-Point and Point-to-Multipoint capability, and a large coverage footprint.
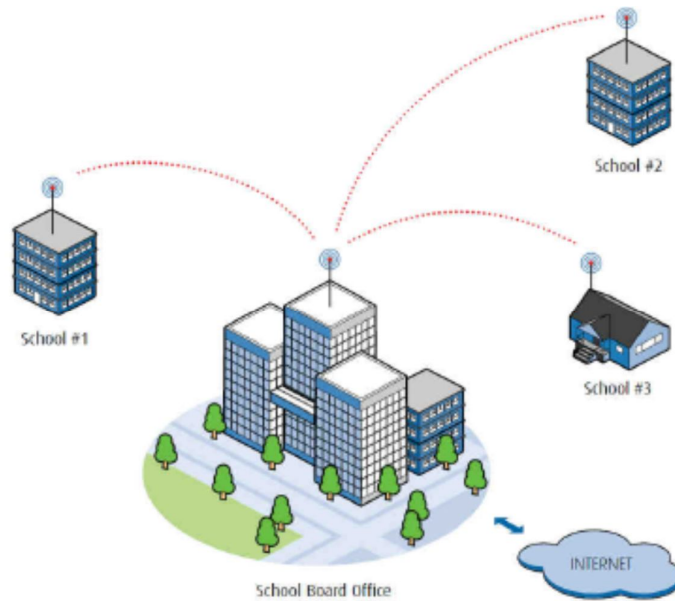
Diagram No.3.2WiMAX for educational institutions.

WiMAX based education networks, using QoS, can deliver the full range of communication requirements, including telephony voice, operating data (such as student records), email, Internet and intranet access (data), and distance education (video) between the school board office and all of the schools in the school district, and between the schools themselves. The WiMAX solution provides broad coverage, making it very cost-effective, particularly for rural schools, which may have little or no communication infrastructure and which are widely dispersed. When school boards own and operate their own network, they can be responsive to changes in the location and layout of their facilities. This will significantly reduce the annual operating cost of leased lines. Wired solutions cannot offer a quickly deployable, low-cost solution and most versions of DSL and cable technology do not have the throughput required by these education networks.

(E) Oil and Gas industry-In today's competitive and highly volatile energy markets, it is imperative that oil and gas companies optimize their exploration and production activities. Fast decisions, facilitated by instant data and voice communications, are keys to sustained revenue generation and cost reduction.

Much of today's oil and natural gas production occurs in largely remote areas of the world beyond the economic range of traditional wired communications. Oil and gas companies must regularly collect critical data from remote well sites, offshore drilling platforms, and outlying production locations, and from SCADA systems set up to monitor facilities, such as storage tanks, pumping stations, or pipelines. Company personnel require high-speed voice and fax services, email and web browsing (e.g. training). Establishing the required broadband network links between multiple locations can be extremely difficult and cost prohibitive, given that these activities generally occur where wire line links are not practical.
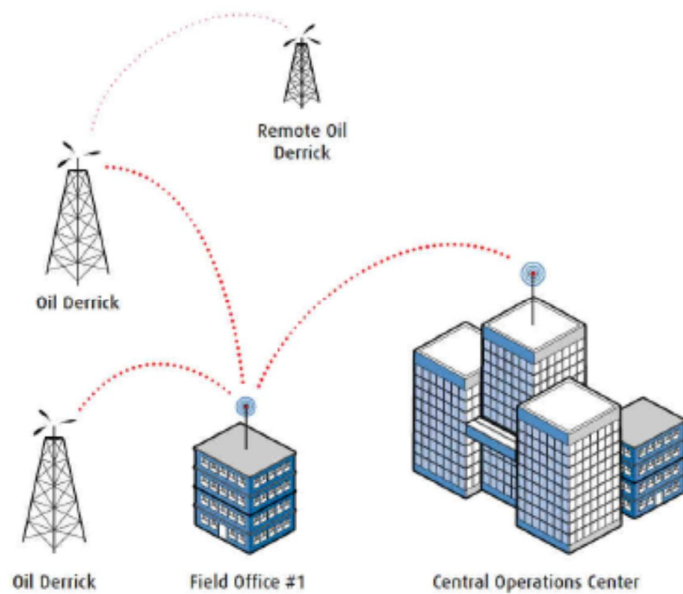
Diagram No.3.3Communication of Oil and Petroleum companies.

(F) Public Safety and Security- Government public safety agencies, such as police, fire, search and rescue, can use WiMAX networks to support response to medical and other emergency situations.
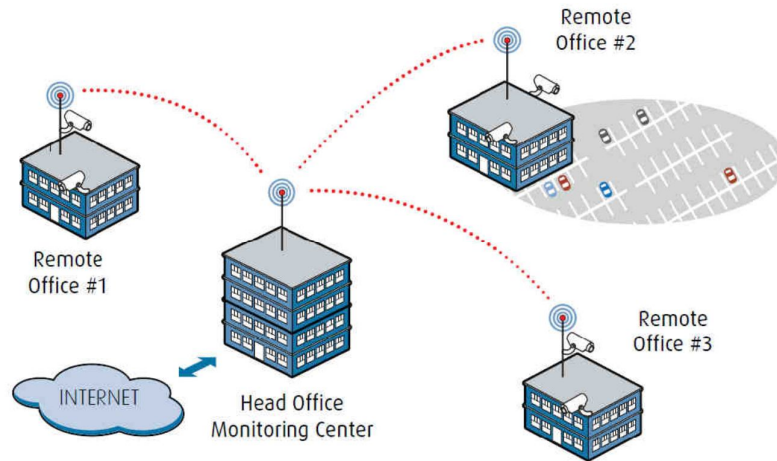
Diagram No.3.4WiMAX for Oil and Petroleum companies.

In addition to providing two-way voice communication between the dispatch center and on-site emergency response teams, the network relays video images and data from the site of the accident or disaster to the control center. This data can be relayed to expert teams of medical or emergency staff, who can analyze the situation in real-time, as if they were on site. WiMAX QoS allows the network to handle these diverse types of traffic. WiMAX solutions are highly deployable, so the initial response team can set up a temporary wireless network at the site of the accident, event, or natural disaster, in a matter of minutes. They can also relay traffic from this network back to a control or dispatch center, over an existing Imax network. Wired solutions are not appropriate situations like these, due to unpredictability and instability of accidents and disasters. As well, there may be a requirement for mobility, such as, for example, a policeman wanting to access a database from moving vehicle, or a fireman wanting to download information about the best route to a fire scene or the architecture of the building on fire. A video camera in the ambulance can offer advance information about the condition of a patient, before the ambulance reaches the hospital. In all of these cases, WiMAX provides support for mobility and high bandwidth, which narrowband systems cannot deliver.

(G) Rural connectivity-Service providers use WiMAX networks to deliver service to underserved markets in rural areas and the suburban outskirts of

cities. The delivery of rural connectivity is critical in many developing countries and underserved areas of developed countries, where little or no infrastructure is available. Rural connectivity delivers much-needed voice telephony and Internet service. Since the WiMAX solution provides extended coverage, it is a much more cost-effective solution than wired technology in areas with lower population densities. WiMAX solutions can be deployed quickly, providing communication links to these underserved areas, providing a more secure environment and helping to improve their local economies.

3.3.7 Benefits of WiMAX

(A) Macro-Economic Benefits- Expanding broad band networks to non-metro areas, where majority of the country's small and medium businesses are run, can spread economic efficiency and productivity and helps in diversifying the income. Further, decentralization of businesses would help to reduce cost of operations thereby improving business efficiency.

(B)Social benefits-

1) Employment generation- WiMAX has potential of 2 million people in direct employment and 59 million people indirect employment (ASSOCHAM and CII,2007).

2) Public policy initiative- Provision of ubiquitous broadband services would be key to success and furtherance of e-Governance, e-literacy, e-health programmes and other social services in remote regions across India. It would also help to ensure connectivity to 100000 common service centres, a recent initiative by the department of Telecom and Department of Information Technology to accelerate delivery of e-governance, entertainment, education, telemedicine, e-commerce, info-services etc to villages across India.

WiMAX promises to provide high-speed wireless cost effective connectivity more easily than current cellular technologies and it offers the scalability to deliver affordable broadband access across India. With the potential

extendibility of wireless infrastructure to provide portable and mobile device support in future, WiMAX offers additional advantages for developing economies globally, such as that of India that do not have wide spread broadband technologies already in place.

3.3.8 Limitations of WiMAX

(A)Low bit rate over Long distance- WiMAX technology offering long distance data range which is 70 km or 40 miles and high bit rate which is 70Mbit/s. which is good but both features doesn't work together. When we increase distance range the bit rate will decreased and if we want to increase bit rate then we should reduce the distance range.

(B)Speed of connectivity -The WiMAX other drawback is that any user closer to the tower can get **high speed** which is up to 40Mbit/s but if a user exist at the cell edge from the tower can obtain only 14Mbit/s speed.

(C)Sharing of bandwidth- In all wireless technology the bandwidth is shared between users in a specified radio sector. Therefore functionality could go down if more than one user exists in a single sector. Mostly user have a range of 2 to 8 or 12 Mbit/s services so for better result additional radio cards added to the base station to boost the capability as necessary.

(D)WiMAX over Wi-Fi- Anyone can build up a WiFi network but to set up a WiMAX network is really expensive so it is very hard for every one that they pay large mount for the setup and frequency license of WiMAX in a region.

(E) WiMAX technology and Different architecture- Because of low bit range on long distance, speed of connectivity from long range, and low bandwidth among user the different granular and dispersed network architectures are being unsupported into WiMAX during autonomous progress.

3.3.9 Growth and Development of WiMAX

New products and key deployments are accelerating WiMAX growth. By 2010 the worldwide WiMAX market reached to $4.5 billion and accounting

for 4% of total broadband usage. This growth is driven by new equipment from the growing list of hardware suppliers and an increasing number of WiMAX trails and deployments. WiMAX has attracted many leading equipment manufacturers and component suppliers. Many are also forming strategic partnerships. Alcatel, Intel implemented dedicated WiMAX project. The current WiMAX project at Baramati is initiated by the Intel under the World Ahead Programme.

3.4 Governance of WiMAX

3.4.1 Indian Governmental Policies on WiMAX

At the macro level, mass proliferation of broadband is expected to spread economic efficiency and productivity and assist in diversifying income. Further it is vital ingredient to push government's initiative of e-governance, improved educational opportunities for health services in rural and remote locations. Over and above, there would be significant revenue generation from spectrum auctions and taxes on services and import of equipment. Thus, broadband connectivity and services can be a key driver for several socio-economic gains. As per the Vision 2020 report of planning commission broadband will play strategic role in rural as well as urban development.

BSNL has 20 MHz of BWA spectrum in the 2.5GHz frequency. This project was successfully launched in Goa, Punjab, Haryana in 2009. Having completed an initial deployment of 1000 base stations already, the company plans to launch another 1600 base stations by the end of 2009 with capacity to service 1.1 million subscribers. BSNL has successfully tested the service speeds of 2Mbps and 1 Mbps at a distance of 2km and 8km in rural areas and 2Mbpsand 1Mbpsat a distance of 2.5kmand 15km respectively in rural areas.

3.4.2 ICT infrastructure for application of rural E-Governance

The empowerment of rural communities is crucial for the development of Rural India. Bringing the rural people into the mainstream of the digital technologies is a major concern now. Rural development implies both the

economic development of the people and social transformation using e-governance (Chaudhari K.et al, 2011).There is comprehensive wired communication infrastructure in place today. WiMAX connectivity could play major role in improving the quality of public services and could bring substantial improvement in rural areas. *E*-governance is defined as "the application of information and communication technologies to transform the efficiency, effectiveness, transparency and accountability of informational and transactional exchanges with in government, between govt. and govt. agencies of National, State, Municipal and Local levels, citizen and businesses, and to empower citizens through access and use of information" (Michiel B,2001; Jain et al,2004).

Table 3.1:Comparisons of Rural wireless options.

Technology	Data Rate	Coverage**
Wi-Fi	11 or 50 MBps<= 200 Mbps*	100 - 1000 ft< 10 Km
WiMAX	<= 70 Mbps	<= 50 Km
Satellite	256 Kbps - 15 Mbps	40% of earth
Balloons	Unsure	40 cell towers

*Wi-Fi typically ha a rate of 11 or 54 Mbps (802.11a, b, g) but rates can get as high as 200 Mbps for 802.11n;
**Coverage range of a single tower or device. For WiFi, one source cites ranges only to 100 ft while another gives a range of Kms.
Source- Vaughan-Nichols;2004.

Table 3.2 :Comparison of WiMAX standards.

	IEEE 802.16—2001	IEEE 802.16a	IEEE 802.16d—2004	IEEE 802.16e—2005
Completed	Dec 2001	Jan 2004	Sept 2004	Dec 2005
Spectrum	10 - 66 GHz	2 - 11 GHz	2 - 11 GHz	2 - 11 GHz
Propagation/Channel Condition	LOS	NLOS	NLOS	NLOS
Bit Rate	Up to 144 Mbps (28 MHz channelization)	Up to 75 Mbps (20 MHz channelization)	Up to 75 MHz (20 MHz channelization)	Up to 15 Mbps (5 MHz channelization)

Modulation	QPSK-16-QAM (Optional in UL) 64-QAM (Optional)	BPSK, QPSK 16-QAM 64-QAM 256-QAM (Optional)	256 Subscriber OFDM, BPSK QPSK, 16-QAM 64-QAM 256-QAM	Scalable OFDMA, QPSK 16-QAM 64-QAM 256-QAM (Optional)
Mobility	Fixed	Fixed	Fixed/Nomadic	Portable/Mobile

Source- Vaughan-Nichols;2004.

3.4.3 Rural information need

Farmers in rural pockets require various information for day-to-day agricultural activities as well as for economic needs. However, rural area have adequate infrastructure to connect with world and limitations to get proper and quick information. Following are major sector where rural people are in search of information.

❖ **Health**
❖ **Agriculture**
    o Rainfall (forecasting)
    o Cropping Pattern
    o Modern Techniques of Cultivation/Farming
    o Irrigation (Sources)
    o Information on Market and Market Prices
❖ **Education**
    o Distance Education/Learning
    o Information on Schools & Virtual Schooling
❖ **Government Information**
    o Information on Soft loans & Financial Institutions
    o Information on Government Go downs
❖ **Land Records**

3.4.4 Feasibility of WiMAX

WiMAX makes most sense in rural areas. WiMAX base stations are particularly cost-effective in rural areas, because of their range of 50 kilometers. Furthermore, in many of these areas, the need for mobility is limited. In rural areas, not many people have motor transport, so mobility is not an issue. And the application of major importance is voice. In these areas, there is no other access method. The only question, then, is how to build up the core. At this point, India has made a huge investment in Class 5 switches, and there is still capacity on those switches. Operators are not going to be anxious to move to soft switches. Therefore, when using WiMAX for voice applications, operators will need to use gateway products like Commatch 6004 to provide connectivity for WiMAX end users to existing TDM switches. Using this kind of low-cost solution is an important factor in making WiMAX a feasible technology for an immediate voice access solution in rural areas. The major difference between 4G and WiMAX is the base station range. A 4G base station might reach a few kilometers in an optimistic estimate, whereas WiMAX base stations can reach even up to 50 kilometers. For rural areas where there is no communication access yet, this has a major impact. It's much more practical to use WiMAX in rural areas, where one base station could serve a wide area. Furthermore, WiMAX can be practical for backhaul, with those distances between base stations and with its broadband capabilities.

Operators are moving towards either the 4G or the WiMAX path, depending on their current infrastructure. Carriers with mobile infrastructure are basically looking at the 4G and LTE path for progression towards wireless broadband, while fixed-line operators are looking towards WiMAX. 4G is more practical in urban areas. However, in India we are already facing problems with frequency allocation in particularly crowded areas, so it would be fine that 2G and 4G technologies will exist side-by-side with WiMAX technologies.

3.4.6 India is major market of WiMAX

As per Infonetics report, India is the most ripe market for WiMAX with VoIP playing a key role in adoption. India is the largest single-country WiMAX opportunity in the world, with most of the major operators actively pursuing WiMAX (BSNL, Tata, BhartiAirtel, etc); deployments are well-underway with acceleration in adoption experienced in many telecoms circles. As per a report by ASSOCHAM, WiMAX broadband subscribers in India will outnumber 4G subscribers by 2014. As per the report, there will be 20 million 4G-based broadband subscribers by 2014 as opposed to 60 million WiMAX users. The rationale behind these numbers is the availability of 20 MHz spectrum per operator and the expected lower price of WiMAX based devices (WiMAX data card is expected to be available for as little as $40, compared to $80 for 4G).

According to research by MIC(Market Intelligence and Consulting Institute) Indian WiMAX subscriber base topped 120000 by the end of 2014 representing year by year growth over 45%. Currently major Indian WiMAX carriers are state-owned carriers BSNL and MTNL as well as private owned carrier Tata communication, Reliance communication, Sify and Bharti Airtel which have begun deploying fixed WiMAX networks in the 4.5GHz frequency band. A recent study sees India's WiMAX subscriber base hitting 14 million by Year 2014 and grow annually at nearly 140% which means that in the next four years about 20% of the global WiMAX users will be in India, making it a $14-billion market.

Emerging markets are regarded as the primary market for the WiMAX industry, specifically India, whose market is expected to grow significantly. Currently, the number of people using broadband in India is relatively low. There are only 4.5 million users out of a population of 120 million. Therefore, it is certainly a great opportunity for WiMAX operators to increase their coverage area. It is predicted that there will be 27 million WiMAX users in India before 2012, which would account for 20% of the worldwide WiMAX market. These days, Indian operators, have already deployed a 802.16d fixed

WiMAX network between 4.4GHz-4.4GHz. Some of them have already finished deployment in many cities. According to the data from the Indian government, the economic growth rate continues to rise 9% each yearand mobile consumers continue to increase by roughly 8 million users each month. After the issuance of licenses for WiMAX network deployment, it is expected to bring large-scale business opportunities for purchasing WiMAX equipment and terminal products. India probably will see the world's lowest end -to-end cost for WiMAX service and will drive costs down further than any other market. Integrated operators will erect Imax towers along with CDMA towers and derive further cost advantages. Third-party radio-tower companies have emerged within the last year in India who offer managed tower services for cellular operators. An extension of this would be to provide nationwide WiMAX tower services in managed -service mode. Bringing together thousands of towers is bound to create additional cost benefits to the WiMAX operator. Currently, cellular operators are deriving a 15 -18% cost advantage from shared tower services. The Internet user population in India will have exceeded 200 million. This will be made possible by lower -cost PCs and notebooks, CPEs below US$40, and cheaper broadband service. It is predicted to accumulate 21 million BWA subscribers by 2014, counting both residential and business segments. WiMAX subscribers should represent the majority of this figure. Approximately 66% of the WiMAX subscribers will be mobile 802.16-2005, predominately residential, while fixed WiMAX will continue to be driven by large corporations and, to a lesser extent, by SME customers. The Indian market for WiMAX will continue to be one of the most sought after markets for global equipment vendors. The nation promises to offer huge, consistently high growth for the next several years, judging by its extremely low broadband penetration rates (under 4 million for a population of over 1 billion).

3.5 Management of WiMAX Project at Baramati

> *"Applying technology in pioneering ways can help increase access to healthcare and improve quality of care for people everywhere. We've seen how technology has enhanced people's lives in Baramati, and look forward to seeing this replicated on a larger scale across Tamil Nadu and the rest of the country."*

In March 2008, Intel Corporation, the world's largest semiconductor manufacturer and leading microprocessor company, organized a conference at Baramati located in Western India along with a local educational institution in India. The main purpose of the conference was to showcase the use of information and communication technologies (ICTs) in providing sustainable solutions for poor communities. Baramati assumed special importance to Intel, as it was the location from where Intel had started its corporate social responsibility program called "World Ahead" in India in May 2006. The program aimed at bringing technology to rural areas by supporting the government.

Intel had announced an investment of about US$ 1 billion on the World Ahead' program. The program aimed at bridging the technology and education gap between developed and developing countries that existed in different parts of the world and also to raise the overall standard of life of people living in these communities. The investment was to be made over a period of five years. According to the company, the project was designed to improve human life in four broad ways – increase accessibility to PCs in remote areas, enhance connectivity through wireless broadband, improve the education system through advanced methods of teaching and learning,

as well as provide localized content and application.

According to the company, Intel had been involved in a number of corporate social activities since its inception. The founders, it said, believed in giving back to the communities which had helped the company to grow. The company paid special importance to education, as it wanted to nurture talented people. Apart from education, the other areas of focus included healthcare, environment, and public policy. Rather than considering these as mere philanthropic activities, Intel regarded them as strategic opportunities for investment in communities and human development.

In India, Intel partnered with a number of IT service companies, state government bodies, Internet Service Providers, non-governmental organizations (NGOs), health, and educational institutes to implement the program. The first phase of implementation began with the community development at Baramati, Maharashtra where the company implemented tele-health services, used mobile Personal Computer (PC) vans to conduct computer education, and ran a school health monitoring system. However, many analysts felt that Intel had launched the program more with an eye on creating new markets than because it was focused on community development.

Intel denied the allegation saying it did want to develop the backward communities. Some analysts, however, pointed out that even if they were being done with capitalistic motives, such efforts brought prosperity for not just the company but for the whole ecosystem at large. As of mid-2009, Intel continued to implement the World Ahead program in various parts of India as well as in other countries across the world.

3.5.1 Background of Intel World ahead Programme

Intel was founded by Gordon E. Moore (Moore) and Robert Noyce (Noyce) in July 1968 at Silicon Valley, Northern California, in the US. Both Moore and Noyce left their jobs at Fairchild Semiconductors to

start this new venture. They were supported by Arthur Rock (Rock), a venture capitalist, who contributed US$ 10,000 for the initial start up and later also helped the company raise additional fund of US$ 2.5 million by issuing convertible debentures. Rock was made the Chairman of Intel the same year.

In 1969, Intel came out with its first product, the 4101 Schottky bipolar random access memory (RAM), a type of data storage device. In 1971, the company was listed on NASDAQ after it came out with its initial public offering at a value of US$ 24.50 for each share, raising US$ 6.8 million in the process.

Intel began manufacturing memory chips and went ahead to develop the first microprocessor, the 4004, within three years of starting its business. Over the years, Intel continued with its product development and upgraded its products within a short span of time. It developed products like microprocessors, chipsets, boards, systems, and software building blocks that were essential parts of computer architecture as well as for the Internet. Intel's products catered mainly to the computer and communication companies that provided high technological solutions for the end users.

Talking about the relevance of Intel's products to their operational markets, Paul S. Otellini (Otellini), President and Chief Executive Officer, Intel, said, ―Perhaps our greatest strength, however, is that we design and build what the world needs. Our products and technologies are at the heart of computing and communications systems that have become essential parts of businesses, schools, and homes around the world, and are being used to tackle some of the world's most complex problems – in areas such as education, healthcare, economic development, and environmental sustainability.

As of 2008, Intel had a world-wide presence with its operations divided into four geographical regions – Asia-Pacific, Japan, the Americas, and Europe (Refer to Exhibit I for Geographic Breakup of Revenues of Intel). For the financial year 2008, Intel reported revenues

worth US$ 7.6 billion, an operating income of US$ 9.0 billion, and a net income of US$ 5.4 billion (Refer to Exhibit II for Income Statement of Intel for five years between 2004 and 2008).

3.5.2 Launching of Intel World Ahead Programme at Baramati

According to analysts, the major credit for creating and implementing the World Ahead Program went to Craig Barrett, Chairman, Intel, who was also the Chairman of United Nation's (UN) Global Alliance for ICT and Development (GAID). Analysts opined that holding this position under the UN had further motivated him to come up with technology driven projects like the World Ahead Program, putting Intel's resources into use.

In May 2006, Intel's World Ahead Program was started primarily to bridge the technological gap that existed in the remote areas of developing nations and to help the people of these areas to live a better life with the assistance of education and exposure to technology. According to analysts, the company implemented the program mainly in developing countries and growing economies rich in resources like Brazil, India, China, and South Africa, along with smaller but fast-growing countries such as Vietnam and Pakistan. The five-year project aimed to bring out one billion new PC users (Refer to Table I for the Objectives of the World Ahead Program).

3.5.4 Objective of World Ahead Programme

Bring out low priced PCs with full features for first time users as well as PCs tailored to suit the needs of different communities and market segments. At the same time, develop infrastructure to sustain the increased number of users.

Develop low-cost, full-featured PCs for first-time computer users and customized PCs to meet the special needs of geographical regions and market segments, as well as the infrastructure to sustain them.

- Extend and deploy WiMAX technology across the world.

- Work in collaboration with local government bodies and other companies on digital- inclusion programs.

- Impart training to ten million more teachers regarding incorporating technology in education.

- Donate 100,000 PCs to schools in developing areas, in order to popularize the use of technology for improved learning.

According to Otellini, with more and more people starting to use technology and technological products, the cost of these would decrease, benefiting the people in the developing nations as well as other countries across the world. He said, ‑While affordability of PCs is crucial, the World Ahead Program goes beyond simple cost to develop the right systems tailored to local needs, drive critical connectivity, cultivate sustainable local capabilities, and provide the quality education needed to make a meaningful difference in people's lives. Intel aimed to bring about progress in these places through four areas: accessibility, connectivity, content, and education.

3.5.5 Accessibility

Intel wanted to increase the accessibility of computers to people by creating opportunities wherein more and more people could afford to purchase and use PCs. The company developed a low priced PC with all the features of a regular PC and also developed content relevant to local needs in different countries across the world.

Intel partnered with the governments of over 50 countries to develop digital inclusion programs that helped in easy purchase or lease of low priced PCs (Refer to Exhibit III for a Note on Intel's Digital Inclusion Programs). Moreover, under Intel's _Discover the PC' initiative, customized PCs with technology solutions suited to the usage group were made available

in different places. There were primarily three types of PCs. The first was a low cost PC with regular features, a user friendly model made primarily for use at home and at the work place. The second type called a Community PC, was meant for PC kiosks installed for public access of useful information like weather forecasts, crop rates etc. via the Internet. As they were meant for public use, these PCs were sturdy and had a rugged chassis to bear unfriendly conditions like varying temperatures, dust, and humidity. They also had a good power back up system to remain active even if there was a long power cut. There was also a one button system for recovery in case of a complete loss of power. The third type of PC was another small, low cost laptop with special hardware and software required for education purposes. It was meant for individual students in primary and secondary schools. Intel established four regional Platform Definition Design centers in Cairo, Egypt; Shanghai, China; Sao Paulo, Brazil and Mumbai, India, to conduct research and development on customized technologies like PCs for the developing world, community PCs, PC kiosks, low cost PCs for students, geographically tailored PCs, low cost laptops, etc. As of early 2009, Intel had developed around 200 programs along with local governments and partners to improve accessibility to PCs in 60 countries.

3.5.6 Connectivity

Along with increasing familiarity with computers, Intel also wanted to develop proper wireless broadband Internet connectivity. It wanted to develop the ecosystem for the same and encourage deployment of such connections. Intel also wanted to promote WiMAX trials and deployment. By 2006, about 175 WiMAX trials had been carried out in different parts of the world and about 45 commercial networks were deployed. The company was also working with other broadband technologies like Wi-Fi, 4G, and wireline ADSL and cable. It also planned to extend the Internet connectivity into mobile PCs.

Intel pointed out that while people remained connected in large cities and towns, remote villages and communities did not possess proper means of communications. In order to address the issue, Intel, in collaboration with the governments of a few of the developing countries, established wireless infrastructure. It continued to work with governments and telecom service providers to provide low-cost broadband network to remote locations.

Intel provided equipment for WiMAX connectivity between two schools, government offices, and a healthcare center in Egypt. Public WiMAX networks were also implemented in India. As of early 2009, more than 400 WiMAX trials were in progress across the world. Intel came up with Intel WiMAX Silicon Solution, through which it aimed to provide low cost broadband access in remote areas.

3.5.7 Content of WiMAX

Intel tried to provide localized content for each and every region. For this, it worked along with local governments, NGOs, as well as with people working in the education and healthcare fields. It also collaborated with local businesses for creating localized content and applications in the areas of healthcare, social and education. Separate training programs were designed for students, local businesses, and professionals.

Once people were provided with access to PCs and connectivity, they were able to use the content that was relevant to them. For example, in the areas of healthcare, the health department workers were able to access information that they needed whenever and wherever they needed it. By using the technology coupled with relevant content, they were able to provide the right care to patients.

3.5.8 Launching of World Ahead' Program In India

In May 2006, the World Ahead Program was launched in India by Otellini. Speaking on the occasion, he said, ―India will play a key role in

designing and developing computing technologies used worldwide under Intel's World Ahead Program. In India, the program unifies Intel's local efforts to enhance the lives of the vast majority of India's population who would benefit from information technology and education, but have not found it within their reach. Otellini expressed concern over the fact that the Internet penetration was just 4.6% in 2006 in India, and said this could pose a challenge in implementing the program.

According to some news reports, Intel planned to sell low priced PCs in India for which it partnered with companies like HCL Enterprises, Millennium Computers, PCS, Wipro Technologies, and Zenith Computers. This helped the company make some entry level computers that were about 20% cheaper than the one priced at US$ 220, which it was already selling.

In June 2006, Intel Technology India Private Limited (Intel India) entered into a joint venture with Reliance Communications (RComm) to extend broadband connections along with Intel PCs sold through a dealership network in 11 cities and towns in Karnataka. A plan was being developed to extend RComm's services to other parts of the country as well.

3.5.9 Management of WiMAX pilot Project at Baramati

In September 2006, the first phase of implementation of the World Ahead program in India began in the small Tier IV town of Baramati, near Pune, in the state of Maharashtra. Baramati, primarily agriculture-based economy, was an administrative center for a group of nearby villages. Intel India's effort aimed at fulfilling the objectives of the World Ahead program of providing access, connectivity, content, and education. Under the Baramati Initiative, Intel India with the aid of the government, implemented ICT-enabled solutions in the fields of education, healthcare, etc. The different activities implemented in Baramati

A) Telemedicine Programme at Baramati- With the technical support of Intel, a tele-health diagnostic center was run by Madurai-based Aravind Eye

Hospital and Bangalore-based Narayana Hrudayalaya at Rui Hospital in Baramati. The project started in September 2006. These two hospitals, renowned for the care they offered in the areas of ophthalmology and cardiology respectively, provided telemedicine diagnosis services at Rui Hospital.

Rui Hospital acquired a special digital ECG apparatus. When the ECG test was carried out on a patient at Baramati, the report was transmitted to the central cardio-care facility at Narayana Hrudayalaya, where cardiologists were present round the clock. The cardiologist then examined the report and if any abnormalities were found, they were reported back to Baramati and the patient was referred to the government hospital in Pune, a city close to Baramati. The whole procedure took ten minutes. Rui Hospital did not refer all the cases to Narayana Hrudayalaya — only those in which the local doctors required guidance or confirmation were sent.

Similarly, for eye ailments, a slit lamp captured the inner image of the eye and this image was transferred to Aravind Eye Hospital. This care was provided only at a specified time, usually coinciding with the Out Patient time at Aravind Eye Hospital. The case referred was responded to within half an hour. All this was achieved at very low costs which were affordable to the rural poor. For example, for ECG, the cost was Rs.4.50 and for eye testing it was Rs.10. The software tele-health diagnosis was provided by SN Informatics and the process of system integration was carried out by a local engineering college, Vidya Pratishthan's Institute of Information Technology (VIIT). In the first four months of starting the program, around 11,000 patients visited Rui Hospital. With the success of the program, the Maharashtra Government decided to extend such programs to around 15 community hospitals in the state. On this initiative, Barrett said, ―The use of technology will increase quality of care while lowering healthcare costs for Baramati tehsil hospital patients. With computers, real-

time video capabilities, and electronic records, critically ill patients can be diagnosed by medical specialists hundreds of kilometres away.

B)Kisoks-In Baramati, Intel opened a community computer center and public kiosks, where the company installed WiMAX technology in collaboration with Aircel. According to Intel, WiMax, which was an efficient and cost-effective way of delivering access to the Internet in remote communities, could be used effectively to bridge the digital divide in countries like India. The aim of this initiative was to deliver broadband Internet access to remote communities. The PCs for the community centers and public kiosks were donated by Intel. These PCs were designed specifically to withstand the dry and hot Indian climatic conditions. Some of the features of the PCs were dust filters and the ability to run with car batteries, in the absence of electricity. WiMAX was deployed on a 4.4 GHz frequency and could provide bandwidth of up to 512 kbps. According to Barrett, WiMAX is an inexpensive way to cover a large area and is ideal for rural towns, which have limited access to other infrastructure.

The rural ICT solutions are normally offered through internet portals hosted on a delivery web server to provide access to the citizens through inexpensive internet medium. The information flow between the delivery server and the other departments is accomplished through Intranet/LAN connectivity with servers of those departments (if exist). Often, due to non-computerization of back-end systems, the transactions are manually exchanged and response data is keyed in manually through the nodes on the delivery server. It may be noticed that the end-to-end connectivity between the central service providers (district administrations, cooperative unions etc.) and the citizens are accomplished through a number of stages involving several agencies/stake holders. These stages, the technologies and agencies/stake holders should involve in offering the different services in rural area. Following services are provided by the WiMAX Kiosks.

- Land Records

- Birth Certificate
- Bill Payments: electricity, telecom
- Licenses, permits, subsidies
- Bus and Railway tickets, online passport form
- Information of agriculture pest, insects and their control measures
- Exam form submission
- Market rate of agriculture product
- Banking Services like application for loan
- Recharge of mobile and satellite T.V.
- Matrimonial, Astrology and Bio-data

C) School Health Monitoring System -This model addressed the issue of malnutrition among children in poor communities. The web- based system helped to identify children who did not receive proper nutrition and assisted them and their parents by giving proper dietary suggestions. The system also maintained digitalized health records and organized health camps that invited participation from the localities and provided them with health-related tips. Each student was given a health card that contained his/her health records. Also a central database on the Web was created that contained the data of the students. One health scout was selected for every 40 students. He/she was trained by the teachers to do physical checks on the students and report any abnormality in terms of height, weight, symptoms of deficiency, etc. The health scout also entered these data into the health cards of the students. These details were then loaded to the central server as well. This system helped to maintain a record of basic health parameters of students as per the age metrics laid down by the World Health Organization (WHO). The application for the School Health Monitoring System was developed by Tata Consultancy Services (TCS), who also provided the software and data entry training. Meanwhile, the computer and Internet facilities were provided by Intel and VIIT.

Intel used the example of Baramati in several locations across India to propagate the positive results of its World Ahead Program to experts and people in non-government organizations, corporations, and government bodies as well as to other organizations serving at the grassroot level. The company held annual conferences to exchange information and explore ways by which digital technology and ICT could further be used to empower the people of underprivileged communities. About 150 participants attended the conference every year including many foreign participants.

Intel India entered into a partnership with other Indian states and began to take up similar community development initiatives at three other places – Tindivanam in Tamil Nadu, Chandni Chowk in Delhi, and Chhindwara district in Madhya Pradesh. It also carried out several other programs to improve education in the country (Refer to Exhibit V for Intel's Other Initiatives in India).

Apart from India, Intel successfully implemented the World Ahead Program in other parts of the world, like at Parintins in Brazil. The program was also deployed in other Asian countries like China, Pakistan, Bangladesh, the Philippines, Sri Lanka, Malaysia, Thailand, and Vietnam as well as in Africa, Russia, and Latin America countries like Peru, among others.

Intel planned to replicate the Baramati initiative in several other locations across the world. According to Barrett, ‐I came to Baramati with an intention to understand and replicate the IT applications used here at other rural locales in India. But I am now convinced that the Baramati recipe can find global application. I will be taking this case study to the United Nations to be replicated world over.

In September 2007, 16 Indian companies formed an alliance to support Intel fulfill its objectives set under the World Ahead program. These companies were the Apollo Hospitals Group, Comat Technologies, the Digital Empowerment Foundation, Educomp Solutions Limited., eGovServices, Fortis Healthcare, Karishma Software Limited, Manipal University, Narayana Hrudayalaya, NIIT Limited, Sankara Nethralaya, SN

Informatics Private Limited, SREI SAHAJ e-village Limited, Tata Consultancy Services, VIIT, and Zoom Developers Private Limited. Most of the companies had worked with Intel to develop and deploy technology in rural India. Barrett, who announced the alliance, said, ‒This alliance is a perfect example of the industry partnerships emerging in India today. We hope to initiate other efforts like these that can scale to produce positive outcomes and benefit citizens around the world.

Most analysts appreciated Intel‘s efforts at improving education and health standards in low income communities and in the process creating better living standards with the help of technology. In June 2008, Intel‘s initiatives toward implementing the World Ahead program at Baramati was declared as one of the top 14 IT implementation projects carried out in the country, by PCQuest. Intel continued to grow its presence in different states of India as well as in other countries through its various programs under the World Ahead program.

Bill Gates (Gates), Microsoft co-founder, felt that the growing trend of community development, with the motive of sustainable growth for Intel was commendable. World Economic Forumin Davos, Switzerland, described this trend as ‗creative capitalism. He said that creative capitalism was a condition where governments, private players, as well as NGOs worked together to develop the market forces and opportunities where more entities could make a profit or gain recognition, while doing something that eased out the disparities in the world. He said that this was exactly what Intel was doing through its World Ahead Program.

Some analysts who supported Intel‘s World Ahead Program argued that the company was not just increasing PC penetration but was actually training various sections of the community at large to use these for their needs. They added that this was a long-term initiative whose impact may not be immediately visible but which would certainly help the company in achieving its mission in the years to come.

D) Computer on Wheel- Computer Education Through Mobile Computer Vans for Rural Children of age 9-14. The Project "For Basic education and literacy" Vidya Pratishthan's Institute of Information Technology (VIIT), Baramati, Dist. Pune, Maharashtra, India is reputed educational institute. The VIIT has already implemented this program in 60+ schools. The institute desires to spread this program and concept in more schools. Impact analysis of this ongoing project is done by premier Indian institute "TATA INSTITUTE OF SOCIAL SCIENCES", Mumbai.Rotary can help VIIT by donating the Computer Van/s and pay VIIT yearly operation amount required to run the project.

The Program envisages implementation of a Computer Education Program in schools situated in rural India, keeping in mind the limitations of the rural environment. The Program incorporates technology infrastructure, teaching/learning aids and skilled human resources, with an aim to provide the students with IT skills, and develop an interest in school subjects. The Learning Infrastructure will comprise of the following:

(a) IT based Infrastructure

(i) A 55 seater bus, redesigned to a computer lab for 46 students accommodating 2 students to a terminal, with a generator facility

(ii) Installation of 18 multimedia Computers (Laptops) on the bus with LAN cabling, a server, printer and if possible - Internet connectivity

(iii) LCD projector Laptop for teaching theory classes in the school classroom.

(b) Computer Education teaching-learning aids

(i) Student Activity Book with learning outcomes, notes & assessment activities for use by students based on computer skills learnt. Each student will be provided with one Student Activity Book

(ii) Teacher Manual with learning outcomes, notes, teaching methodology, additional activities & assignment activities for use by teacher based on computer skills taught. Every bus will have at least four Teacher Manuals

(iii) Resource CD with soft-copy teaching-learning aids and monitoring & assessment kit. At least two Resource CDs will be provided per bus.

(c) Operation and Maintenance of Infrastructure

(i) Three qualified Computer Teachers per bus, who will teach Computer skills based on the Program Manuals provided

(ii) Maintenance of infrastructure - including the bus and the IT hardware

(iii) One qualified Computer Education Coordinator per 5 buses, for coordination, monitoring and reporting of Program implementation and affectivity

(iv) One driver cum cleaner per bus

(d) Educational services

(i) Computer Teacher's training to orient them for effective Program implementation, provide them with technical + pedagogical inputs and enhance their soft-skills

Salient features :

• Depending on the student nos. in a school, the Mobile Computer Bus will implement the Program in a school for approx 2 hours per 72 students

• Every student attends 1-hour of Computer-theory, conducted in the classroom using a multimedia-projector system & 1-hour of Computer-practical, conducted in the Mobile Computer Bus. The course-ware is adapted in native language - Marathi.

• Club will monitor the project by students' review on regular basis and further may think of assisting by financial support by running the project.

3.5.10 Difficulty and Constraint of WiMAX project at Baramati

1) Current software and hardware creates limitation to use in various purposes in the Kiosk.

2) WiMAX dos not support to the fast access of the website which takes time.

3) Delay in repairing the hardware in one of the main constraint to WiMAX pilot project at Baramati.

4) WiMAX tower at Baramati is not fully working to give the full range to the Kiosk at Katewadi.

5) Because of lack of awareness some people in the experimental village Katewadi un-necessary took a time for inappropriate information.

6) Funding for sustainability of this project is one of the forthcoming hurdle of this project.

7) WiMAX connected projects like Telemedicine and Computer on Wheel are not been more popular among the people because lacking of accessibility of the people.

3.5.11 Intel's other WiMAX Projects in India

In March 2007, Intel announced that ten institutes would be developed as Centers of Excellence, as a part of its World Ahead program. The selected institutes were College of Engineering, Guindy; Harcourt Butler Technological Institute, Kanpur; IIIT, Bangalore; IIIT, Hyderabad; IIIT, Pune; Kalasalingham University, Krishnan Koil; PSG College of Technology, Coimbatore; Shanmugha Arts, Science, Technology & Research Academy (SASTRA), Thanjavur; Thiagarajar College of Engineering, Madurai; and Visvesvaraya Technological University, Belgaum. The selected institutes were to be mentored by senior technologists from Intel and they would be provided with equipment valued at US$ 150,000. The institutes, in turn, were required to bring in changes in their computer science curriculum. The selected institutes were required to mentor other smaller institutes enabling them to be equipped with new technologies.

In September 2007, Intel started an e-health initiative in Tamil Nadu, South India, on the lines of the initiative at Rui Hospital, Baramati. It was implemented in Tindivanam, a small town, with the aim of improving healthcare facilities in the town and neighboring villages. Two hospitals, one at Tindivanam and the other at Mailam, were made centers to provide the required facilities. Two hospitals, Narayana Hrudayalaya and Shankara Netralaya joined the efforts and agreed to provide the services of their doctors. TCS developed software, using which reports of the patients visiting these centers could be uploaded onto a portal – webhealthcenter.com. They were then studied by the experts at the two hospitals, who posted the diagnosis reports on the portal. A school health monitoring system was also started in Tindivanam at St. Philomena Girl's Higher Secondary School.

A child health monitoring project was launched by Intel in Chandni Chowk, Delhi, to cater to needs of the urban poor. The project was developed by TCS and was implemented by ZMQ Software Systems with the help of a local NGO, School Health Annual Report Program (SHARP). The project aimed at providing around 2,000 children who studied at Anglo Arabic School with educational and healthcare facilities. Through the project, the educational and healthcare records of the children were stored in a digitalized form, and health camps were conducted from time to time to monitor the health of the children and provide them with health related knowledge. Teachers at the school were also trained as a part of Intel's World Ahead Program.

In May 2008, Intel launched its Intel Teach program in Shivpuri district Madhya Pradesh. Intel planned to train around 1,000 teachers from 100 schools in the district. They would be trained on integrating technology into teaching methods, promoting problem solving, critical thinking, and collaboration skills.

In October 2008, the Intel Teach program and the World Ahead program were launched in Uttar Pradesh. Through this program, Intel aimed at providing accessibility to PCs and Internet, to provide local citizens with

better employment prospects. For the program, Intel provided 50 PCs along with an Internet connection, software, etc. At the same time, teachers were also trained as a part of the Intel Teach program.

In January 2009, Intel and the government of the state of Gujarat in western India signed an MoU under which Intel planned to launch the World Ahead program in the state, with the aim of enhancing student learning capacity through ICT-based activities.

Summary

Demand for internet, which has shown multifold growth both in urban and rural areas, across individuals and corporate, is expected to remain robust in the future. Statistics reflect that there were about 81 million internet users in the country (growth of 1,520% during the period 2000-2008), making India home to the 4th largest number of internet users in the world, after USA, China and Japan. Wi-Fi LANs operate using unlicensed spectrum in the 2.4GHz band. The WiMAX emerges as the quintessential answer to these problems, given its superior performance and lower costs as compared to the existing 4G technologies and futuristic Long Term Evolution (LTE) equivalents. WiMAX (Worldwide Interoperability for Microwave Access) is a wireless communications standard designed to provide 40 to 40 megabit-per-second data rates, with the 2011 update providing up to 1 Gbit/s for fixed stations. WiMAX refers to interoperable implementations of the IEEE 802.16 family of wireless-networks standards ratified by the WiMAX Forum. WiMAX is a great invention in wireless technology providing 40 miles broadband access to mobile users. WiMAX technology based on IEEE 802.16 standard and it is a telecommunication protocol offering full access to mobile internet across cities and countries with a wide range of devices. WiMAX technology is based on IEEE standard for high layer protocol such as TCP/IP, VoIP, and SIP etc. WiMAX network is offering air link interoperability and vendor for roaming. The multi vendor access from WiMAX focused on higher level networking specifications for fixed WiMAX, mobile WiMAX, and portable WiMAX.

WiMAX Equipments are not well known because there are very limited subscriber demands for WiMAX Products and equipments. Most WiMAX equipments are installed with WiMAX Technology chip which are certified by WiMAX forum. The orthogonal frequency division multiplexed access (OFDMA) in WiMAX technology, is a great technique used to professionally take advantage from the frequency bands. The transmission frequencies of WiMAX technology from 2.4MHz to 4.5 GHz make it low price wireless network.The independency of data is a great feature of OFDMA (Orthogonal Frequency Division Multiplexed Access) that prohibit interfering and be multiplexed. It also makes possible power prioritization for various sub carriers according to the link quality. WiMAX technology brings a new ingredient to today's mobile community. The most important application offered by WiMAX Technology is business, consumer connectivity, and backhaul. WiMAX Technology carry real augmentation to communications through which you can get benefit not only from voice but also video and data transmission to get quick response to situation. WiMAX based education networks, using QoS, can deliver the full range of communication requirements, including telephony voice, operating data (such as student records), email, Internet and intranet access (data), and distance education (video) between the school board office and all of the schools in the school district, and between the schools themselves. In addition to providing two-way voice communications between the dispatch center and on-site emergency response teams, the network relays video images and data from the site of the accident or disaster to the control center. This data can be relayed to expert teams of medical or emergency staff, who can analyze the situation in real time, as if they were on site. Farmers in rural pockets require various information for day-to-days agriculture activities as well as for economic needs. However, rural area have adequate infrastructure to

connect with world and limitations to get proper and quick information. WiMAX makes the most sense in rural areas. WiMAX base stations are particularly cost-effective in rural areas, because of their range of 50 kilometers. Furthermore, in many of these areas, the need for mobility is limited. In rural areas, not many people have motor transport, so mobility is not an issue. As per Infonetics report, India is the most ripe market for WiMAX with VoIP playing a key role in adoption. India is the largest single-country WiMAX opportunity in the world, with most of the major operators actively pursuing WiMAX (BSNL, Tata, Bharti Airtel, etc); deployments are well-underway with acceleration in adoption experienced in many telecoms circles. Intel had announced an investment of about US$ 1 billion on the World Ahead' program. In India, Intel partnered with a number of IT service companies, state government bodies, Internet Service Providers, non-governmental organizations (NGOs), health, and educational institutes to implement the program. In May 2006, Intel's World Ahead Program was started primarily to bridge the technological gap that existed in the remote areas of developing nations and to help the people of these areas to live a better life with the assistance of education and exposure to technology. Intel wanted to increase the accessibility of computers to people by creating opportunities wherein more and more people could afford to purchase and use PCs. In May 2006, the World Ahead Program was launched in India by Otellini. Speaking on the occasion, he said, ‒India will play a key role in designing and developing computing technologies used worldwide under Intel's World Ahead Program. In September 2006, the first phase of implementation of the World Ahead program in India began in the small Tier IV town of Baramati, near Pune, in the state of Maharashtra. Baramati, primarily agriculture-based economy, was an administrative center for a group of nearby villages.

CHAPTER – IV
PROFILE AND COMMUNICATION NETWORKS AT SELECTED VILLAGES IN BARAMATI.

4.1 Introduction

The present research study also aims to find out the existing communication networks like ICT (WiMAX) and their role in rural development of India in general and Baramati region of Maharashtra state in particular. This chapter attempts to present a general profile of two selected villages i.e. experimental village (Katewadi) and non-experimental village (Zargadwadi), which set the stage for a more in-depth analysis in the next chapter (i.e. Chapter-V). This chapter analyses the role of communication network in rural development.

4.2 Profile of the Experimental Village

The detail profile of experimental village Katewadi is mentioned below. Profile gives brief idea about communication networks as well as facilities in Katewadi.

4.2.1 Location of Katewadi (Experimental Village)

Katewadi is a Village in Baramati Taluk, Pune District, Maharashtra State. Katewadi is located 9 km distance from its Taluka Main Town Baramati. Katewadi is 110 km far from its District Main City Pune. Katewadi has the honour of being the first eco-village in the state of Maharashtra.

Village Settlement:

Katewadi is a nucleated village with the dwellings clustered together and surrounded by agricultural fields. The population of this village is 2,844 (2001 census) of 527 families. The settlement pattern of the village is shown in Table No. 4.1. The village is located into four different locations and is divided into three religious groups. About three quarters are Hindu, less than a fourth of them are Mali and only one percent Muslim. Christians

have migrated from other places and settled in the village about 40 years ago, most of them are converted from backward castes mainly Mahar.

Table No. 4.1 : Katewadi Village Settlement (2001)

Sr. No.	Location	Number of households	Total Population
1.	East	112 (21.25)	809 (28.45)
2.	Central	273 (51.80)	1369 (48.14)
3.	South	108 (20.49)	534 (18.76)
4.	North-East	34 (6.45)	132 (4.64)
	Total	527 (100.00)	2844 (100.00)

The figures in parentheses indicate percentage to the total.

Source: Village Grampanchayat Records.

Table No. 4.1 reveals that, the eastern part is approximately 1 Km far from the village center with 112 (21.25 %) households, the maximum 273 (51.80 %) households are concentrated in the central part of the village where the village Grampanchayat is located. Due to the Government Housing Scheme for Below Poverty Line (B.P.L.) families 34 (6.45 %) now they are settled in the north-east part of the village. Forty houses are constructed for them under this scheme where majority of the backward caste people are living. The village population according to sex and caste category is presented in Table No. 4.2.

During field work it was observed that, majority of the families in the village are joint and belong to *Maratha* caste. Nuclear families are more among the backward castes (*Mahar, Mang*). The nuclear family consists of married couple and their unmarried children. The joint family consists of a married couple, sons and their wives and children, unmarried daughters and

rarely widowed or divorced daughters. The family shares the same kitchen and pools family property. Nuclear families are particularly common among the landless agricultural labourers, where every adult is an earner and living as part of a larger unit does not promise any extra benefits.

Table No. 4.2 : Village Population according to sex and caste category.

Sr. No.	Caste Category	Sex		Total
		Male	Female	
1.	Open	1105 (63.80)	627 (36.20)	1732 (100.00)
2.	Backward Castes*	643 (57.82)	469 (42.18)	1112 (100.00)
	Total	1748	1096	2844

The figure in parentheses indicates percentage to the total.
Source: Village Grampanchayat Records (2001).
*Note-*Backward castes include SCs, STs, OBCs and NTs.*

4.2.2 Economic Structure

Agriculture is one of main occupations of the villagers. Many people also have other occupations they are doing jobs in co-operative sector because Baramati Co-operative Complex is just 5 Kms from this village. The caste Hindus are dominant in the economy of the village. As in other parts of Maharashtra the scheduled caste people are the weakest section and majority of them earn their livelihood through daily wages from Rs. 80 to 100 per day.

4.2.3 Cropping Pattern and Land use

Katewadi village is situated on the right side of Bhatgar Dam. Canal. Irrigation is one of the important factors for agricultural development. The village has, irrigation Co-operative: *"Katewadi Co-operative Lift Irrigation Scheme"*, also as per the record of Grampanchayat

there are in all 99 wells for agriculture. The entire area has fertile soil. Very small part of the village can be classified *as Maal-Raan* or non-fertile upland covered by dunned hills. The land use and cropping pattern in Katewadi village is shown in Table No. 3.3. It can be concluded that from the above table, maximum 77.36 % of the total geographical area is under cultivation and 11.61 % land is considered as a fallow land. It is interesting to note that in this village villagers are using 4.28 % land as common land for ruminant livestock.The remaining 6.75 % of the land is not available for cultivation.

Table No. 4.3: General Land use and Cropping Pattern (2004-05)

A: General Land use

Sr. No.	Category	Area in Hectares	Percentage to total geographical area
A) Area under Cultivation			
1.	Irrigated land	372.00	45.46
2.	Dry land	261.00	31.90
	Total	**633.00**	**77.36**
B) Area Not Under Cultivation			
1.	Village Settlement	45.15	5.52
2.	Roads	10.08	1.23
3.	Common Land	35.00	4.28
	Total	**90.23**	**11.03**
C)	Fallow Land	95.00	11.61
	Grand Total	**818.23**	**100.00**

Source : Village Talathi Records, Katewadi.

B: Cropping Pattern

Sr. No.	Major Crop	Area in hectares	Percentage to total cultivated area

	A)Cash Crop		
1.	Sugarcane	285.00	45.02
2.	Grapes	138.00	21.80
	Total	423.00	66.82
	B)Food Crop		
1.	Wheat	64.00	10.11
2.	Jowar	52.00	8.21
3.	Pulses	38.00	6.00
4.	Ground nut	41.00	6.48
	Total	195.00	30.80
	C)Other Crop		
1.	Vegetable	6.00	0.95
2.	Other Fruit	9.00	1.42
	Total	15.00	2.37
	Total area under crops	633.00	100.00

Source : Village Talathi Records, Katewadi.

A glance at Table No. 4.3 (B) reveals that, the cash crop in the village is sugarcane (45.02 %). The second major cash crop is grapes (21.80 %). A very important characteristic feature of this village is that 66.82 % of the land is under cash crops. Of the total (30.80 %) area is under food crops, Wheat (10.11 %) and Jowar (8.21 %) are the main food crops in this village followed by pulses (6.00 %) and Groundnut (6.48 %). The peasants generally grow the Groundnut and Jowar in the wet *kharif* Season (July to November). The wheat crop generally grows in the *Rabbi* season (December to March). The villagers also produced very small amount of land for vegetable (0.95 %) and fruits (1.42 %) Mango is the main fruit of this village. According to one peasant :

*"Now a days mango is considered as one of the cash crops, because we are growing Alponso (**hapus**). Hapus is very famous variety and the rate is also very high approximately Rs. 70 to 90 per dozen. Therefore it is very profitable rather than other variety of mango. Due to the favorable climate and soil many villagers are planning to grow this variety of mango. We sell mangos in local as well as some times in Mumbai market."*

Wheat is produced mainly for household consumption. Some of the families, who produce surplus wheat, sell it to the local traders or in the nearby urban markets. The majority of families do not produce sufficient wheat to meet their own requirements. At the time of the field work it was noticed that maximum big and medium peasants and a few small and marginal peasants sold their surplus wheat. Most of the bigger peasants grow a high-yielding variety of Wheat as well as the traditional variety. During the field work we noticed that most of the peasants of Katewadi, are applying innovative farm techniques in their farms regarding farm cultivation, new variety of seeds, crops and advanced farm implementation etc (See Chapter V and plate No. 22,23).

In this village the basic means of production is land. Table No. 3.4 shows that the majority of landholders hold marginal land. The larger, more viable landholdings are concentrated in the hands of a small number of peasants.

Table No. 4.4: Distribution of landholding in Katewadi according to sex and caste category.

Sr. No	Category	General		Backward		Total
		Male	Female	Male	Female	

1.	Marginal Up to 1 acres	227 (44.60)	85 (60.71)	62 (91.18)	5 (71.43)	379 (52.35)
2.	Small 1 acres to 2.19	120 (23.57)	36 (25.71)	4 (5.88)	1 (14.28)	161 (22.24)
3.	Medium 2.20 acres to 4.39	120 (23.57)	13 (9.29)	1 (1.47)	1 (14.29)	135 (18.65)
4.	Big 5.00 and above acres	42 (8.25)	6 (4.29)	1 (1.47)	----	49 (6.76)
	Total	509 (100.00)	140 (100.00)	68 (100.00)	7 (100.00)	724 (100.00)

The figures in parenthesis indicate percentage to the total.

Source : Government of Maharashtra, Ministry of Agriculture. (Survey Report 2001/V)

Thus, due to the fertile black soil, favorable climate, availability of irrigation facilities and nearness to the Malewadi Co-operative Sugar factory, WiMAX and Baramati Grapes Ltd. has influenced the agronomy and agricultural practices of the village.

4.2.4 Animal Husbandry

Due to the healthy atmosphere of Dairy-Co-operatives approximately total of 284 households are keeping local breeds of buffalo's and 128 are keeping high yielding variety stocks.

4.2.5 Cooperatives, Credit facilities and Village Institution

There are two credit societies to finance the agriculture credit needs of the villagers one is co-operative credit society and another is scheduled bank i.e., '*Pune DCC Society'* which was established five years ago. The Dairy Cooperative is very strong in this village. We observed that approximately 409 (77.60 %) families are engaged in Dairy Cooperatives. There are in all 8 Dairy-Cooperatives out of that one is a Women Dairy Cooperative i.e., '*Sharda Mahila Co-operative Dairy Society'*. It has eleven elected members on its executive committee, of which four seats are reserved for the backward sections with total 82 members.[7] The

Grampanchayat of Katewadi was established on October 1956. There are in all eight members. It is interesting to note that the village Sarpanch is a women member Mrs.Savitri Kate.

During the field work it was noticed that due to the flow of, '*Mahila Bachat Ghat*' (Women Self Help Group) the socio-economic consciousness among the women's especially in the backward caste and weaker sections is increasing day by day. There are five, '*Mahila Bachat Gats'* in this village, out of that two are reserved for backward caste and weaker sections. '*Mahila Bachat Gat'*, (Women Savings Group) is one of the oldest bachat gat which was started in May 2000. In all 16 women members from different backward caste and weaker sections are members of the *Mahila Bachat Gat*.

4.2.6 Educational Facilities

Two High Schools are situated in this village. The *Zilha Parishad's High School* was established in 1981. This was the first high school in this village located at the village centre. The second High School was started in 1995 on non-grant basis approximately 500 students are studying in both schools and then it has received grant in 2005. For higher education the people have to send their children to Katewadi which is 5 Kms far from this village. There is a very healthy educational atmosphere that is helpful for the surrounding villages. During the informal interview with the Principal of Shri Chatrapati High School Katewadi, he said that children are very brilliant and eager to learn more things like email, websurfing, desingning, horse riding gymnastics and so on.

4.2.7 Health and Medical Facilities

Medical facilities in Katewadi are too good as any other village in the taluka. There are three hospitals, out of that two are private and third one is Government Primary Health Centre (PHC) which is tahsil

government hospital having sixteen beds with all surgical and maternity facilities. One full time M.B.B.S. doctor is available full time in this hospital. In Katewadi the Government Primary Health Centre (PHC) arranges all governmental programmes very sincerly. They also carry out extension activities such as advertising, display of posters and writing on walls. They inform and remind the villagers of the polio camp in their village.

According to Chief Doctor, Dr. Patil A.S. :

"In the year 2004-2005 a 14 family planning operations were completed Vasectomy and Copper- T method, are to used. Men hesitate to use condom but women are using contraceptive tablets such as Mala-D for family planning.

The private medical practitioner gets Rs. 50 to 100 as consultancy charges. For getting advanced medical service people have to go to Baramti. It was noticed that there are two medical stores Mr. Shrikant Kumbhar owner of 'Omkar Medical Stores', added:

"I have kept all types of tablets and medicines as per the requirement of Doctor, patient and relevant to diseases."

4.2.8 Provisions for Drinking Water

The villagers are benefiting from a rural water supply scheme maintained by the Grampanchayat. Public and Private Wells are also catering to the drinking water needs of this villages. However, during summer seasons, shortage of drinking water in certain elevated parts of this locality is a regular feature. Water was by far the most discussed topic among villagers throughout the field work.

4.2.9 Transport and Electrification

The village has very sound transport facilities because this village is closely situated on the right side of Indapur-Baramati Highway, daily approximately 18 to 20 State Road Transport Vehicle locally known as S.T.

buses run through the village. Electricity is available at every place in this village for agriculture and domestic purpose.

4.2.10 Interpersonal Communication Networks

This section shows the communication channel at Katewadi. In theprocess of development communication interpersonal network are very important. Hartmann *et al.* (1989:260) found that, interpersonal communication network was a much greater source of information than mass media. In this village during field work it was observed that though interpersonal communication network play important role but the villagers are not completely isolated from the modern communication networks. There are a several places in the village were villagers interact in the course of their day and which serves as a focal point of information exchange. These interacting places may be called 'gossip centers' shown in Table No. 4.5. Each gossip centers is associated with a particular group or locality. The researcher identified 13 gossip centers in Katewadi. Generally women converse at the homes of their neighboring and farms, but not at public meeting places. It is interesting to note that, in this village due to weekly meetings of, *'Mahila Bachat Gat'*, women's interaction has increased tremendously enabling them to be exposed to developmental information.

Table No. 4.5: Village Gossip Centers according to gossip group and timing.

Sr. No.	Major gossip centre	Gossip group	Timing
1.	Tea Stall	Young boys	7 am to 11 am 4 pm to 6 pm
2.	Grampanchayat	Elders, middle age peasants	11 am to 3 pm
3.	Street Corners	Young boys	5 pm to 7 pm 9 pm to 10 pm
4.	Temples	Elder villagers	2 pm to 5 pm 8 pm to 10 pm
5.	Library	Elder, middle age peasants	8 am to 11 am
6.	Milk Centre	Milk producer peasants	6 am to 9 am 6 pm to 9 pm

7.	Grocery shop	Young Boys	8 am to 10 am 6 pm to 7 pm
8.	Bus Stand	School boys, girls	10 am to 11 am 5 pm to 6 pm
9.	Pan Shop	Middle age peasants, young boys	8 am to 9 am 5 pm to 7 pm
10.	Village Information Kiosk	Sugarcane cultivator peasants	9 am to 11 am 3 pm to 5 pm
11.	Par*	Elder villagers	12 pm to 2 pm 4 pm to 6 pm
12.	Gambling Centre	Youngsters, middle age villagers	2 pm to 5 pm 8 pm to 10 pm
13.	Neighbors house	Women	1 pm to 3 pm 5 pm to 6 pm

Source : Based on field observations.

Par means an old pimple tree where villagers are gossiping.

Katewadi still retains the formal and traditional way of spreading information through a key communicator or messenger. It is a quickest and most efficient way of transforming information to villagers. Mr.Vasant is 61 year old man who belong to schedule caste (*Mahar*) and is a key communicator of this village.

During the interview of Vasant he explained that:

"I do this service since last thirty years, using tom-toms to attract attention of villagers. I am beating the tom-tom stopping at the nodal points, where two streets meet or where villagers have already congregated and making the relevant announcement regarding Government announcement about collection of land revenue, an official visit by an officer, health campaign or public tenders are conveyed by this method."

Mr.Vasant also conveys messages about births, marriage ceremonies and opening ceremonies of new shops etc., for which he takes a nominal minimum fee of two rupees, some time he takes Wheat or Jowar.

4.2.11 Modern Communication Networks

The modern communication networks to which the villagers of Katewadi are exposed to any significant extent are newspapers, radio, television and Information and Communication Technology (ICT) i.e. Computer, Internet and Communication networks.

Newspaper :

Table No. 4.6, shows the extent of newspaper readership by the heads of households in the short media survey conducted during the field work. It is interesting to note that only 58 (11.00 %) heads of households who say they read newspapers and subscribe, but majority of the figure 146 indicate that they read newspapers but do not buy.

It was observed that due to heavy agriculture work and other means of information 323 heads of the households (61.30%) answered that they do not subscribe nor read newspapers.

Table No. 4.6 : Newspaper reading of heads of households.

Sr. No.	Category	Number	Percentage
1.	Who read newspapers and subscribe	58	11.00
2.	Who do not subscribe to but read newspapers	146	27.70
3.	Who do not subscribe and do not read newspapers	323	61.30
	Total	527	100.00

The total circulation of newspapers in Katewadi village is presented in Table No. 4.7

Table No. 4.7 : Circulation of newspapers in Katewadi village.

Sr. No.	Name of the newspaper	Language	Circulation	Percentage
1.	Pudhari	Marathi	60	37.04
2.	Lokmat	Marathi	40	24.69
3.	Sakal	Marathi	30	18.52
4.	Tarunbharat	Marathi	30	18.52
5.	Times of India	English	02	1.23
	Total		162	100.00

Source : Village level newspaper agencies.

The village gets a total of 162 newspapers, the majority (160) of them in the regional language Marathi. Only two persons (Doctors) subscribe to Times of India, an English language newspaper. There are three newspaper agencies circulating news papers to the villagers, most non-subscribers read newspapers at the library or at the Grampanchayat. The most widely read newspaper are Sakal and Pudhari because of its political and local news coverage and easy to digest. During my later visit to this village I found that very few innovative peasants have been getting *Agro One* news paper that is exclusively for agricultural and rural issues.

Radio:

Radio's potential reach in India, at least in aggregate terms, far exceeds that of any other mass medium (Singhal and Rogers, 2003 : 70). Table No. 4.8 clearly indicates that radio still holds enormous potential to carry development messages to poor rural population which cannot afford television sets.

Table 4.8: Radio exposure of household heads.

Sr. No.	Category	Number	Percentage
1.	Who own radio and listen	198	37.57
2.	Who do not own but listen	113	21.44
3.	Who neither own nor listen	216	41.00
	Total	**527**	**100.00**

Table No. 4.8 reveals that, the radio occupies a unique place in the village life of Katewadi. It reaches many, though not all, of the less educated or illiterate peasants who cannot be reached through print media.

Table No. 4.8 shows that 37.57 % of households in Katewadi own radio sets. It was observed that most of the big and economically developed peasants (41.00 %) do not listen or own the radio sets but mainly (21.44 %) marginal and medium peasants regularly listen to radio.

Television :

Television is one of the best inventions of man. It has an edge over other forms of mass media, viz. radio and newspapers. It has overcome the barrier put up by illiteracy, that is the main hurdle with the print media (Yadav, J. P. 2004 : 51). Television can highlight the problems of the rural people, there are mainly three kinds of television reception in India and in this village too. Doordarshan, the Government owned station and newly introduced Direct to Home (DTH) and Satellite cable channel, that can be taken from a cable operator. But after 1990s there is growing cable television market in urban as well as rural society Table No. 4.9 shows the ownership of television in Katewadi village.

Table No. 4.9: Viewership pattern of Television in Katewadi

Sr. No.	Category	Number of households	Percentage
1.	Television with cable connection	126	42.89
2.	Television with DTH	301	57.11
	Total	**527**	**100.00**

After 1990s, the nature of Indian television changed in a very important and dramatic way. Due to the cable and satellite channels these networks reach not only the urban audiences but also rural audiences.

During the media survey in Katewadi village it was observed that due to digital clarity and variety of channels maximum (57.11 %) households are having television with cable connection. Those who are interested to watch satellite channels but are unable to pay monthly rent of cable they are now purchasing Direct To Home (DTH) Satellite Dish approximately at the cost of Rs. 2000 but 57.11% households have this facility in Katewadi village. This indicates television as one of the key media technology of attitudinal and behavioural changes in consumerism, food habits, dress pattern, language, values in education, health, politics, caste, family welfare etc in Katewadi village.

Information and Communication Technology (ICT):

During the entire field work it was observed that, village Katewadi is moving towards the Information and Communication Technology (ICT). It was noticed that there are in all four computers available in this village. The first computer with internet was installed at the 'Village Information Kiosk', under the scheme of, 'WiMAX', in May 2006 facilitating the services to farmers and villagers. Mr. Sachin Kate who is 25 year old young man belongs to progressive agricultural family purchased his personal computer in October 2007. It is interesting to note that due to 'WiMAX' he was very much attracted towards computer and internet hence he purchased the computer (Case Study No.3). The remaining two computers are used at the Primary Health Centre (PHC) and the fourth computer is used by a private medical practitioner Dr. B. S. Patil. Table 4.10 shows the ownership of computers in Katewadi village.

Table No. 4.10 Ownership of Computer in Katewadi.

Sr. No.	Ownership	Year of purchasing	Number of Computer
1.	WiMAX Kiosk	2007	2
2.	Primary Health Centre	2001	3
3.	Young Farmer	2002	37
4.	Doctor	2004	3
	Total		45

Telecommunication Networks :

Merely 85 households in this village are having landline telephones. Majority of telephone users belong to medium and big peasant category. But the young and middle age peasants are purchasing mobile cell phones since mobile has now become a status symbol even among the villagers. As one villager told that:

I have purchased two mobile phones I am doing agriculture as well as Dairy farming, I have twenty buffalo's therefore it is very difficult to communicate with my agricultural labourers and my staff. Now because of mobile I can easily communicate with them.

There are all the respondents' subscribers in this village. Alongwit these Seven PCO's are available in this village and average per day estimated calls are 160 to 200.

4.3 Profile of Non-Exprimental Village

The detail profile of non-experimental village Katewadi is mentioned below. Profile gives brief idea about communication networks as well as facilities in the Katewadi.

4.3.1 Location of Zargadwadi

The village of Zargadwadi is located in the Baramati taluka of Pune in the Maharashtra State. It is situated 20 Kms South-East of Pune and 10

Kms away from experimental village (Katewadi) which is closely situated (approximately 300 meters) on the right bank of Bhatgar canal.

Village Settlement :

The villagers of Zargadwadi are mostly peasants of Maratha caste. The total population of the village is 2,710 (2001 census) in 549 households which is divided into three separate wadis. Table No. 4.11 gives a break down of the population and number of households per wadi.

Table No. 4.11: Zargadwadi Village Settlement (2001)

Sr. No.	Wadi	Households	Population
1.	South	123 (22.40)	571 (21.07)
2.	Central	217 (39.53)	1127 (41.60)
3.	East	209 (38.07)	1012 (37.34)
	Total	549 (100.00)	2710 (100.00)

The figures in parentheses indicate percentage to the total.

Source : Village Grampanchayat Records.

Table No. 4.12 shows that, the central wadi is approximately 400 meters from the village center with 217 households (1127 people) mainly comprising of Households (58%) of Maratha caste. The southern wadi is closely located (approximately 200 meters) on the right bank of Nira Right bank canal with 123 households (571 people) with mixed caste of Maratha, Jain and Dhangar. The Eastern wadi with 209 households (1012 people) comprises majority of population (30%) belonging to *Dhangar* community. The village temple of Hanuman is located in the Southern wadi. The distribution of total population as per sex and caste category is presented in Table No. 4.12.

Table No. 4.12 : Village population according to sex and caste category

(2001)

Sr. No.	Caste Category	Sex		Total
		Male	Female	
1.	General	1065 (60.72)	689 (39.28)	1754 (100.00)
2.	Backward castes*	627 (65.59)	329 (34.41)	956 (100.00)
	Total	1692	1018	2710

Source : Village Grampanchayat Records.

The figures in parentheses indicate percentage to the total.

Backward Caste includes SCs, NTs and OBCs

There are mainly two castes that are dominant in this village i.e. Maratha (58%) and *Dhangar* (30%). There are 92 households (5.96%) Schedule Caste families in Zargadwadi.

Table No. 3.12 clearly indicate that majority of the village pollution (64.72 %) belongs to general category. The researcher was eager to know about *Dhangar* community and their tradition. The elderly man from this caste Mr. Sakharam Patil said;

> *"Long time ago there were many Dhangars living in Zargadwadi compared to present, actually they lived all over this region. They are sheep herders and that is their livelihood. The Jajmani System (locally called Balutedari Padhat) still continues in this village mainly because of the Dhangars. In our village we celebrate the yatra of Hanuman every year. At that time the Dhangars beat the Dhol (a traditional musical instrument). It is one of the traditional occupations of Dhangar community. For this holy religious work yearly villagers give rice and other agricultural food grains to Dhangars."*

Thus, the traditional practice of Jajmani system still continues in this village. Thus, it is the religious or cultural festival bond that still holds castes into the village Jajamani system.

4.3.2 Economic Structure

The economic structure of the village is predominantly agrarian. It was observed that some peasants practice Floriculture.

One peasant said :

"From last five years more than five to ten peasants are cultivating floriculture, it is possible because our village has very sound water condition and favorable climate. We are growing Zendu (Marigold), Rose and Nishigandha (Polianthes/Tuberosa) etc., it takes three to four months for flowering. After cutting the flowers we sell in Mumbai market because there is a huge demand for these flowers. It is a very quickest method to earn money, we can earn approximately Rs, 20 to 25 thousand in one acre, now a days it is considered as a new cash crop."

The *Marathas* are economically and politically dominant in the economy of the village. Overall the village economy is strong due to irrigation facility. The conditions of agricultural wage labourers are poor. There are two types of agricultural wage labourers : those who work on daily wage basis and those who work on a yearly contract. However, for agriculture wage labour different rates are paid with men being paid (Rs. 200-250) about 30 % more than women during the peak season and about 50 % (Rs. 150-200) more than women in the slack seasons.

4.3.3 Cropping Pattern and Land Use

Being a village situated on the right bank of Bhatgar canal, it is having homogeneous land setting. The soil is medium black to deep black nearer the river; they are deep and away from the river and are medium black. Agriculture is the backbone of the economy of the village. Physical and cultural aspects have a major impact on the agriculture. Table No. 3.13 shows the general land use and cropping pattern in Zargadwadi village.

Table No. 4.13 : Village Zargadwadi General Land use and Cropping Pattern (2004-2005).

A)   General Land use :

Sr. No.	Category	Area in hectares	Percentage to total geographical area.
A) Area Under Cultivation			
1.	Irrigated land	357.29	48.64
2.	Dry land	241.25	32.84
	Total	598.54	81.48
B) Area Not Under Cultivation			
1.	Village Settlement	38.66	5.26
2.	Forest	29.14	3.97
3.	Roads	09.12	1.24
	Total	76.92	10.47
C) Fallow land		59.10	8.04
	Grand Total	734.56	100.00

Source : Village Talathi Records, Zargadwadi.

Table No. 4.13(A) reveals that nearly 81.48 % of the total geographical area is under cultivation and 8.04 % land is classified as fallow land, the remaining 10.47 % of the land is not available for cultivation. This category has comparatively higher percentage of land due to the forest and increasing roads and settlements.

B)Cropping Pattern

Sr. No.	Major Crop	Area in hectares	Percentage to total cultivated area
A)Cash Crop			
1.	Sugarcane	272.40	45.51
2.	Grapes	62.00	10.36
3.	Soybean	49.00	8.19
	Total	**383.40**	**64.06**
B)Food Crop			
1.	Wheat	97.00	16.21
2.	Pulses	31.00	5.18
3.	Jowar	42.00	7.02
4.	Paddy	35.00	5.85
	Total	**205.00**	**34.26**
C)Other Crop			
1.	Vegetable	04.14	0.70
2.	Flower	06.00	1.00

	Total	10.14	1.70
	Total area under crops	**598.54**	**100.00**

Source: Village Talathi Records, Zargadwadi.

It is clear from Table No. 4.13(B) a very important characteristic feature of the both villages (experimental and control) is that a higher percentage of the land is under cash crops. Out of the total geographical area of 598.54 hectors, 383.40 hectares i.e. 64.06 % of the area is under cash crops and 205 hectares i.e. 34.26 % area is under food crops. The remaining 10.14 hectares (1.70 %) area is under other crops i.e. vegetable 4.14 hectares (0.70 %) and flower 6 hectares (1.00 %).

Sugarcane covers the highest cropping land which is 272.40 hectares, 45.51 % followed by Wheat in 97 hectares, Grapes in 62 hectares and soybean in 49 hectares. Other food crops like pulses, Jowar, wheat etc. account for 108 hectares. The peasants generally grow the food crops for household consumption, some of the big and middle category peasants produce surplus food crops, they sell it in the local or nearby urban markets. Majority of the villagers mainly depend upon agriculture land, Table No. 4.14 shows the landholding of Zargadwadi according to sex and caste category.

Table No. 4.14: Distribution of Landholding in Zargadwadi according to sex and caste category.

Sr. No.	Category of Peasant	General		Backward Caste		Total
		Male	**Female**	**Male**	**Female**	
1.	Marginal up to 1 acre	210 (47.00)	35 (55.56)	87 (89.69)	7 (77.78)	339 (55.03)
2.	Small 1 acre to 2.19	110 (24.61)	11 (17.46)	9 (9.28)	1 (11.11)	131 (21.27)
3.	Medium 2.20 acres to 4.39	110 (24.61)	14 (22.22)	1 (1.03)	1 (11.11)	126 (20.45)
4.	Big 5.00 and above	17 (3.80)	3 (4.76)	---	---	20 (3.25)

	Total	447	63	97	9	616
		(100.00)	(100.00)	(100.00)	(100.00)	(100.00)

The figures in parenthesis indicate percentage to the total.

Source : Government of Maharashtra, Ministry of Agriculture (Survey Report 2001/5)

Table No. 4.14 reveals that, the general category peasants (510) hold majority of the land, and only (106) peasants who belong to backward castes hold very few (5.81%) land. It is interesting to note that among general category the Hindu (especially Marathas) hold land above the average holding and they are placed at a higher plane on the path of development. As is the case everywhere, the backward castes population are the poorest section most (2.5%) of them are agricultural labourers.

4.3.4 Animal Husbandry

This region is famous for Sugarcane and Dairy-co-operatives in Maharashtra. We observed that approximately 269 households are keeping local breeds of buffalo and 180 household have high yielding variety stocks. Nowadays the villagers are extensively engaged in Dairy farming. As one medium category peasant told :

> *"I have purchased two buffalo's during last year, it plays key role in improving my economic condition. Daily I am selling 10 to 15 litres milk in the nearest dairy i.e. 'Mahalaxmi Sahakari Dudh Sangha', with Rs. 15 to 20 per liter. Average monthly I am earning Rs. 5 to 6 thousand from dairy farming."*

It is interesting to note that, due to the *Dhangar* community in this village they are rearing sheep, because sheep farming is the main traditional occupation of *Dhangars*. Approximately 98 % of *Dhangar* families are keeping sheep's except those who are doing jobs in Government and co-operative sector.

143

4.3.5 Co-operatives, Credit facilities and Village Institution

There is one Co-operative Credit Society to finance the agriculture credit needs of the villagers of Zargadwadi. Co-operative dairy farming is an important subsidiary occupation of the peasants and agricultural labourers in Zargadwadi.

At present total seven Primary Milk Co-operative Societies are functioning in this village. Out of those seven, two are reserved for women. It is interesting to note that, due to various Government schemes, loan and subsidies are given for SCs, NTs and B.P.L. families. 89 households are engaged in dairy farming that belong to weaker and deprived sections of this village. It was observed that there are three, '*Mahila Bachat Gat*', in this village one is reserved for backward and weaker section, but these are not very effectively working as in the experimental village. After independence the Indian Government, in an effort to effectively decentralize, formed an institution called the Panchayat. The first Grampanchayat of Zargadwadi was established on 5th December 1957. The present Grampanchayat was elected on 12th December 2005, there are in all 8 members. There are two seats reserved in the Grampanchayat, one for a women and the other for representative of a scheduled caste. The women member is a member only for name sake she rarely attends any of the Panchayat meetings.

4.3.6 Educational Facilities

In this village only one High School is present but the primary school started quite early under British period in 1927, later in 1983 High School was started. About 550 students are studying in, '*Vidhya Mandir High School, Zargadwadi*'. There is one Arts and Science College at a distance of 5 Kms from this village.

4.3.7 Health and Medical Facilities

In Zargadwadi Medical facilities are almost non-existent. There is one Government Sub Primary Health Centre, wherein one full time nurse is

available at this health centre. There is not a single medical store; however six private medical practitioners are present. But they do not have any professional degrees such as B.H.M.S. and M.B.B.S. For getting better medical service people have to go to Baramati.

4.3.8 Provisions for Drinking Water

This area is benefiting from a rural water supply scheme of the State government. There are 49 public and private wells in this village. There is no shortage of drinking water in any season.

4.3.9 Transport and Electrification

Electrical power is available at every corner in this village, one post office is also available. Zargadwadi village is approximately 10 Kms away from the Katewadi which is well connected to state highway. But the villagers do not have any transport problem because of the private Jeeps (locally known as *Wadap*). Daily 5 to 6 private jeeps and 10-15 State Road Transport Vehicle known as ST ply through this village connecting to the taluka and district.

4.3.10 Interpersonal Communication Network:

The villagers of Zargadwadi opined that interpersonal communication is the most effective network among the villagers. But after arrival of the modern communication networks such as Radio, Television, DTH and Cable they have increasingly switched over to these media. The villagers of Zargadwadi generally communicate at various places mainly in the village. People generally gather at these places in the morning and evening. The young boys mainly gather at the in *Yuvak Mandal* or at the street corners. The elderly gather at village temples and at *par*. There are some important places where middle age peasants chit-chat e.g. Grampanchayat office and the tea shops. The most important topic of discussion is politics right from village level to national level. The same

observations are made by Harttman *et al.* 1998. Women generally communicate with their neighbouers while the women laborers gossip in the fields. The village liquor shop is another key centre of gossips relating to agriculture, politics and other personnel and family problems.

It is interesting to note that approximately 91 % of the villagers are engaged in Dairy co-operatives. Everyday in the morning and evening approximately 400 villagers come to the milk collection centres. These centers are emerging as a major source of interpersonal communication in the villages of Baramati region

Table No. 4.15 :Village Gossip Centers according to gossip group and timing.

Sr. No.	Major Gossip Centre	Gossip Group	Timing
1.	Milk Centre	middle age peasants and women	6 am to 9 am 7 pm to 9 pm
2.	Temple	elder villagers	1 pm to 4 pm 7 pm to 3 pm
3.	Bus Stand	school/ college girls/ boys	9 am to 11 am 5 pm to 6 pm
4.	Grampanchayat	elder and middle age peasant	10 am to 3 pm
5.	*Par**	elder villagers	11 am to 2 pm 4 pm to 6 pm
6.	*Yuvak Mandal*	young boys	1 pm to 3 pm 5 pm to 8 pm
7.	Street Corner	young Boys	8 am to 10 am 8 pm to 10 pm
8.	Neighbors house	women	1 pm to 3 pm 5 pm to 6 pm
9.	Gambling Centre	young and middle age peasants	1 pm to 4 pm 9 pm to 10 pm

10.	Country liquor shop	elder and middle age peasants	7 pm to 10 pm
11.	Barber Shop	young boys	8 am to 10 am
12.	Grocery Shop	middle age villagers	9 am to 11 am 3 pm to 5 pm

*Par means an old *Pimpal* tree where villagers sit under its shade and are gossiping.

4.3.11 Modern Communication Networks:

      Zargadwadi village has mixed modern communication networks. Like in the other parts of this region the exposure to television is higher than exposure to other modern communication networks. Such as newspaper, radio and information and communication technology (ICT) that includes computer and internet.

Newspaper :

      Newspaper is the major source of District level political information. Table No. 3.16 shows newspaper readership of the heads of the households of Zargadwadi village.

Table No. 4.16: Newspaper Readership of heads of households.

Sr. No.	Category	Number	Percentage
1.	Who read newspapers and subscribe to	42	7.65
2.	Who do not subscribe to but read newspaper	118	21.49
3.	Who do not subscribe and do not read newspapers	389	70.86
	Total	549	100.00

      Table No. 4.16 reveals that only 42 heads (7.65%) of the households read newspapers and subscribe to. It is interesting to note that majority of

them belong to upper caste big peasants. 118 heads (21.49%) of the households who say they read newspapers but do not buy them almost certainly include a number of people who consult a newspaper only occasionally rather than regularly. A maximum number (389) of heads (70.86%) do not subscribe and do not read newspapers because of heavy agriculture work, illiteracy, and poverty. The total circulation of newspapers in Zargadwadi is presented in Table No. 4.17.

Table No. 4.17 :Circulation of newspapers in Zargadwadi Village.

Sr. No.	Name of the newspapers	Language	Circulation	Percentage
1.	Pudhari	Marathi	40	34.78
2.	Sakal	Marathi	30	26.09
3.	Lokmat	Marathi	25	21.74
4.	Tarun Bharat	Marathi	20	13.39
	Total		115	100.00

Source: Local newspaper agency.

Table No. 4.17 clearly indicates that the direct exposure to newspapers in the village is low. The total circulation of the newspapers in Zargadwadi is only 115 in regional language, Marathi. There is no person who subscribes an English language newspaper. The most widely read newspaper is Pudhari followed by Sakal. Though the circulation of newspaper is low the information from the newspapers is conveyed to many others through interpersonal networks.

Radio:

In the words of Wilbour Schramm (1964: 19), 'Radio can bring news to people who can't read. It can bring instructions and advice to people who help in farming or health improvement or community development. The radio exposure of households of the heads of is presented in Table No. 4.18. Before arrival of the Television, radio was considered as an effective

communication network in rural society. (Schramm, W : 1964; Hartmann *et al.* : 1989; Hedebro G : 1982; Sharma S C : 1989) show that due to the illiteracy and poverty in rural India radio is the prime communication network among the villagers. But these studies were conducted before 1990s. After the introduction of television and satellite channels in 1990s the picture changed in favour of TV and private commercial channels.

Table No. 4.18: Exposure of household heads to Radio.

Sr. No.	Category	Number	Percentage
1.	Who own radio and listen	214	39.00
2.	Who do not own but listen	125	22.77
3.	Who neither own nor listen	210	38.25
	Total	549	100.00

Table No. 4.18 reveals that 39.00 % heads of household own radio sets and listen regularly while 22.77 of head of the households do not own radio sets yet listen to radio mainly for news and songs. 38.25 % of the heads of households in Zargadwadi neither own nor listen to the radio. Most of them are middle and big peasants. But it is interesting to note that in the Control village 61.77 % radio exposure is higher as compared to the Experimental village (59.01%).

Television:

Television was introduced in Delhi as an experimental educational service under a grant from UNESCO in 1959. The ownership of television in Zargadwadi is presented in Table No. 4.19. Johnson, Krick (2000) study of, 'Television and Social Change in Rural India', has studied the village *Danawli* in Western Maharashtra. The author concluded that television is a key instrument of social change in rural society. In the village Zargadwadi too television is fast emerging as a vital instrument of social change.

Table No. 4.19 : Ownership of television in Zargadwadi

Sr. No.	Category	No. of households	Percentage
1.	Television with DTH	423	77.04
2.	Television with cable connection	126	22.96
	Total	549	100.00

Table No. 4.19 shows that the maximum 77.04 % households have television with DTH, while 22.96 % of household having television with cable connections. About DTH during the field work we observed that, villagers believe in the benefits of DTH. I noticed that most of them are landless agriculture labourers and marginal peasants some of them listen radio for entertainment and very few of them are watch television at neighbors house. The above data indicate that the exposure of television is less than Experimental village (Katewadi) due to some key reasons.

Information and Communication Technology (ICT):

It includes computer and internet, in our entire field work we do not find any single computer in this village. But only two to three college boys who belongs to science faculty they are surfing internet in their college and town. Thus it can be concluded that the villagers of Zargadwadi are very far from the information and communication revolution.

Telecommunication Network:

In village Zargadwadi approximately 172 households have landline telephone connection and majority of them are medium and big category peasant. Now the trend is moving towards Mobile Cell Phone, Mobile telephony services were introduced in India in 1995 along with pager services (Cable Waves, 1997 : 9). In this village all villagers are using mobile phones, Airtel and BSNL are the main service providers in this area. As one villager told :

"Mobile is much better than land line telephone and due to mobile service I can easily contact my family and friends. It is also useful in my agriculture work and it is a very cheap communication network than other media".

Summary

Experimental Katewadi is a nucleated village with the dwellings clustered together and surrounded by agricultural fields. The population of exprimental and non exprimental villages are heterogenous in nature. During field work it was observed that, majority of the families in the village are joint and belong to *Maratha* caste. Nuclear families are more among the backward castes (*Mahar, Mang*). The joint family consists of a married couple, sons and their wives and children, unmarried daughters and rarely widowed or divorced daughters. Katewadi village is situated on the right side of Bhatgar Dam Right Canal. Irrigation is one of the important factor for agricultural development.

The village has, irrigation Co-operative: *"Katewadi Co-operative Lift Irrigation Scheme"*, also as per the record of Grampanchayat there are in all 99 wells for agriculture. It reveals that, the cash crop in the village is sugarcane (45.02 %). The second major cash crop is grapes (21.80 %). A very important characteristic feature of this village is that 66.82 % of the land is under cash crops. Of the total (30.80 %) area is under food crops, Wheat (10.11 %) and Jowar (8.21 %) are the main food crops in this village followed by pulses (6.00 %) and Groundnut (6.48 %). The peasants generally grow Groundnut and Jowar in the wet *kharif* Season (July to November). Due to the healthy atmosphere of Dairy-Co-operatives approximately total of 284 households are keeping local breeds of buffalo's and 128 are keeping high yielding variety stocks.

There are two credit societies to finance the agriculture credit needs of the villagers one is co-operative credit society and another is scheduled

bank i.e., '*Pune DCC Society*' which was established five years ago. The Dairy Cooperative is very strong in this village. We observed that approximately 409 (77.60 %) families are engaged in Dairy Cooperatives. There is a very healthy educational atmosphere that is helpful for the surrounding villages. During the informal interview the Principal, Shri Chatrapati High Katewadi, Katewadi said that children are very brillient and eager to learn more things like email, websurfing, desingning, horse riding, gymanystic and so on. Medical facilities in Katewadi are too good as any other village in the taluka. There are three hospitals, out of that two are private and third one is Government Primary Health Centre (PHC) which is tahsil government hospital having sixteen beds with all surgical and maternity facilities.

It is found that, Katewadi still retains the formal and traditional way of spreading information through a key communicator or messenger. It is a quickest and most efficient way of transforming information to villagers. Mr.Vasant is 61 year old man who belongs to schedule caste (*Mahar*) and is a key communicator of this village. It is interesting to note that only 58 (11.00 %) heads of households who say they read newspapers and subscribe, but majority of the figure 146 indicate that they read newspapers but do not buy. It was observed that due to heavy agriculture work and other means of information 323 heads of the households (61.30%) answered that they do not subscribe nor read newspapers. During the media survey in Katewadi village it was observed that due to digital clarity and variety of channels maximum (57.11 %) households are having television with cable connection.

Those who are interested to watch satellite channels but are unable to pay monthly rent of cable they are now purchasing Direct To Home (DTH) Satellite Dish approximately at the cost of Rs. 2000 but 57.11% households have this facility in Katewadi village. The first computer with internet was installed at the 'Village Information Kiosk', under the scheme of,

'WiMAX', in May 2006 facilitating the services to farmers and villagers. Mr. Sachin Kate a 25 year young man belong to progressive agricultural family purchased his personal computer in October 2007. It is interesting to note that due to 'WiMAX' he was very much attracted towards computer and internet hence he purchased the computer.

Another non-experimental village i.e. Zargadwadi are mostly peasants of Maratha caste. The total population of the village is 2,710 (2001 census) in 549 households which is divided into three separate wadi. The economic structure of the village is predominantly agrarian. It was observed that some peasants practice Floriculture. This region is famous for Sugarcane and Dairy-co-operatives in Maharashtra. We observed that approximately 269 households are keeping local breeds of buffalo and 180 household have high yielding variety stocks. There is one Co-operative Credit Society to finance the agriculture credit needs of the villagers of Zargadwadi. Co-operative dairy farming is an important subsidiary occupation of the peasants and agricultural labourers in Zargadwadi.

In this village only one High School is present but the primary school started quite early under British period in 1927, later in 1983 High School was started. In Zargadwadi Medical facilities are almost non-existent. There is one Government Sub Primary Health Centre, wherein one full time nurse is available at this health centre. There is not a single medical store, however six private medical practitioners are present.

The villagers of Zargadwadi opined that interpersonal communication is the most effective network among the villagers. But after arrival of the modern communication networks such as Radio, Television, DTH and Cable they have increasingly switched over to these media. Zargadwadi village has mixed modern communication networks. Like in the other parts of this region the exposure to television is higher than exposure to other modern communication networks. Such as newspaper, radio and information and communication technology (ICT) that includes

computer and internet. It is found that, only two to three college boys who belongs to science faculty they are surfing internet in their college and town.

From this it is ascertain that, WiMAX in the experimental village disseminate the awareness among the villager and which leads to make development in the village. Whereas in contrast to this in the non experimental village have limited scope of development. Next chapter covers the results and interpretation which shows social and economic changes by WiMAX.

It is found that, modern ICT tool like WiMAX plays key role in agricultural communication and connected rural area to the whole World. Next chapter covers the results and interpretation related to role of WiMAX in rural development.

CHAPTER - V

ANALYSIS OF WI-MAX PROJECT FOR RURAL DEVELOPMENT IN BARAMATI.

5.1 Introduction

This chapter deals with finding the role of modern ICT tool WiMAX in rural development at experimental village i.e. Katewadi and in contradictory its comparison with traditional communication networks at non-experimental village i.e. Zargadwadi. The rural development aspects are measured through various indicators like human resource generation, increasing crop production, income and saving behaviour, awareness of ICT, getting farm advocacy, economic activities of SHG and mobility of villagers, human resource generation and so on in the experimental and non-experimental villages. There are changes from a typical conventional practice of cultivation to modern agriculture reformation. Hypothesis testing is also covered in this topic. However, first part gives the overview of WiMAX project at Baramati region.

5.2 Information and Communication Technology Dawns on the Baramati

Information is the key to democracy. Using information and communication technology, it has been possible for the common man to access global information. The WiMAX Project, mooted by the collective endeavor of the government (IT Directorate) and the officials of Vidya Prathisthan, Katewadi village and Mr. Sharad Pawar, have brought the usage of ICT at rural level.

5.2.1 Location and Climate of Baramati

Baramati is a well-developed rural area located 75 kilometers east of the Pune City, Maharashtra. The larger part of the Baramati region is covered by the basaltic ranges. The rainfall in the valley ranges from 17" to 27". Baramati is this long 50 mile stretch of land, historically, culturally and traditionally rich in every sense (Kondalkar, P, 2002 : 4).

5.2.2 Historical background of the development of Baramati

Baramati is well known in Maharashtra for its visionary leader Mr. Sharad Pawar, who is present agriculture minister at the Government of India. He has carefully planned the development of entire surrounding area around Baramati, where industries thrived along with irrigated agriculture. Every village where the project is located has more than 80 percent land irrigated either through canal or through bore wells. Sugarcane is a major cash crop here and hence sugar factory too has been established in the cooperative sector. There are major industries, such as sugar factory, three wheeler tempo factory, spinning mills and many others. There is a flying school near the MIDC area, which brings students from all over India. MIDC area itself is sprawling 800 acres and houses not only industries but also educational institutions. The advantage is that there is a permanent power supply to this area, which provides congenial environment for IT colleges and also any BPO activity in future.

Baramati is also close to Pune, which is a major city next to Mumbai in Maharashtra, well known as an Information Technology hub. People can commute every day for their work and commerce. Thus Baramati is a growth center and the people have developed aspirations for better life. The environment at Baramati provides hope. The wealth and grace both are visible in the new parts of town. The buildings are well painted and adorned with modern architecture. It looks like a pink city. The taluka court is newly built and has a grand façade. The Panchayat Samiti office is renovated newly and appears like any modern corporate office, with lot of glass and wooden work stations, where the usual site of stacks of old files was not visible. Special grant had come for this renovation.

Over the last few years Baramati has evolved as an educational center not only for the three talukas around it but has been able to attract students from all over India for engineering, IT, Biotech, M.Ed., B. Ed and D.Ed. courses on self financed basis. There is also college of Arts, Commerce and Science. Along with many old schools and colleges, Vidya Pratishthan, an

educational institution, sponsored by Mr. Sharad Pawar has launched Baramati in the international orbit. It has been holding international conferences on the theme of 'Information Technology for Rural Development' for last five years. Thus, Baramati has been ideal destination for the project like, 'Empowering the poor'. It will be apparent through our findings that people's mindset is ready to absorb this knowledge. Although it has to be remembered that alongside the wealth there exists a class on back of which this wealth gets created. These are the poor, laboring classes. They are the target group of this project. However, for appreciation of IT the white collared class as well as salaried class is also required, which exists around Baramati. Its indicator is that many high schools in Baramati have started computer labs and have outsourced them to some small IT companies in Pune. In fact existence of cyber cafes is also another indicator of IT atmosphere in Baramati. They are not plenty but are in existence and also numerous small IT institutions exist, which teaches the basic courses.

A) Role of Leadership in Dawn of ICT at Baramati

The role of leadership has remained a significant factor in all kinds of acquainted development in the Indian context. One who is well acquainted with this place shall always mention the name of Mr. Appasheb Pawar, who was born on 1926. The forerunner, initiator, all in all, a positive visionary has transformed this region from poverty stricken infertile destitute to a rich and insolvent society based on community living. '*My outlook is to convulse India with the co-operative movement*' said by Jawaharlal Nehru, during the planning commission was the philosophy that Mr. Appasaheb Pawar adhered to. Appa believed that, villages are the life of India and followed the Co-operative way of planning for the village welfare programmes. He belonged to a small village called Katewadi. Mr. Appasaheb initiated the cooperative movement in Baramati with opening of cooperative sugar factory and Baramati Agricultural Trust.

Mr. Sharadchandra Govindrao Pawar was born on 12 December 1940. He is the president of the Nationalist Congress Party. He has previously held

the posts of Minister of Defense and Chief Minister of Maharashtra and currently serves as Minister of Agriculture, Government of India. Sharad Pawar belongs to Baramati in Pune District. Baramati is known as sugarcane heartland and Sharad Pawar as a stronghold, has about 100 villages that largely earn their livelihood from agriculture and cattle farming. As you enter Baramati, the first thing that you feel is the smooth road, in sharp contrast to the bumpy, spine-jarring road that connects Pune to the small, dusty taluka that tech giant Intel chose to implement a pioneering WiMAX project. A tough find on the map of India, it's this obscure taluka, nearly 120 km from Pune. This technology allows internet connectivity over long distances, theoretically, as much as 30 km. Simply put, WiMAX is 'Wi-Fi on Steroids'. Because of the visions and effort of Mr. Sharad Pawar; the Intel Corporation launched ICT's World Ahead Programme at Baramati in December 2006. His elder brother, Mr. Appasaheb Pawar, was managing director of Baramati Sugar Co-operative through which Pawar has wielded much of his political influence.

B) Review of Co-Operatives movements in Baramati

Mr. Appasaheb Pawar understood that, main source of livelihood which is sugar cane growing, needed its own sugar factory. At that time there was only one sugar cane factory in the area, located in Malegaon near Baramati and farmers had no choice but to sell their crops to the monopolist, with a negative impact on their incomes (Cecchini; 2002:3). Mr. Appasaheb Pawar piloted the project with support of the Government. He collected one lakh rupees by way of share capital. But he gave up the plan as the co-operative Bank of Bombay declined to support for investment and so he refunded the money to the proposed members. In doing so he established his trust and respect in the minds of farmers. In 1954 the proposal of the sugar factory was ultimately registered as **Baramati Sugar Cooperative Ltd. Malegaon-Baramati** now it is called as **Malegaon Cooperative Sugar Factory Ltd. Shivnagar-Malegaon** and the initial share capital of Rs. 5 lakhs was collected (Dahiwale S. M, 1994: 139).

In 1959 he was able to open a Co-Operative sugar factory in the village Malegaon, now the hub of the co-operatives. Each farmer who had contributed

to the creation of the sugar cane factory became a member of the sugar cane co-operative, which currently has a total of 20,000 members. The sugar factory however could cater only to 15 to 20 % of the population in Baramati who had irrigated land but tried to create employment for the marginal farmers and landless laborers. Baramati model comprises 25 Co-operative societies with a total turnover of $ 130 million.

5.3 Economic activities of Baramati Group of Co-operatives

A) *The Sugar Factory*

The sugar factory is the backbone of the Baramati complex. "Weaker" sections of society have experienced economic growth and a level of prosperity unimagined earlier as a result of direct employment. The sugar factory has won several awards for its efficiency and productivity. The sugar cane factory, which produces 110,000 tonnes of sugar per year, employs 8,000 workers and collects sugar cane from about 35,000 farmers. It is the main source of income for the Baramati region. A distillery has also been set up in the complex. An electricity generation unit has been set up using the waste water of the the distillery (Vijaditya. N, 2002 : 100). All decisions concerning the sugar factory are taken by an elective body, the 19 member board of the sugar co-operative. Elections take place every five years in the 100 villages around Baramati. Three members are elected from each of five clusters of villages, while two seats on the board are reserved for women and two for representatives of scheduled castes. The board, in turn elects a Chairman and a Vice-Chairman., and Directors. Responsibility of co-ordination of activities of the different Co-operatives lies with the Pawar family and the managing directors. The Baramati complex is designed to look after all the basic needs of the workers. Baramati complex is provided with living quarters, filtered water, inexpensive electricity, schools, physical training and cultural centers.

B)*The Sugar Administrative Building*

The sugar administrative building, situated in the heart of Baramati, houses the administrative staff of the sugar, distillery and paper factories. The

sugar factory is located around 500 meters from this building. The sugar cane for the factory is obtained from approximately 70 villages located in the districts of Pune, Solapur and Ahmednagar.

C)Baramati Cooperative Dairy

This dairy registered in 1977, having its office at Kasaba-Baramati, has Dairy unit at Malegaon with handling capacity of 1.0 lac liters per day supported with one chilling centre at Nira and 65 village bulk coolers. To cater the needs of our prestigious farmers the organisation has established its own Cattle feed plant of 200 MT per day capacity at Malegaon.

This dairy has achieved the "**BEST QUALITY MILK SUPPLY AWARD**" for two years in succession from Mahanand (Maharastra Rajya Sahakari Doodh Maha Sangh Ltd, Mumbai) for 2005-06 and 2006-07.

D) Dynamix Dairy

Dynamix, a private Dairy society is situated approximately 3 km from the Baramati. The office of the dairy has computers for its data processing. Some of the important milk products include pasteurized milk known as "*Dynamix Dudh*", milk powder, ghee, butter and Sreekahnd. Dynamix supplies milk products like yoghurt, and mozzarella cheese to multinational giants like Nestle and Pizza Hut from this plant at Baramati. Nearly 60 per cent of the plant's products are exported to the US and Europe. In all, Dynamix collects nearly a million liters of milk from five districts, including Baramati. Factory management has shown a keen interest in computerization and networking and to complement these tasks, has emphasized training of staff.

E) Agriculture Development Trust, Baramati

Agricultural Development Trust was founded by renowned social reformers Hon. Sharadchandra Pawar and his elder brother Late Padmashree Dr. D. G. Alias Appasaheb Pawar, in the year 1968 with the objective of serving the down trodden masses and bringing agricultural and educational development among them.

160

The Trust is situated at a distance of 5 km from Baramati, on the Baramati - Nira road. The trust began its activities by constructing percolation tanks in the drought prone area of Baramati Tahsil, which could fulfill the water requirement for drinking and agriculture.

At the same time, two great Australian women Miss. Hesel Skuces and Miss. Edna Wazar were providing free food, milk and necessary goods through the CASA Society to drought affected people. But that help was temporary. It could not solve the problem of the people living in this area. This was realized by our Mr. Sharadchandraji Pawar & Late Mr. Appasaheb Pawar. So they implemented the programme 'food for work' in collaboration with these Australian Ladies, which brought a great success to irrigate the area. The scheme helped to build around 300 percolation tanks in the Baramati tahsil. First Percolation tank was built at Tandulwadi in 1967 which provided water to 150 acres of land in that area. The Trust was registered on 22nd June 1971 and since its inception, has come a long way in establishing itself as a credible torchbearer of agricultural and educational movement in rural background and has made a commendable contribution of awakening and inspiring the masses who were deprived of education. The trust has developed 110 acres of demonstration farm at Malegaon.

This trust has primary and secondary schools, Krishi Vigyan Kendra, Agriculture College, Junior and Senior College, Biotechnology College and Watershed Management Mission.

F) Krishi Vigyan Kendra (KVK)

The Krishi Vigyan Kendra is a district level Farm Science Center established by the Indian Council of Agricultural Research (ICAR), New Delhi at Agricultural Development Trust, Baramati District, Pune for speedy transfer of technology to the farmers' fields. The operational area of this KrishiVigyan Kendra comes under the western Maharashtra dry Zone. The aim of Krishi Vigyan Kendra is to reduce the time lag between generation of technology at the research institutions and it's transfer to the farmer's field for increasing production, productivity and income from the agriculture and allied sectors on

a sustained basis. In order to achieve this goal, four mandates have been envisaged in the design of the Krishi Vigyan Kendra.

On an average this KVK conducts 100 to 120 need-based training programs in a year for farmers, farmwomen, rural youth and extension personnel out of which 40-50% are long duration trainings. The KVK has purchased more than 200 educational audio visual aids to make the training activities more effective. More emphasis is given on long duration practical, self-employment oriented trainings for school dropouts & unemployed rural youth. Many participants on completion of the training have been successfully self employed by way of establishing their own poultry, goatery, nursery, dairy & sericulture units. Efforts are made to empower the women technically, as they play very vital role in agricultural operations. Farmer's groups may approach the KVK for customized trainings.

G) Goods Processing Society

This Baramati Cooperative society has been set up for processing agricultural goods in packaged form. The raw material for this is obtained from a large number of villages in various districts. The machinery has been imported and the installation is nearing its completion.

H) Vidya Pratishthan Shikshan Mandal

Vidya Pratishthan is a name fondly synonymous with education in all its myriad forms and academic aspects. Right since its inception in 1972, the Institution has majestically scaled the ladder of success with profundity that aptly reflects its commitment to accord educational facilities to all sections of society. Duly realizing the absolute necessity of providing class education to the kith and kin of farmers, labourers and villagers, Vidya Pratishthan took it upon itself the need based endeavor of making education accessible to the poor and the deserving. Backed by the illustrious visionary, Hon. Mr. Sharadchandra Pawar and indomitable leader, Mr. Ajitdada Pawar with experienced guidance by the members of the Management Committee; the Pratishthan ushered in an era of imparting general as well as Technical Education through the

Institutions, which are captained by illustrious personalities in their respective fields.

With a sprawling campus of 156 acres, the Pratishthan houses 23 Institutions, where 18,000 students are nurtured daily to turn them into the dearest citizens of the nation and sought after persons to the world of Knowledge. The dry, desolate and rocky landmass, once upon a time, has been turned into an artistically carved out landscape that creates just the right aura and decor of the Academia.

Ultra modern hostels cater to the need of cozy, comfortable and spacious accommodation for the students, while plush residential quarters are provided to the teaching and non-teaching staff. In a nutshell, it is sheer grandeur blended with aesthetic sophistication that makes Vidya Pratishthan, a truly class Educational Institution with a touch of magnificence in all its fields. The Vidya Prathisthan's colleges have more than 40% women.Thus educational development has further enriched economic development of the local people.

There are many institutions that are working under aegis of Vidya Pratishthan Shikshan Mandal. They have senior degree colleges, School of Biotechnology, Institute of Information Technology, College of Engineering, College of Education, Law College, Marathi and English Medium School, Poytechnique college and music academy.

I) Baramati Grape Industries Ltd.

The Grape Grower's Association was established in 1975 for finding processing solutions to grapes produced in the area. They started Baramati Grape Industries Ltd., Pimpli near Baramati. Wine-making came to Baramati much before wineries were set up in Nashik and Narayangaon. The Baramati Grape Industries Limited owned by United Breweries makes wine under the Bosca brand name.

This grape industry crushes about 5,000 tonnes of grapes per annum. The grapes are sourced from a 10 mile radius and have 500 farmers in the supply chain. However, a much larger portion of the grapes grown in Baramati are exported. According to Sunil Pawar, Director of the Baramati Fruit Growers Association, between 13,000-14,000 acres in Baramati is used for growing the seedless Thompson White meant for table purposes. Eighteen containers of Thompson White were exported this season (each container roughly contains 400 kg) and prices this year touched Rs. 68 per kg.

J) Agriculture Tourism

Agriculture Development Trust Baramati started Agro Tourism and Eco Tourism first time in the Maharashtra. Agro tourism covers simple home cooked vegetarian meal, traditional Maharashtrain folk performances, camp fires, Winery visits, farm visits etc. Agriculture tourism are to achieve income, employment and economic stability in rural communities in India, help in boosting a range of activities, services and amenities provided by farmers and rural people to attract urban tourists to their area, thus providing opportunity for urban people to get back to the roots.

5.4 Application of WiMAX Project at Baramati

A) Why WiMAX was the chosen one?

Based on the IT revolution proliferating in Andhra Pradesh and the IT savvy Chandra Babu Naidu's (Ex-Chief Minister of Andhra Pradesh) endeavors towards development, Mr. Shardachara Pawar initiated the project on the same lines. He proposed IT revolution with computer chip maker Intel's Craig Barrate to launch India's first wireless internet access WiMAX project in rural area at Baramati. It was promptly run due to the availability of the infrastructure and the support from Intel and government of India. It involved the co-operative nature where communication via networking was any day feasible than the traditional ways. The application would have been simple considering the requirements of the various personal as well as co-operative structures. The entire project was a pilot study to understand the effectiveness

of such implementation so as to further replicate the experiment in other parts of India.

To enable the wireless communications' infrastructure, Intel set up the high-speed internet network to connect the community computer center and public Kiosk, donated PCs to the community and developed a telemedicine programme for Baramati's government hospital.

B) Goals of the Project

The major goals of the WiMAX project proposed for Baramati are as follows,

1. To bring Baramati on National Informatics Centre NET (NICNET).
2. To increase the efficiency / productivity of the existing co-operative societies by providing state of the art computer communication network and latest database technology.
3. To provide computerized facilitation booths in majority of villages that are linked up to the central computer network at VIIT, Baramati.
4. To create database of villagers on socio-economic aspects.
5. To provide Tele–education to both primary and higher educational institutes by developing IT centres at most populous points.
6. To create greater transparency.
7. To make local language interface.

C) Project Partners

This project was co-ordinated with the help of the following agencies;

1. Intel's World Ahead Programme
2. Directorate of Information Technology, Government of Maharashtra.
3. Vidya Prathisan's Institute of Information Technology (VIIT), Baramati.

D) Financial Assistance

The total cost of this project was Rs. 1.5 crores which was sponsored by Intel under the scheme of World Ahead Programme especially implemented in the developing and underdeveloped nations .

E) Why Intel's first rural WiMAX at Baramati

The topography of Baramati-with villages spread far and wide. The success of WiMAX would be a standup case for WiMAX as a medium for last mile connectivity in rural areas. Intel is using WiMAX to connect a series of five community internet Kiosk spread across five villages in the taluka to the VIIT campus, which will serve as a base camp for the WiMAX implementation (In other words, Baramati still doesn't have 'mobile' WiMAX) of the five villages. Katewadi is the closest at a distance of 10 km from the VIIT campus, while the rest of the villages are at least 20-25 km away from the campus. Physically wiring up this community Kiosk for internet connectivity would not only have been costly, but also a logistics nightmare.

F) How the project Works ?

The WiMAX system, jointly installed by Intel and Aircel, is a cost-effective and efficient way to deliver broadband internet access to remote communities. The PCs, donated by Intel to the community computer center and public Kiosk, also include ones specifically engineered for extreme environments in India. These "Community PCs" have dust filters, auto-restore, and can connect to car batteries for electricity.

A new Community Service Centre features Kiosk that provides internet access and services. WiMAX enables broadband speeds in a wireless environment, while Intel-powered PCs provide computing power and access, even in areas with erratic power supplies. One beneficiary of the town's new PC access is the network of more than 100 women's vocational self-help group.

A digital community health center was implemented with remote diagnostics in ophthalmology and cardiology. The center delivers specialized care in areas like cardiology and eye care at dramatically lower costs than in urban areas – sometimes as much as 25 times less expensive. The initiative involved healthcare partners - SN Informatics and Schiller Healthcare, along with tertiary care providers Narayana Hrudyalaya and Arvind Eye Hospital, and supported by the leading local institute at Baramati, Vidya Prathisthan's Institute of Information Technology (VIIT).

The ECG test of a patient in Baramati is transmitted to the cardio-care room of Narayana Hrudayalaya and a slit lamp captures the inner image of the eye and the data is transferred to Arvind Eye Clinic. The existing tele-medicine set-up of the hospital was utilised for this purpose. A cardiologist examines the test results and reports the abnormalities, if any, round the clock through this procedure. The average response time is less than 10 minutes. The community health center is making a striking difference, with 11,000 outpatients served in just first four months of its operation. The project was under the World Ahead Programme, an initiative launched by Intel to provide education and healthcare service in India and encouraged by the working of the Baramati project. Intel has expanded the tele-health scheme to a 100-bed hospital in Tindivanam as well.

1) Computer on Wheels

Pursuing the belief that knowledge spread is knowledge earned, Intel and VIIT has started its own mobile education endeavor—Computer on Wheels. Using this innovative campaign, they are training more than 6,300 students across 51 schools spanning 40 villages in rural Maharashtra in the basic and advanced usage of computers. "We cover two to three schools every day and we give training of approximately 60 hours on the computer to each student. Using this we are spreading technology awareness amongst the rural community and providing equal opportunities for them in this highly competitive age" , explained by Mr. Amol Goje, Director VIIT. Some of the

challenges faced in such operations in rural areas are that of non-availability of hardware, lack of skilled teachers, maintenance of hardware and lack of or inconsistent power supply. Irrespective of these hiccups, they operated using batteries and generators in low power areas. "One of the biggest concerns in rural areas is that of availability and quality of good teachers, to tackle this, we give them proper training and help them create their objectives," said Goje.

2) WiMAX brings e-Progress in Rural society

Fourteen-year-old Aarti Dhawan flips open her sleek, black Compaq laptop and conjures a PowerPoint slide for my benefit-all with a beautific smile. She then clicks on an Excel spreadsheet and explains the month's expenses to her 33-year-old uncle, Mr. Santosh Dhawan. A sugarcane field is an unlikely place to use a laptop, but if you are in Baramati, the sugarcane heartland of Maharashtra, you might not find many other places to use one. The class nine students first saw a computer about two years ago at a computer lab in her school. Since then, Aarti has not only managed to master simple applications like Word, Excel and PowerPoint, but has also coaxed her uncle, a small farmer with 30 acres of land, to open an e-mail account and surf the internet. A year ago, they purchased a desktop that they use at home to access the net for agriculture-related information. "We surf the net to find out, for example, how to cultivate different varieties of grapes," says a smiling Aarti. For now, the young girl is glad to tally the accounts of her uncle's farm on her brand new laptop-a gift from Intel's Chairman Craig Barrett, who visited the girl's home during inauguration of WiMAX project in 2006.

3) Courtesy : The internet helps in rearing the Emu

The 37-year-old poultry farmer got into the business in 1982 with 50 chicken. Since 1993, he had always wanted to breed birds other than chicken to augment his income. But sources of information in a small town like Baramati were limited. And then, in 2002, a cyber café opened at Baramati and Tawde struck pay dirt. He discovered, on the net, that the EMU (an Australian bird)

could be bred in India. And what's more, EMU meat was far costlier than that of the chicken he was breeding. An avid Google who surfs the net two to four hours every day, Tawade sold nearly 750 kilos of EMU meat last year in India alone at Rs.180 per kilo. This year, he plans to sell two tonnes of EMU meat. As he sits in his bare one-room office, people walk in to ask for advice. "I help people surf the net whenever they come to me for information. I do that for free", he says.

4) WiMAX gifts good health

Mr. Bapu More, a 50 year old who came to Rui Government hospital for medical check-up for a suspected heart problem. Normally, a specialised heart check-up like this would mean a two-and-a-half hour bumpy bus trip to Pune. The farmer, incidentally, has never left Baramati in his 50 years on the planet. But Intel's recently launched telemedicine service saved the hassle of leaving his beloved Baramati. As I watched, More's ECG readings were taken and e-mailed to Narayana Hrudayalaya, a super specialty hospital in Bangalore. In less than five minutes, an e-mail from Dr. Bomaiah popped up from Bangalore. "Sinus rhythm within normal limit," read the e-mail. Case closed. Said Dr.Manjusha Goje, who runs the clinic: "We are reaching out with these services to the unreachable."

5) Market Yard

Another famous IT application destination in Baramati is Krishi Utpanna Bazar Samiti's information center at agriculture market yard. It is visited by the farmers on Mondays and Thursdays, when they come to sell their produce. Very few agricultural labourers had come to this place. Although some CDs are used to show new agricultural practices to the visitors, main demand is for the website, which displays agricultural prices in different mundies. How many farmers base their decisions of selling the produce using this information is not known. Also how many farmers come here to enquire about prices prior to bringing their produce to the market is also not known.

However, the market yard boasts for having this technology, which is but natural considering the fact that the town belongs to agricultural minister, who has determined to integrate the agriculture in the globalized market.

6) SETU (*Bridge between the government and the people*) : *Suvidha Kendra*

Baramati has the most equipped Suvidha Kendra than any other taluka or for that matter any other district place in Maharashtra. It is a new initiative by the government of Maharashtra. Probably it is the first established centre of its kind, once the decision was taken by the government. More than 50 kinds of certificates/ Licenses are required for submission of applications for different purposes such as land records for acquiring loans, caste certificate for applying for educational scholarship or obtaining any other scheme for reserved categories and so on. Usually it used to take three to four months and the person desiring required to go round the desks in the collector's office or Tahsildar's. Here the Suvidha Kendra has been thought of one window mechanism to obtain such certificate within a week. Information is fed in the set format and the printout is taken for the signature from the relevant authority and the certificate is returned as the Suvidha Kendra within a week. As yet the local LAN system is not set up between the Suvidha Kendra and the tahsildar's office and the papers are physically taken for signatures. But ultimately it is thought of getting wired and the officer would be able to download the applications from the LAN network. This system means that computer stores information under the unique code m-number and the duplicate copy could be prepared easily or any other information can be corroborated for the new certificate. The people are happy because it saves their time as well as bribe money for forwarding the application ahead. Land record is very important document in the life of agriculturist. Once the land record gets computerized and is easily made available on line the last Non-Experimental and point of exploitation of farmers would be loosened.

I noticed that Baramati Suvidha Kendra was well visited and every day around 300-400 certificates are distributed at the time of results and college

admissions for two to three months. It had come to light through interview that, this was the best known use of computers in the rural area.

5.5 ICT and Rural Development: Role of WiMAX Project

Both the descriptive and analytical statistics are presented and interpreted here. The descriptive statistics giving the actual and percentage distribution of respondents on selected variables are given in form of comparisons between two villages. Hypothesis i.e.' WiMAX is an effective ICT tool for rural development' is also tested through following analysis. Before going to analyse the role of WiMAX in development, it is pertaining to see the profile of respondents by status variables.

Table No. 5.1 Distribution of respondents by socio-economic status in Experimental and Non-Experimental Villages

Sr. No	Status variable	Experimental Village (%) (N = 100)		Non-Experimental Village (%) (N = 114)	
		General	B.C	General	B.C
1	Sex				
	Male	69 (69.00)	16 (16.00)	78 (68.42)	12 (10.53)
	Female	12 (12.00)	3 (3.00)	22 (19.30)	2 (1.75)
2	Marital Status				
	Unmarried	1 (1.00)	(0.00)	2 (1.75)	(0.00)
	Married	80 (80.00)	19 (19.00)	98 (85.96)	14 (12.28)
3	Land holding :				
	Marginal peasant (Up to 2.5 acres)	38 (38.00)	15 (15.00)	47 (41.22)	11 (9.67)
	Small peasant (2.5 to 5 acres)	19 (19.00)	2 (2.00)	24 (21.05)	2 (1.75)
	Medium peasant (5 to 10 acres)	20 (20.00)	2 (2.00)	20 (17.54)	1 (0.87)
	Big peasant (10 and above acres	4 (4.00)	(0.00)	9 (7.89)	(0.00)
4	Age (in years) :				
	21 – 30	9 (9.00)	2 (2.00)	7 (6.14)	1 (0.88)
	31 – 40	20 (20.00)	2 (2.00)	33 (28.95)	4 (3.51)
	41 – 50	38 (38.00)	7 (7.00)	27 (23.68)	5 (4.38)

	above 50	14 (14.00)	8 (8.00)	33 (28.95)	4 (3.51)
6	Type of Family				
	Joint	51 (51.00)	13 (13.00)	57 (50.00)	5 (4.38)
	Nuclear	30 (30.00)	6 (6.00)	43 (37.72)	9 (7.89)

Figures in parentheses indicate percentage to the total.

Note : General refers Non Reserved Castes and B.C. refers Reserved Castes.

Status is defined simply as the position of a person in the social structure and is classified in terms of ascribed and achieved components. Table No. 5.1 shows the distribution of respondents in both villages (experimental and Non-Experimental) by sex, marital status, land holding, age, education and type of family. It shows that percentage of respondents of female and unmarried are lower in experimental village than in Non-Experimental village. Majority of respondents belong to marginal and small category in both villages i.e. 74.00 % of experimental and 74.14 % of Non-Experimental village. But the percentages of backward caste peasants are very less as compared to general category peasants. Backward caste peasants possessed only 17 % land in experimental and 11.42 % land in Non-Experimental village. Only 26 % respondents of experimental and 26.03 % respondents of Non-Experimental village of medium and big category possessed maximum land. 67 % of Experimental and 60.57 % of Non-Experimental village were in the age group of 31-50 years. However literacy is as high 68 % in Experimental village as against 64.04 % in Non-Experimental village. There are slightly more joint families (51.00 %) in Experimental village than in Non-Experimental village (50 %) respectively.

The background variables of the respondents show their brief profile, it indicates relatively similar socio-economic status of both villages. The next discussion will provide in depth analysis regarding the role of WiMAX in the process of development.

5.5.1 WiMAX and Social Changes

A) Awareness about Computers and ICT

Table No. 5.2 Awareness and Familiarity regarding computer.

Sr. No	Variables	Experimental Village (N=100)		Non-Experimental Village (N=114)	
		General	B.C	General	B.C
A	Do you know about computer ?				
	Yes	79 (79.00)	18 (18.00)	52 (45.61)	5 (4.38)
	No	2 (2.00)	1 (1.00)	48 (42.11)	9 (7.89)
B	At which place have you seen ?				
	a)City	13 (13.00)	3 (3.00)	47 (41.23)	4 (3.51)
	b)Shop	5 (5.00)	1 (1.00)	20 (17.54)	2 (1.75)
	c)WIMAX Kiosk	63 (63.00)	14 (14.00)	(0.00)	(0.00)
	d)Milk centre	(0.00)	1 (1.00)	18 (15.79)	5 (4.38)
	e)Sugar factory	(0.00)	(0.00)	16 (14.03)	3 (2.63)

Figures in parentheses indicate percentage to the total.

B.C. = Backward Castes i.e. SC, NT and OBCs.

General = Maratha, Jain, Lingayat, Brahmin.

The concept of fully automated villages was a dream till few years back. But the reality has come true with the rapid growth of Information and Communication Technology (ICT) in the world scenario. The wired villages and info villages have shown that information can be disseminated in a more useful manner and as a peasant need. It is clear from Table No. 4.2 that 97 % peasants of Experimental village know about computers and it is interesting to note 77 % peasants are familiar with computer of the WiMAX On the other hand only 49.99 % are familiar with computer at city. As far as caste category is concerned 19 % backward caste peasants of Experimental village know about computer but it is 12.27 % in Non-Experimental village.

DiagramNo.5.1Awareness of Computer according to land holding pattern.
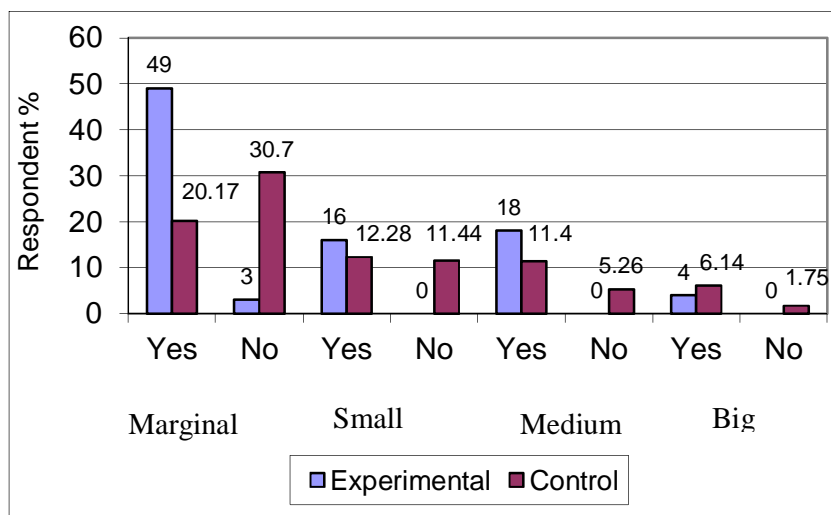
Among the different land holding wise category of peasants, the awareness level of computer is different as shown in Graph No. 5.1. It is observed that the awareness of computer is high among the big and marginal peasants i.e. 22% of the total, followed by small and marginal i.e. 39 % respectively whereas the degree of computer awareness in Non-Experimental village is less than experimental village. The awareness is found high among the big and medium size peasant i.e. 17.54 % of the total, followed by small and marginal peasants i.e.32.45% respectively due to socio-economic background.

Table No. 5.3 Differences about ICT awareness among the experimental and Non-Experimental village peasants.

Sr. No.	Differences about ICT	Experimental Village (N = 100)		Non-Experimental Village (N = 114)	
		General (N = 81)	Backward Castes (N = 100)	General (N = 100)	Backward Castes (N = 14)
1.	Computer is beneficial?				
	Yes	78 (78.00)	14 (14.00)	54 (47.37)	4 (3.50)
	No	3 (3.00)	5 (5.00)	46 (40.35)	10 (8.77)
2.	Are you interested to learn computer?				
	Yes	62 (62.00)	11 (11.00)	33 (28.95)	2 (1.75)
	No	19 (19.00)	8 (8.00)	67 (58.77)	12 (10.53)

3.	Do you feel your children should learn computer?				
	Yes	81 (81.00)	19 (19.00)	74 (64.91)	5 (4.38)
	No	-	-	26 (22.80)	9 (7.89)
4.	Do you know any parts of computer?				
	Yes	52 (52.00)	12 (12.00)	14 (12.28)	5 (4.38)
	No	29 (29.00)	7 (7.00)	86 (75.44)	14 (12.28)
5.	Do you know internet?				
	Yes	32 (32.00)	8 (8.00)	19 (16.66)	2 (1.75)
	No	49 (49.00)	11 (11.00)	81 (71.05)	12 (10.53)
6.	Are you interested to access agro-based information through internet?				
	Yes	68 (68.00)	15 (15.00)	40 (35.08)	3 (2.63)
	No	13 (13.00)	4 (4.00)	60 (52.63)	11 (9.65)

Figures in parentheses indicate percentage to the total.

Table No. 5.3 shows the consciousness about I.C.T. among the peasants of both villages. It indicates majority i.e. 78 % General and 14 % of backward caste peasant of experimental village agree that computer is beneficial to them, while 62 % of General and 11 % of backward caste peasants are interested to learn computer. Both category peasants of Non-Experimental village shows poor interest 47.37 % of general and 3.50 of backward caste peasants believe that computer is beneficial. However i.e. 58.77 % of General and 10.53 % of Backward caste peasants are not interested to learn computer. It is important to note that the total 100 % peasants of both categories felt that their children should learn computer which shows the positive consciousness among the peasants of experimental village especially among the peasants of backward caste. But on the other hand 64.91 % General category peasant and 4.38 % backward caste peasants of Non-Experimental village felt that their children too learn computer. Furthermore 52 % General and 12 % backward caste peasants know about a few parts of computer such as monitor, key board and

mouse. 75.44 % General and 12.28 % backward caste peasants of Non-Experimental village did not know about any single part of computer. As regards internet 32, 68 % of general category and 8.15 % of backward caste peasants of experimental village know about internet and they are interested to access agricultural information through internet. This indicates that peasants are changing their views according to the demanding situations. In Non-Experimental village they are still sticking to their traditional beliefs because majority i.e. 71.05 and 52.63 % of general and 10.53 and 9.65 % of backward caste peasants don't know what is Internet. Due to illiteracy and lack of outside exposure backward caste peasants are not interested to use this information for agriculture. As per our comparative observation in both villages it is found that due to lack of WiMAX Kiosk and other I.T. related activities the awareness level is too poor amongst the peasants of Non-Experimental village. It was also noticed that the awareness level of I.C.T. among the backward caste peasants of experimental village was quite appreciable. It plays vital role in bridging the gap between information have's and have not's. It is clear from the above table that due to WiMAX Kiosk, the awareness about I.C.T. is high among the peasants of Experimental village. At the same time it has created sustainable atmosphere regarding I.C.T. in this village. Following case-study number 1 will illustrate this point.

Several studies show that interpersonal communication plays an important role in rural communication. The above Graph No. 4.9 indicates that 92% peasants feel their interpersonal communication has increased due to WiMAX Kiosk. On the other hand 84.21% of Non-Experimental village peasants believe that absence of WiMAX affects their interpersonal communication negatively.

Table No. 5.4:Frequency of Visits to WiMAX Kiosk.

Sr. no	Frequency	Experimental village (N = 100)				Total
		Marginal peasant	**Small peasant**	**Medium peasant**	**Big peasant**	

A	Male					
	Once in a day	6	3	3	----	12
		(6.00)	(3.00)	(3.00)		(12.00)
	Twice in a week	23	7	10	1	41
		(23.00)	(7.00)	(10.00)	(1.00)	(41.00)
	Once in a month	17	8	5	2	32
		(17.00)	(8.00)	(5.00)	(2.00)	(32.00)
B	Female :					
	Once in a day	3	1	1	----	5
		(3.00)	(1.00)	(1.00)		(5.00)
	Twice in a week	1	-----		----	1
		(1.00)				(1.00)
	Once in a month	3	2	3	1	9
		(3)	(2.00)	(3.00)	(1.00)	(9.00)
	Visiting time					
	Male					
	Morning	28	14	15	2	59
		(28.00)	(14.00)	(15.00)	(2.00)	(59.00)
A	Afternoon	7	2	2	1	12
		(7.00)	(2.00)	(2.00)	(1.00)	(12.00)
	Evening	10	2	2	-----	14
		(10.00)	(2.00)	(2.00)		(14.00)
B	Female :					
	Morning	3	1	1	----	5
		(3.00)	(1.00)	(1.00)		(5.00)
	Afternoon	4	2	3	1	10
		(4.00)	(2.00)	(3.00)	(1.00)	(10.00)
	Evening	-----	-----	---	----	----

Figures in parentheses indicate percentage to the total.

Table No. 5.4 reveals the frequency of visit of peasants to WiMAX Kiosk by sex and land holding pattern. It is observed from the above data, that majority of male respondents i.e. 41% visits the WiMAX Kiosk twice a week between 9 am to 11 am as reported by 59% of respondents. On the other hand most of the female respondents 9% are prefer to visit once a month between 2

pm to 4 pm as reported by 10% respondents followed by morning and twice in a week. Because during afternoon women do not have much work therefore mostly they prefer to visit to WiMAX Kiosk between 2 p.m. to 4 p.m. Due to huge domestic and agricultural work women do not have enough time to visit WiMAX Kiosk frequently. But it is interesting to note that due to WiMAX Kiosk the contact of women to such common places is increased.   During the field work it was observed that the frequency of visiting time was mainly depended upon the sex and the information need.

B) Education

Table No.5.5: Educational Status in the Experimental and Non-Experimental Villages at Baramati region.

Sr. No	Status variable	Experimental Village (%) (N = 100)		Non-Experimental Village (%) (N = 114)	
		General	**B.C**	**General**	**B.C**
1.	Education : Illiterate Primary Secondary Higher Secondary Graduate Post graduate	**20 (20.00)** **31 (31.00)** **16 (16.00)** **10 (10.00)** **3 (3.00)** **1 (1.00)**	**12 (20.00)** **3 (3.00)** **2 (2.00)** **1 (1.00)** **1 (1.00)** **(0.00)**	**35 (30.70)** **43 (37.72)** **19 (16.66)** **2 (1.75)** **1 (0.87)** **0 (0.00)**	**6 (5.26)** **4 (3.51)** **3 (2.63)** **1 (0.87)** **0 (0.00)** **0 (0.00)**

From the table number 5.5 it is revealed that, illiterate people in the non-experimental village is higher than the experimental village as well as number of villages who pursue higher education is more in number in the experimental village i.e. Katewadi. Here it is analyzed that, WiMAX in the experimental village is doing greater role in uplifting the educational profile. Katewadi villagers are looking to send their children to higher and technical education.

Table No. 5.6: Children's education and their problems in Experimental and Non-Experimental Villages

Sr. No.	Background Variables	Experimental Village (N = 100)		Non-Experimental Village (N = 114)	
		General	**Backward castes**	**General**	**Backward castes**
A.	Education				
	1. For Son				
	1. Secondary	-	- (0.00)	- (0.00)	- (0.00)
	2. Higher secondary	-	- (0.00)	1 (0.88)	1 (0.88)
	3. Graduate	38 (38.00)	10 (10.00)	48 (42.10)	7 (6.14)
	4. Post graduate	43 (43.00)	9 (9.00)	51 (44.74	6 (5.26)
	2. For Daughter				
	1. Secondary	1 (1.00)	0	5 (4.38)	1 (0.88)
	2. Higher secondary	24 (24.00)	10 (10.00)	40 (35.08)	7 (6.14)
	3. Graduate	40 (40.00)	4 (4.00)	39(34.21)	3 (2.63)
	4. Post graduate	16 (16.00)	5 (5.00)	16 (14.03)	3 (2.63)
B.	Educational Problems				
	1. Lack of transport facility	7 (7.00)	1 (1.00)	7 (6.14)	1 (0.88)
	2. Lack of private tuition	10 (10.00)	2 (2.00)	10 (8.77)	2 (1.75)
	3. Lack of personal guidance	28 (28.00)	5 (5.00)	41 (35.96)	3 (2.63)
	4. Economic problem	21 (21.00)	7(7.00)	27 (23.68)	5 (4.38)
	5. Lack of higher / professional educational institution	15 (15.00)	4 (4.00)	15 (13.16)	3 (2.63)

Figures in parentheses indicate percentage to the total

Table No. 5.6 shows that the parents aspire towards education of their children. It indicates that maximum respondents prefer to educate their sons up to minimum graduation (48%) and post-graduation (52%) in experimental

village. The corresponding figures for the Non-Experimental village are 48.24% graduation and 50% post-graduation. In case of daughter's education most of the respondents of experimental village preferred to teach up to higher secondary (34%), graduation (44%), and post-graduation (21%). In Non-Experimental village the corresponding figures of preference are higher secondary (41.22%), graduation (36.84%) and post-graduation (16.66%).

It is pertinent to note that the average attitude of the peasants of experimental village towards children's education is much positive than Non-Experimental village peasants. It is also clear that the aspiration of backward caste respondents of experimental village is greater than that of the backward caste respondents of Non-Experimental village. The above table also indicates that lack of personal guidance (33%) and economic problem (28%) are the major problems associated with education faced by the respondents of experimental village. The same problems exists among the respondents of Non-Experimental village, while it was noticed that economic problem is the major hurdle among the backward caste peasants of both villages. Thus, it can be concluded that lack of educational atmosphere, illiteracy, heavy agricultural work and economic problem are the major hurdles in rural education.

C) Health

Table No 5.7: Family planning, medical consultation and mass media

Sr. No.	Background Variables	Experimental Village (N=100)		Non-Experimental Village (N=14)	
		General	Backward castes	General	Backward castes
A	Family Planning : 1) Used any family planning method?				
	Yes	63 (63.00)	10 (10.00)	59 (51.75)	6 (5.26)
	No	18 (18.00)	9 (35.96)	41 (35.96)	8 (7.01)
B	Medical Consultation 1) Doctor				
	1.1 Government	20 (20.00)	10 (10.00)	25 (24.56)	6 (5.26)
	1.2 Private	17 (17.00)	-	22 (19.29)	-
	1.3 Both	44 (44.00)	9 (9.00)	49 (42.98)	7 (6.14)
	2) Traditional Medicine man	-	-	1 (0.88)	1 (0.88)
C.	Mass Media play key role in health awareness?				
	Yes	78 (78.00)	17 (17.00)	82 (71.93)	8 (7.01)
	No	3 (3.00)	2 (2.00)	18 (15.79)	6 (5.26)
D	If yes which mass media?				
	1. Radio	20 (20.00)	8 (8.00)	33 (28.95)	6 (5.26)
	2. Television	28 (28.00)	4 (4.00)	27 (23.68)	3 (2.63)
	3. News Paper/Magazines	19 (9.00)	2 (2.00)	11 (9.65)	1 (0.88)
	4. Posters/Photographs	24 (24.00)	5 (5.00)	29 (25.44)	4 (3.51)

Figures in parentheses indicate percentage to the total.

Table No. 5.7 presents the data regarding family planning, medical consultation and mass media. It shows that nearly 73% of respondents from experimental village are using family planning method, while 57.01% in Non-Experimental village. It was found that majority of the respondents from both

182

villages prefer to consult government as well as private doctors. The figures are 53% in experimental village and 49.12% in Non-Experimental village. In comparison to private doctors most of the respondents preferred to consult Government doctor. It is interesting to note that in experimental village there is not a single respondent consulting traditional Medicine man for medical treatment, but in Non-Experimental village the figure is 1.76%. The health situation in rural areas is so dismal that it is necessary to create awareness about health problems in rural area. However, it is not an easy task; hence in this context the role of communication networks is vital. The above data shows that 95% of experimental and 78.94% of peasants in Non-Experimental village pointed out that, mass media was playing a key role in health awareness. Due to the e– revolution the picture of communication networks in rural area is changing. In the experimental village, 32% respondents reported that the television is playing a key role in health communication, followed by posters and photographs (29%) and radio (28%). In Non-Experimental village the corresponding figures are television (26.31%) followed by posters and photographs (28.95%) and radio (34.21%) respectively. The backward caste peasants of experimental village are much aware about health awareness than their counter part peasants of Non-Experimental village. Backward caste peasants are mainly dependent upon radio and posters photographs as a major source of information followed by television and newspapers. Thus from above it is clear that in both the villages, posters and photographs are the most frequent and preferable medium for health communication followed by television and radio.

Diagram No. 5.2: Role of Mass Media in Health Awareness.
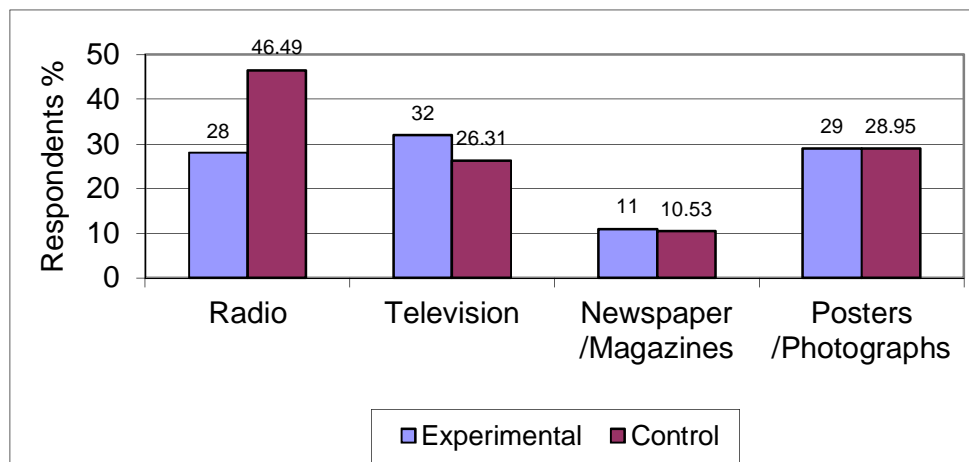
Diagram No. 5.2 clearly indicates that, television 32% in experimental village and radio 44.69% (Non-Experimental village) has created more health awareness among the peasants. It is pertinent to note that posters and photographs are also found to be one of the significant media for disseminating health awareness among the peasants. This is because of its easy and catchy language, illustrations, entertainment free of cost and freedom to watch and read it at any time. Though the intensity of exposure is not yet high, but the researcher found that posters and photographs are more popular among the marginal and medium category peasants. The findings are in consonance with (Joseph, J.S.: 1997). The above figures clearly indicate that posters and photographs are playing an effective role in health awareness in the rural context. Let me illustrate this point with the help of following case study.

D) Status of Woman

In general, there is not much difference between the attitudes of peasants of both villages but the peasants of experimental village expressed their positive attitudes more strongly towards the status of women than the peasants of Non-Experimental village. Due to external exposure, high rate of media consumption, education and higher degree of economic and social participation the peasants of experimental village are more liberal and positive towards the status of women. It was also found that young people have more liberal attitudes

than others. It suggests that views regarding women are changing and the new generation is discarding old beliefs and biases. During field work it was found that interpersonal communication has reinforced the conservative attitudes towards women. On the other hand, mass media networks stimulate positive changes and create more democratic and liberal attitudes. The present findings are in agreement with the findings of Hartmann et al (1989).

Diagram No. 5.3: Role of Communication Networks in Women Empowerment.
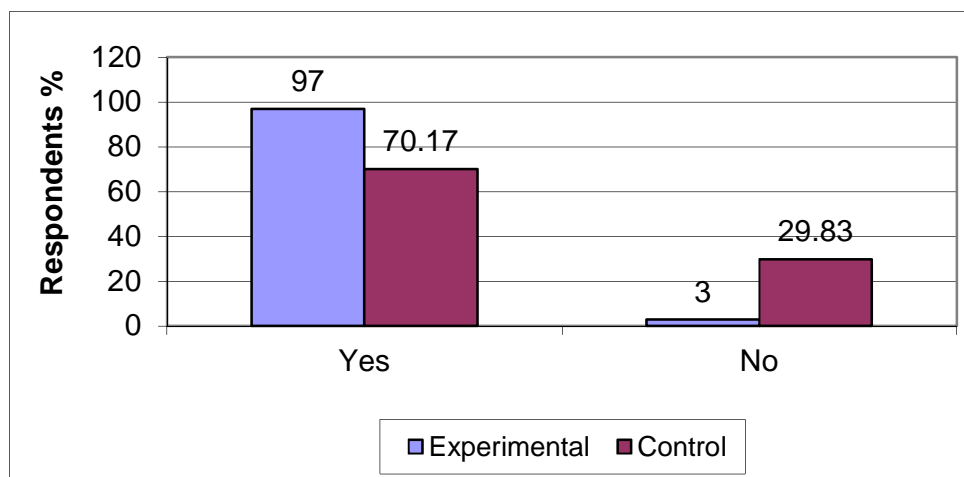
Empowerment means opportunity to take part in decision making concerning political and economic questions affecting individuals concerned. The approach primarily deals with building upon strength which already exist in women, adding further strength towards self-reliance and thus reducing major hurdles in development (Kumar.S, 2006:51). But at the same time it is necessary to understand these issues properly and therefore information is essential. Hence in this connection communication networks are playing an important role. It is clear from the graph No.5.3 that communication networks are playing key role in the awareness of women empowerment as reported by 97 % of experimental and 70.17% of Non-Experimental village peasants respectively. During field work it was observed that the people of the older generation hold negative attitude in this regard.

Table No. 5.8: Attitudes of Respondents Regarding Status of Rural Women

Sr. No.	Participation	Experimental Village (N=100)				Control Village (N =114)			
		General		Backward castes		General		Backward castes	
		Yes	No	Yes	No	Yes	No	Yes	No
	What do you think that ?								
1.	The system of dowry should be abolished	79 (79.00)	2 (2.00)	16 (16.00)	3 (3.00)	86 (75.44)	14 (12.28)	12 (10.53)	2 (1.75)
2.	The girl should choose her life partner	62 (62.00)	19 (19.00)	14 (14.00)	5 (5.00)	65 (57.01)	35 (30.70)	6 (5.26)	8 (7.01)
3.	The girl should have an equal share of property	59 (59.00)	22 (22.00)	12 (12.00)	7 (7.00)	72 (63.16)	28 (24.56)	10 (8.77)	4 (3.51)
4.	Women should be treated as equal to them	80 (80.00)	1 (1.00)	18 (18.00)	1 (1.00)	89 (78.07)	11 (9.65)	11 (9.65)	3 (2.63)
5.	Women should go in for higher education	74 (74.00)	7 (7.00)	17 (17.00)	2 (2.00)	73 (64.03)	27 (23.68)	6 (5.26)	8 (7.01)
6.	Women should attend and participate in Gram Panchayat and other elections	76 (76.00)	5 (5.00)	14 (14.00)	5 (5.00)	62 (54.38)	38 (33.33)	5 (4.38)	9 (7.89)
7.	Women should take up jobs outside the home	73 (73.00)	8 (8.00)	17 (17.00)	2 (2.00)	65 (57.01)	35 (30.70)	4 (3.51)	10 (8.77)
8.	Women should get equal pay for the same work as men	70 (70.00)	11 (11.00)	15 (15.00)	4 (4.00)	73 (64.03)	27 (23.68)	9 (7.89)	5 (4.38)

Figures in parentheses indicate percentage to the total

It is interesting to note that the television was found as the most effective communication network for creating awareness about women empowerment 53% according to the peasant respondents in the experimental village. In the Non-Experimental village, radio was found as the most popular (50.88%) mass communication media. Print media was found to have a negligible role among peasant respondents of both villages. Review of literature indicates that radio is the most effective mass media in rural community (Harrtmann, 1989; Yadav,1993; Singh.J.,1990). But the present study indicates that television has emerged as one of the most popular mass media.

Diagram No. 5.4: Role of effective communication networks in women empowerment.
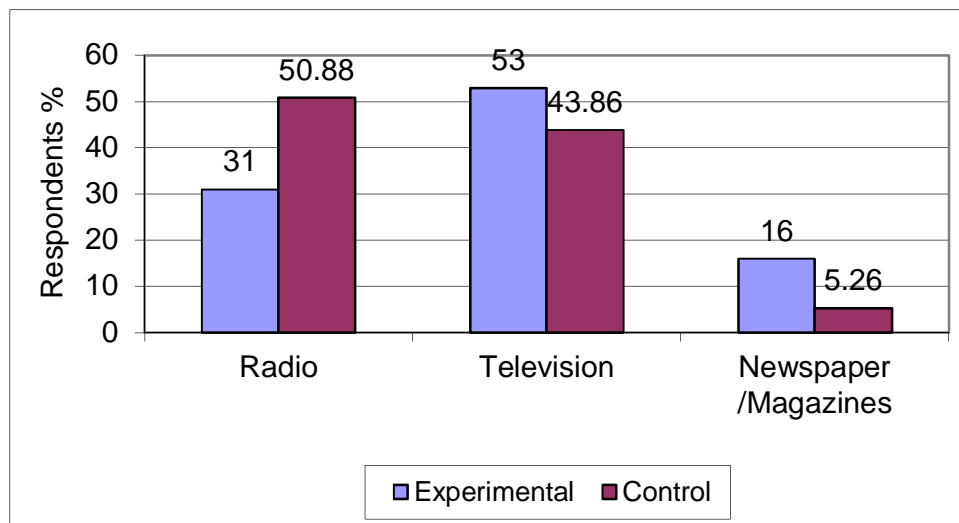
 E) Status of Weaker Section

Table No. 5.9 provides a summary of respondent's attitudes towards the status of backward castes. Nearly 90 % of experimental and 79.82 % of Non-Experimental village peasants reported that they have seen positive changes in caste stratification in their village. Majority of peasants 31 % of experimental and 25.44 % of Non-Experimental village reported that they are not practicing untouchability, involved in political participation 23% in experimental village, eating and participation with upper caste peasants 21.05 % in Non-Experimental village. It was also observed that there is a hidden discrepancy between attitudes

and actual practices regarding backward castes in both villages. Though it was found that there were some changes in the traditional rural social structure especially regarding backward caste, but it was seen at macro level. As far as experimental village is concerned it was found that there is much caste consciousness among the peasants of backward castes. This may be due to sufficient population rate, education, media exposure and political leaders. It is interesting to note that majority of respondents pinpointed that Government efforts and law are much helpful in creating the positive changes towards the status of backward castes as reported by 67 % of experimental and 74.56 % of Non-Experimental village peasants.

Indian rural society has multiple complexities such as caste, class, religion, language, culture, beliefs, superstitions and orthodoxy. Though we are living in IT era yet a number of superstitions continue in rural society. Let us know the ground realties through the Table.No.5.7. It clearly shows that majority i.e. 90.88 % of experimental village and 83.33%, 84.21 % of Non-Experimental village peasants do not believe in black magic and witch craft. But it is interesting to note that majority of peasants believe in the superstition of cat crossing one's way. It was seen that the backward caste peasants of both villages believe in evil eyes and inauspicious things. Peasants at present do not believe in superstitions relating to witch craft and ghosts. Peasants also expressed in informal discussion, that education and exposure to mass media had changed the people's attitudes from irrationality towards rational and scientific thinking.

Table No. 5.9: Respondents Attitudes Regarding Status of Backward Castes.

Sr. No.	Status of Backward Caste	Experiment Village (N=100)		Control Village (N=114)	
		General	Backward castes	General	Backward castes
A)	Do you see any change in caste stratification? 1. Yes 2. No.	75 (75.00) 6 (6.00)	15 (15.00) 4 (4.00)	82 (71.93) 18 (15.79)	9 (7.89) 5 (4.38)
B)	If yes, what are those changes?				
1.	Villagers are not following untouchability	26 (26.00)	5 (5.00)	25 (24.56)	4 (3.51)
2.	Now the temples are open for all castes	11 (11.00)	4 (4.00)	20 (17.54)	3 (2.63)
3.	Free communication, eating and participation	16 (16.00)	3 (3.00)	22 (19.29)	2 (1.75
4.	No restriction of specific work	9 (9.00)	4 (4.00)	18 (15.79)	3 (2.63)
5.	Increasing political participation	20 (20.00)	3 (3.00)	15 (13.16)	2 (3.51)
C)	What are the reasons for changes? 1. Communication networks 2. Government efforts 3. Law	 27 (27.00) 30 (30.00) 24 (24.00)	 6 (6.00) 9 (9.00) 4 (4.00)	 25 (24.56) 27 (23.68) 48 (42.10)	 4 (3.51) 4 (3.51) 6 (5.26)

Figures in parentheses indicate percentage to the total.

F) Interpersonal Communication

On this background during the field work one peasant from experimental village said:

"Before WiMAX we used to spent our leisure time in gossiping, gambling and so on. But after WiMAX whenever we visit WiMAX Kiosk we discuss agricultural issues extensively with fellow peasants. It is a proper forum to interact and exchange our ideas with someone."

Diagram No. 5.5: A Comparative picture of interpersonal communication in Experimental and Non-Experimental village.
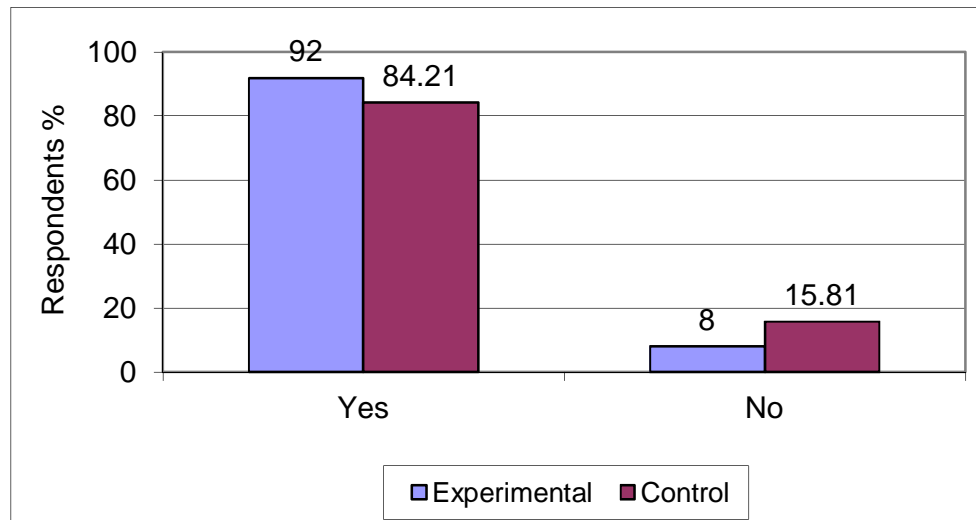
The above example clearly shows that WiMAX is not only beneficial to economic and agricultural development but at the same time it is also helpful in producing healthy interpersonal communication. Peasants are coming on one common platform to share their ideas, and views with each other. It also creates integration and positive mass participation towards I.C.T.

Table No. 5.10:Interpersonal Communication channels of respondents

Sr. No.	Interpersonal Communication Channels	Experimental Village		Non-Experimental Village	
		Frequency	Rank	Frequency	Rank
A)	**Occasion's of Interpersonal Communication**				
1.	Agricultural Work / Practices	25 (25.00)	I	21 (18.42)	I
2.	At the time of milk collection	20 (20.00)	II	17 (14.91)	III
3.	At the time of watching television	17 (17.00)	III	18 (15.79)	II
4.	Ceremonies	10 (10.00)	V	14 (12.28)	V
5.	Gramsabha	11 (11.00)	IV	15 (13.16)	IV
6.	Festival	8 (8.00)	VI	13 (11.40)	VI
7.	Meetings of women self group**	5 (5.00)	VII	10 (8.77)	VII
8.	Meetings of *mahilamandal***	4 (4.00)	VIII	6 (5.26)	VIII
B)	**Venue of interpersonal Communication**				
1.	Own house	17 (17.00)	III	21 (18.42)	II
2.	Neighbours house	7 (7.00)	VI	14 (12.28)	V
3.	Farm	21 (21.00)	I	27 (23.68)	I
4.	Dairy society	13 (13.00)	V	16 (14.03)	IV
5.	Village Information Kiosk (WiMAX Kiosk)	14 (14.00)	IV	----	---
6.	Par	18 (18.00)	II	19 (16.66)	III
7.	Centre of women self help group **	6 (6.00)	VII	9 (7.89)	VI
8.	Centre of MahilaMandal**	4 (4.00)	VIII	8 (7.01)	VII
C)	Topics of interpersonal Communication				
1.	Family matters	21 (21.00)	III	18 (15.79)	IV
2.	Agricultural issues	23 (23.00)	II	23 (20.17)	III
3.	Agro-based issues	14 (14.00)	V	13 (11.40)	V
4.	Entertainment	17 (17.00)	IV	28	II
5.	**Political Issues**	25 (25.00)	I	32	I

Figures in parentheses indicate percentage to the total   ** Indicates the representativeness of women respondents.

191

5.5.2 WiMAX and Changes in Economic sphere

Information and communication technology (ICT) is emerging as an effective and efficient tool to support the agrarian society. On this background Table No. 5.4 and Figure No. 5.3 shows how WiMAX Kiosk is one of the emerging vital instruments of agricultural development of the experimental village.

A) Crop Production

(1) Sugarcane Production:

Diagram No.5.6 Year-wise Sugarcane production in experimental and non-experimental villages (MT/acre)
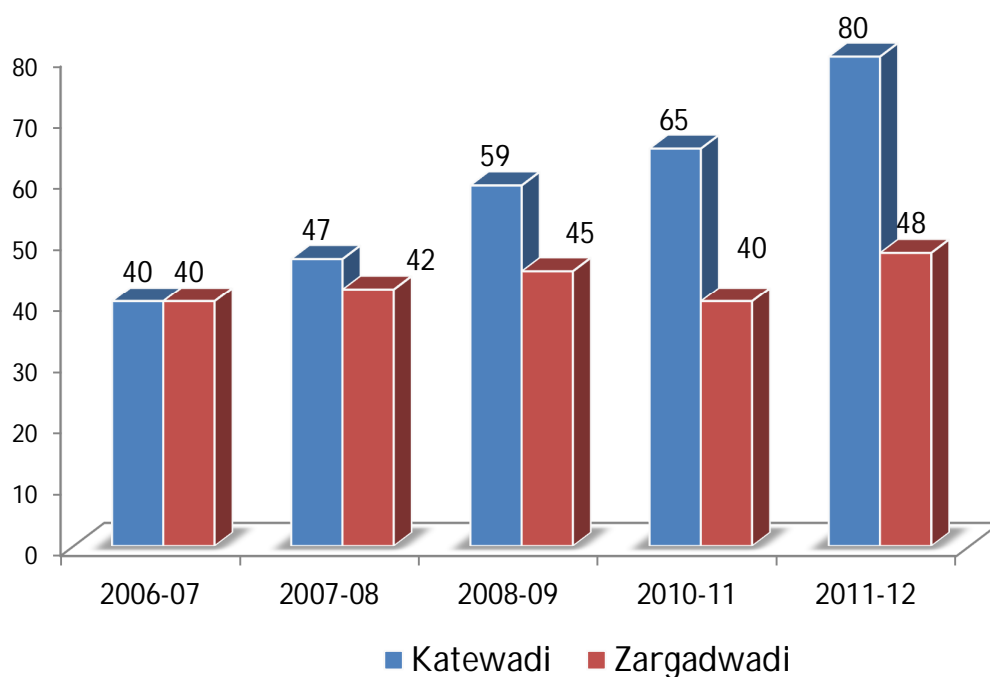
Sugarcane is the dominant crop both in the Katewadi and Zargadwadi villages. Every peasant in both the village cultivating sugarcane and it gives the idea of its popularity. Diagram number 5.6 reveals that, there was massive increase in the sugarcane production in the Katewadi since year 2006-07 whereas in non-experimental village i.e. Zargadwadi sugarcane production just increased by 8 metric tonne per acre which was very lower comparatively to the Katewadi. However, there are several reasons for increase in the sugarcane production in the Katewadi. Improved irrigation facilities, high yielding

varieties, agrochemicals and modern agri-equipments have raised the sugarcane yield. Along with these, one of the major reasons is the WiMAX Kiosk, where sugarcane growers are getting advocacy about the sugarcane plantation up to harvesting. Henceforth, the vitality of WiMAX for agriculture in general and sugarcane production in particular, was found.

Diagram No. 5.6 (A): Differences in sugarcane production

(Per acre) before and after WiMAX Kiosk.
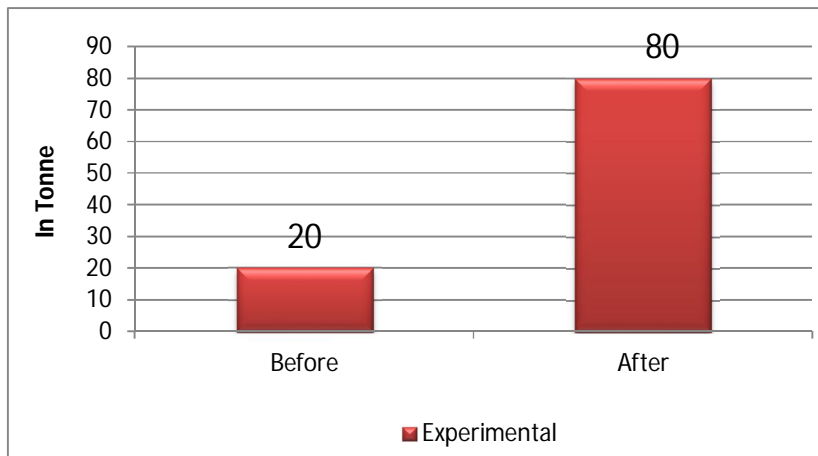
With regards to experimental village, majority of 64% peasants had produced minimum 20 to 30 tonnes and only 4% of peasants produced maximum 50 tonnes sugar cane per acre before WiMAX Kiosk. Thus, after WiMAX Kiosk the difference of tonnage of sugarcane between two villages has been increased. After WiMAX Kiosk in experimental village majority of respondents i.e. 74% produced minimum 30 to 50 tonnes and 26 % peasants produced 60 to 80 tonnes sugarcane per acre.   In comparison to the experimental village the difference of tonnage of sugarcane decreased in Non-Experimental village. From the data it is found that, peasants of Non-Experimental village produce minimum 20 to 40 tonnes by higher % i.e. 78.78 and maximum 50 to 60 tonnes sugarcane per acre after 8 years with minimum 21.22 % respectively. It was therefore concluded that due to one of the important factor i.e. WiMAX Kiosk the peasants of experimental village produced average 20 tonne more sugarcane than the peasants of Non-Experimental village.

The average sugarcane production (per acre) in tonnes before WiMAX Kiosk is less than average sugarcane production (per acre) in tons after WiMAX Kiosk.

Testing of Hypothesis number 1 **"Modern ICT tool i.e. WiMAX helps to increase agriculture production i.e. sugarcane."**

Paired t- test for testing is applied to analyse the hypothesis i.e. ICT tool i.e. WiMAX helps in increase average sugarcane production in Katewadi:

Let X = sugarcane production (per acre) in tons before WiMAX

Y = sugarcane production (per acre) in tons after WiMAX

Null Hypothesis:

$$H_0 : \mu_X = \mu_Y$$

i.e. there is no significant difference in the average sugarcane productions (per acre) in tons before and after WiMAX Kiosk.

Alternative Hypothesis:

$$H_1 : \mu_X < \mu_Y$$

i.e. average sugarcane production (per acre) in tons before WiMAX Kisok is less than average sugarcane production (per acre) in tons after WiMAX Kisok.

Test Statistic:

Under H_0, the test statistic is

$$t = \frac{\bar{d}}{S/\sqrt{n}} \sim t_{(n-1)}$$

where

$$\bar{d} = \frac{\sum_{i=1}^{n} d_i}{n} \; ; \; d_i = X_i - Y_i ; i = 1,2,...,n.$$

$$S^2 = \frac{\sum_{i=1}^{n}(d_i - \bar{d})^2}{n-1}$$

In our case,

$n = 100$

$$\sum_{i=1}^{100} d_i = -1359$$

$$\sum_{i=1}^{100} (d_i - \overline{d})^2 = 6114.19$$

$$\therefore t = \frac{-1359/100}{\sqrt{6114.19/99}/\sqrt{100}} = -17.293$$

Tabulated $t_{0.05}$ for 99 degrees of freedom for single –tail test is 1.66.

Thus, calculated $|t| = 17.293 > t_{0.05} = 1.66$, H_0 is rejected at 5% level of significance. Hence, hypothesis i.e Modern ICT tool i.e. WiMAX helps in increase in crop production is proved. It is also found that, average sugarcane production (per acre) in tons before WiMAX Kiosk is less than average sugarcane production (per acre) in tons after WiMAX Kiosk.

(2) Wheat:

Diagram No. 5.7: Year-wise Wheat production in experimental and non-experimental villages (Quintal/acre)
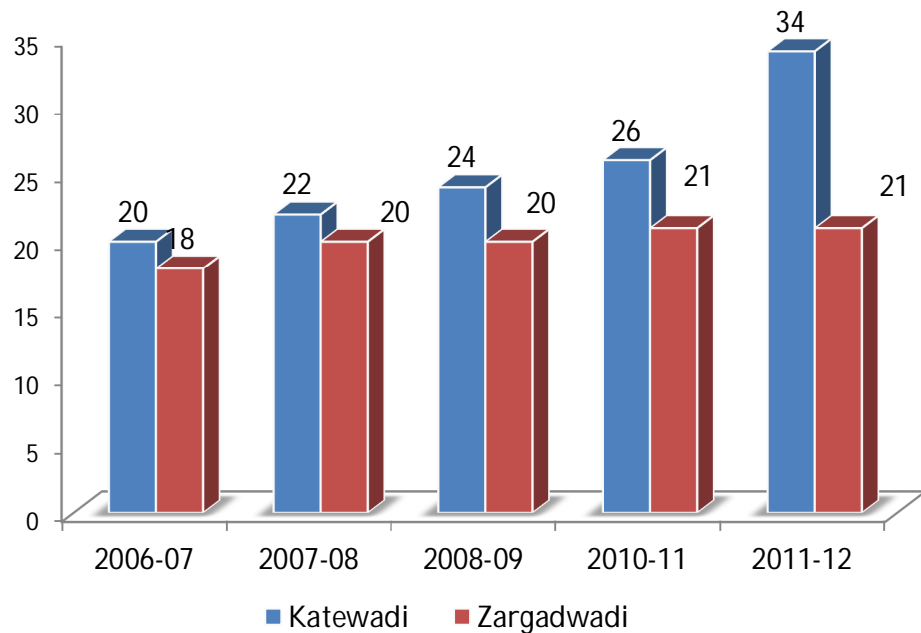
Wheat is one of the major crop cultivated both in the experimental and non-experimental villages. Diagram number 5.7 shows the trend of wheat production since 2006-2012. From this it is pertinent to note that, wheat production the experimental village increased by 1.5 times during 2006 to 2012 but in the Zargadwadi it increased merely by 2 quintals per acre. Therefore it is interesting to find the reasons behind the increased crop production in the Katewadi. Wheat growers in the Katewadi have got advice from the WiMAX Kiosk related to the high yielding variety, spraying of micronutrients and weather related information. In consonance these information are lacking in the non-experimental village, Zargadwadi.

Diagram No. 5.7 (A): Differences in Wheat production (Quintals Per acre) before and after WiMAX Kiosk.
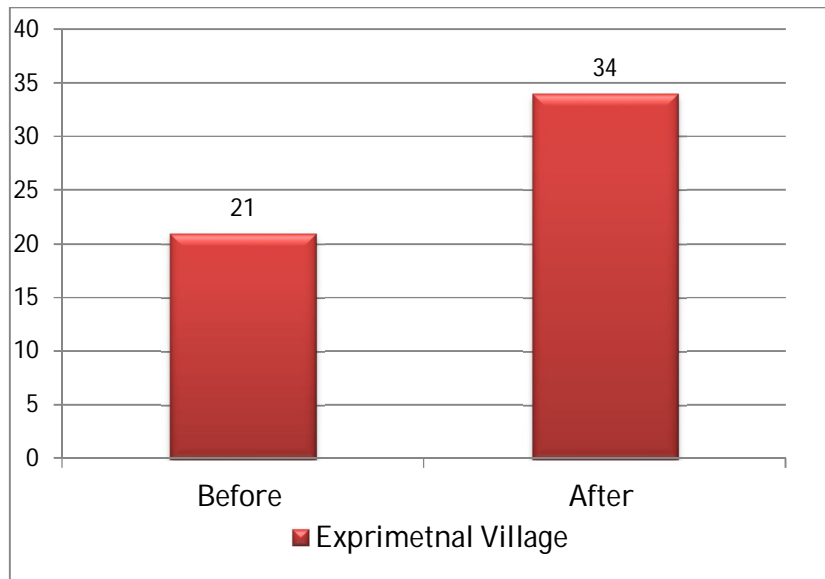
With regards to experimental village, majority of 87% peasants had produced minimum 8 to 10 quintals and only 4% of peasants produced maximum 11 quintals of Wheat per acre before WiMAX Kiosk. After WiMAX Kiosk in experimental village majority of respondents i.e. 56% produced minimum 10 to 13 quintals and 44 % peasants produced 13 to16 quintals of Wheat in one acre. This was because peasants used the recent grades of plant nutrient about which they got information from WiMAX Kiosk. However in

contrary to this, peasants of Non-Experimental village did not have any idea of plant nutrients and their wheat production did not change. It was therefore concluded that due to one of the important factor i.e. WiMAX Kiosk the peasants of experimental village produced average 5 quintals more wheat than the peasants of Non-Experimental village.

Testing of Hypothesis number 1**"Modern ICT tool i.e. WiMAX helps to increase agriculture production i.e. Wheat."**

Paired t- test for testing is applied to analyse the hypothesis i.e. ICT tool i.e. WiMAX helps in increase average wheat production in Katewadi:

Let X = Wheat production (per acre) in quintal before WiMAX

  Y = Wheat production (per acre) in quintals after WiMAX

Null Hypothesis:

$$H_0 : \mu_X = \mu_Y$$

i.e. there is no significant difference in the average wheat productions (per acre) in quintal before and after WiMAX Kiosk.

Alternative Hypothesis:

$$H_1 : \mu_X < \mu_Y$$

i.e. average wheat production (per acre) in quintal before WiMAX Kisok is less than average wheat production (per acre) in quintal after WiMAX Kisok.

Test Statistic:

Under H_0, the test statistic is

$$t = \frac{\bar{d}}{S/\sqrt{n}} \sim t_{(n-1)}$$

where

$$\bar{d} = \frac{\sum_{i=1}^{n} d_i}{n} ; \ d_i = X_i - Y_i ; i = 1,2,...,n.$$

$$S^2 = \frac{\sum_{i=1}^{n}(d_i - \bar{d})^2}{n-1}$$

In our case,

$n = 100$

$\sum_{i=1}^{100} d_i = -1235$

$\sum_{i=1}^{100} (d_i - \bar{d})^2 = 5254.34$

$\therefore t = \frac{-1235/100}{\sqrt{5254.34/99}/\sqrt{100}} = -13.112$

Tabulated $t_{0.05}$ for 99 degrees of freedom for single –tail test is 0.98

Thus, since calculated $|t| = 13.112 > t_{0.05} = 0.98$, H_0 is rejected at 5% level of significance. Hence, hypothesis i.e. Modern ICT tool i.e. WiMAX helps in increase in crop production is proved. It is also found that, average wheat production (per acre) in quintals before WiMAX Kiosk is less than average what production (per acre) in quintals after WiMAX Kiosk.

(3) Maize Production:

Diagram No. 5.8: Diagram No.5.6 Year-wise Maize production in experimental and non-experimental villages (Quintal/acre)
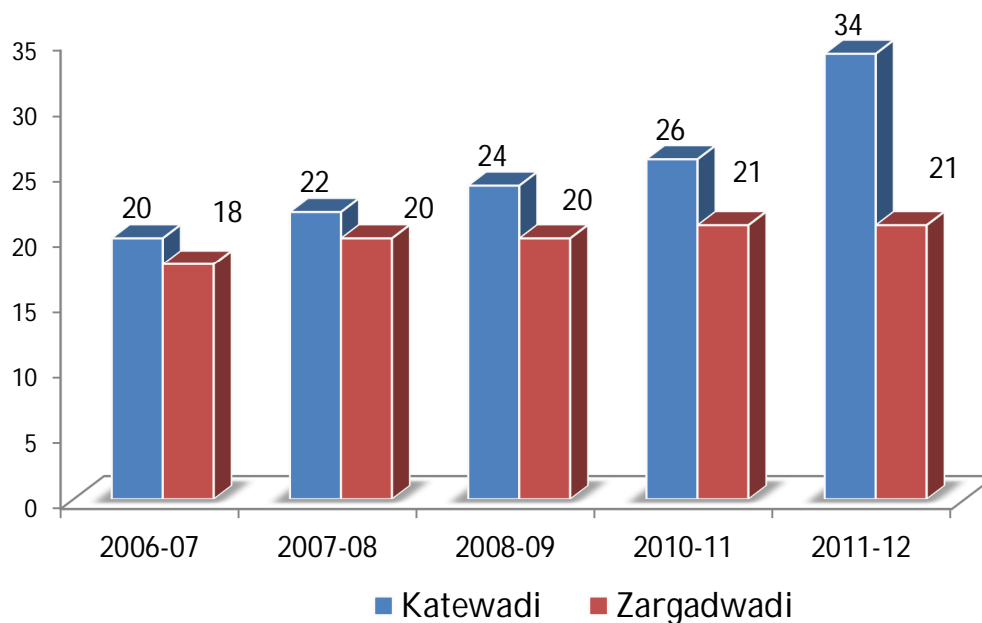
Maize is popular and subsidiary crop among the peasants in both the villages. Maize crop is short term crop and gives steady source of income to the peasants taking this crop with other crops. Year-wise maize production is demarcated in the diagram number 5.8. From this it is clear that, similarly like the sugarcane and wheat, production of maize is increasing the Katewadi village from 2006 to 2012. From the diagram numbers 5.6, 5.7 and 5.8 it is revealed that, agriculture production in the experimental village Katewadi increasing since the accomplishment of WiMAX project.   WiMAX is helping to raise the awareness among the peasants who are now using the modern machineries, high yielding varieties, graded micro nutrients, pesticides and fertilizers. This results in the increase in the crop production.

Diagram No. 5.8 (A): Differences in Maize production (Quintals Per acre) before and after WiMAX Kiosk.
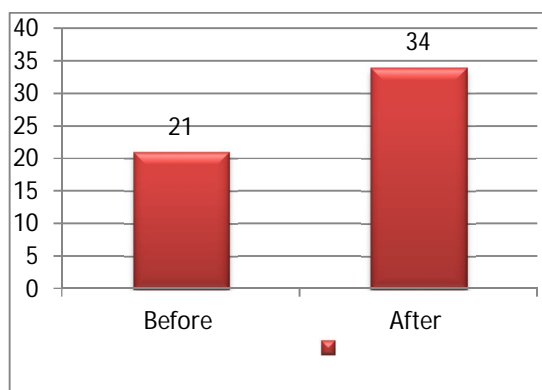
With regards to experimental village, majority of 48% peasants had produced minimum 18 to19 quintals and only 14% of peasants produced maximum 23 quintals of maize per acre before WiMAX Kiosk. After WiMAX Kiosk in experimental village majority of respondents i.e. 67% produced minimum 25 to 30 quintals and 33% peasants produced 28 to37 quintals of Maize in one acre. This was because peasants got information of high breed variety of maize from WiMAX Kiosk. However in contrary to this peasants of Non-Experimental village did not have any idea about such varieties and their maize production did not change. It was therefore concluded that due to one of the important factor i.e. WiMAX Kiosk the peasants of experimental village produced average 12 quintals more wheat than the peasants of Non-Experimental village.

Testing of Hypothesis number 1 **"Modern ICT tool i.e. WiMAX helps to increase agriculture production i.e. Maize."**

Paired t- test for testing is applied to analyse the hypothesis i.e. ICT tool i.e. WiMAX helps in increase average maize production in Katewadi:

Let X = Maize production (per acre) in quintal before WiMAX

Y = Maize production (per acre) in quintals after WiMAX

Null Hypothesis:

$$H_0 : \mu_X = \mu_Y$$

i.e. there is no significant difference in the average sugarcane Maize productions (per acre) in quintal before and after WiMAX Kiosk.

Alternative Hypothesis:

$$H_1 : \mu_X < \mu_Y$$

i.e. average Maize production (per acre) in quintal before WiMAX Kisok is less than average Maize production (per acre) in quintal after WiMAX Kisok.

Test Statistic:

Under H_0, the test statistic is

$$t = \frac{\overline{d}}{S/\sqrt{n}} \sim t_{(n-1)}$$

where

$$\overline{d} = \frac{\sum_{i=1}^{n} d_i}{n} ; \; d_i = X_i - Y_i ; i = 1,2,...,n.$$

$$S^2 = \frac{\sum_{i=1}^{n}(d_i - \overline{d})^2}{n-1}$$

In our case,

$$n = 100$$

$$\sum_{i=1}^{100} d_i = -1437$$

$$\sum_{i=1}^{100} (d_i - \overline{d})^2 = 7438.02$$

$$\therefore t = \frac{-1437/100}{\sqrt{7438.02/99}/\sqrt{100}} = -17.439$$

Tabulated $t_{0.05}$ for 99 degrees of freedom for single –tail test is 1.35

Thus, since calculated $|t| = 17.439 > t_{0.05} = 1.35$, H_0 is rejected at 5% level of significance. Hence, hypothesis i.e. Modern ICT tool i.e. WiMAX helps in increase in crop production is proved. It is also found that, average maize production (per acre) in quintals before WiMAX Kiosk is less than average maize production (per acre) in quintals after WiMAX Kiosk.

B) Mobility and Cost

1) Mobility-

Table No. 5.11: Difference in contacts with Sugar factory before and after WiMAX

Difference by visiting time in year	Land holding pattern (N = 100)				
	Marginal peasant	Small peasant	Medium peasant	Big peasant	Total
Before WiMAX					
Not visiting	1 (1.00)	- (-)	2 (2.00)	- (-)	3 (3.00)
1 to 3 time	16 (16.00)	7 (7.00)	5 (5.00)	- (-)	28 (28.00)
3 to 5 time	9 (9.00)	4 (4.00)	1 (1.00)	- (-)	14 (14.00)
5 to 8 time	1 (1.00)	1 (1.00)	1 (1.00)	- (-)	3 (3.00)
8 to 12 time	21 (1.00)	6 (6.00)	12 (12.00)	3 (3.00)	42 (42.00)
12 to 36 time	4 (4.00)	2 (2.00)	1 (1.00)	1 (1.00)	8 (8.00)
36 to 72 time	1 (1.00)	1 (1.00)	- (-)	- (-)	2 (2.00)
After WiMAX Not visiting	20 (20.00)	10 (10.00)	11 (11.00)	2 (2.00)	43 (43.00)
1 time	25 (25.00)	5 (5.00)	11 (11.00)	1 (1.00)	42 (42.00)
2 time	7 (7.00)	6 (6.00)	- (-)	1 (1.00)	14 (14.00)
6 time	1 (1.00)	- (-)	- (-)	- (-)	1 (1.00)

Figures in parentheses indicate the percentage to the total.

Generally for receiving information regarding sugarcane, crop cultivation and other administrative work peasants are going to sugar factory for that they have to spent money and time. But WiMAX Kiosk has changed this scenario because now day's peasants can get necessary information and advice by visiting to WiMAX Kiosk. Table No. 5.11 presents the exact differences of contacts of peasants to sugar factory. Before WiMAX Kiosk they visited minimum 1 to3 time and maximum 9 to 72 time in a year. The percentages were 28 to 50% respectively. It is a wonder to note that after WiMAX majority of 43% peasants literally do not have any single reason to visit sugar factory. The remaining 42.15% peasants preferred to visit minimum 1 time and maximum 2 to 6 time in year. Because now they are able to access

these information in WiMAX Kiosk in their own village and which also saves their time and money.

Diagram No. 5.9 Comparison of visits to the Sugar factory after implementation of WiMAX in Katewadi (Experimental village)
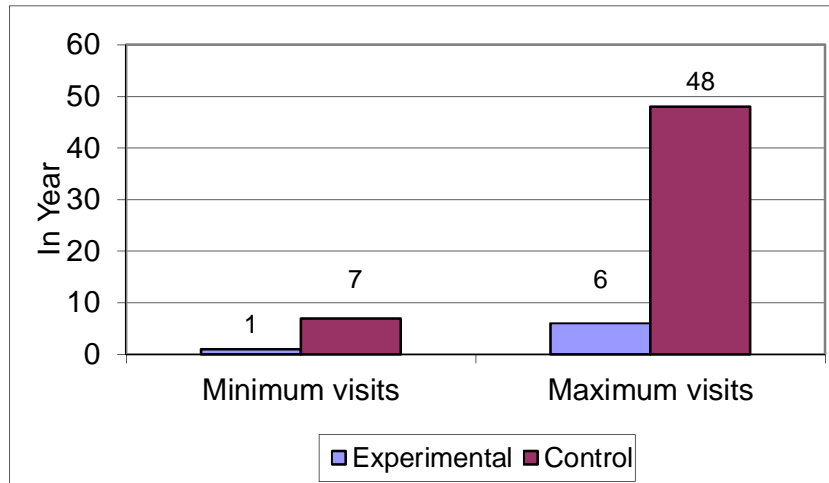
The contacts between sugarcane cultivator peasants and sugar factory are inevitable. Therefore many times it is necessary to go to sugar factory. Graph No. 5.9 shows that lack of WiMAX Kiosk in Non-Experimental village the peasants prefers to visit minimum 7 time and maximum 48 times in a year to sugar factory. While the peasants of experimental village visit minimum 1 time and maximum 6 time in a year to sugar factory. It shows the positive impact of WiMAX Kiosk among the peasants of experimental village.

The above Table No. 5.11 amply shows that average visits per year before WiMAX Kiosk is more than average visits (per year) after WiMAX Kiosk.

Testing of Hypothesis number 2 **"WiMAX is time saving ICT tool and is tremendously helpful to provide the information services in the experimental village"** is analyse with the help of pair sample t-test.

Paired t- test for testing shows that, WiMAX save time and cost. This has been measure through the average visits (per year) of the peasant in the experimental Katewadi village to the sugar factory for information services:

Let X = Visits (per year) before WiMAX.

Y = Visits (per year) after WiMAX.

Null Hypothesis:

$$H_0 : \mu_X = \mu_Y$$

i.e. there is no significant difference in the average visits
(per year) of the respondents before and after WiMAX.

Alternative Hypothesis:

$$H_1 : \mu_X > \mu_Y$$

i.e. average visits (per year) before WiMAX are more than average visits (per
year) after WiMAX.

Test Statistic:

Under H_0, the test statistic is

$$t = \frac{\bar{d}}{S/\sqrt{n}} \sim t_{(n-1)}$$

where

$$\bar{d} = \frac{\sum_{i=1}^{n} d_i}{n} \; ; \; d_i = X_i - Y_i ; i = 1, 2, ..., n.$$

$$S^2 = \frac{\sum_{i=1}^{n}(d_i - \bar{d})^2}{n-1}$$

In our case,

$$n = 100$$

$$\sum_{i=1}^{100} d_i = 900$$

$$\sum_{i=1}^{100}(d_i - \bar{d})^2 = 9928$$

$$\therefore t = \frac{900/100}{\sqrt{9928/99}/\sqrt{100}} = 8.987$$

Tabulated $t_{0.05}$ for 99 degrees of freedom for single –tail test is 1.66.

Thus, since calculated $t = 8.987 > t_{0.05} = 1.66$, H_0 is rejected at 5% level
of significance. Hence, it is conclude that average visits (per year) before
WiMAX are more than average visits (per year) after WiMAX. The hypothesis

i.e. WiMAX is helping to save time, money and provide information services in the experimental villages is proved here.

2) Cost-

<p align="center">Table No. 5.12: Cost saving after WiMAX project</p>

Cost saving in year (Cost in Rs.)	Land holding pattern (N = 100)				
	Marginal peasant	Small peasant	Medium peasant	Big peasant	Total
Cost Saving After WiMAX					
1000-2000	1 (1.00)	- (-)	-(-)	- (-)	1 (1.00)
2000-3000	1 (1.00)	1 (1.00)	1 (1.00)	- (-)	3 (3.00)
3000-4000	2 (2.00)	1 (1.00)	- (-)	- (-)	14 (3.00)
4000-5000	14 (14.00)	3 (3.00)	1 (1.00)	- (-)	18 (18.00)
5000-7000	22 (22.00)	11 (11.00)	14 (14.00)	2 (3.00)	49 (49.00)
7000-10,000	9 (9.00)	4 (4.00)	1 (1.00)	1 (1.00)	15 (15.00)
<10000	4 (4.00)	1 (1.00)	5 (5.00)	2 (1.00)	12 (12.00)

Figures in parentheses indicate the percentage to the total.

Generally for receiving information regarding sugarcane, wheat and maize, their crop cultivation and other administrative work peasants are going to sugar factory and Krishi Vidyan Kendra for which they have to spend money as well valuable time. But the WiMAX Kiosk has changed this scenario as peasants getting all necessary information and advice only from the WiMAX Kiosk. It is pertinent to note that; nearly half (49%) peasant replied that they were annually saving Rs. 5000-7000 since implementation of WiMAX. After implementation of WiMAX 15% and 12% peasants agreed that their savings were Rs.7000-10000 and more than Rs.10000 annually respectively. From the table number 5.12 it is clear that, WiMAX is also cost effective tool it saves money as well as time. Hence Hypothesis number 3 **'WiMAX is cost effective tool for rural development'** is proved here.

C) Human Resource Generation

Diagram No. 5.10 WiMAX and human resource development
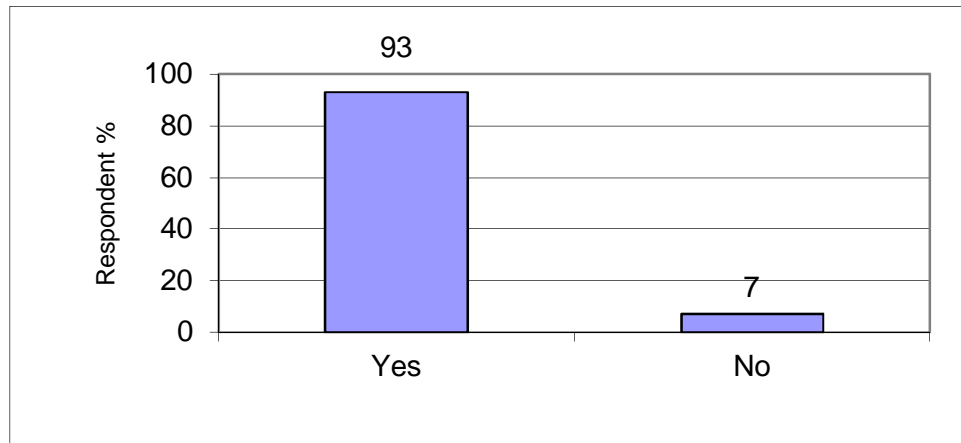
WiMAX Kiosk has provided the required skill level to the operators to handle the machines and assist the villagers. During our field work it is observed that this project has proved helpful in generating employment opportunities, for the local population. It is clear from Figure No. 4.8 that WiMAX Kiosk is playing a supportive role in human resource development as reported by 93% peasants. At present 42 operators are providing services in various WiMAX Kiosk. While fifteen operators were already recruited in the hub of WiMAX Kiosk. It was also found that WiMAX Kiosk has motivated number of youths towards I.C.T. revolution; it's a significant development that is happening in this region. The findings are consistent with Vijayditya. N (2002).

D) Occupation

Occupation is a major factor in the development of any person. It affects his socio-economic condition. Table No.5.12 presents changing attitudes of peasants towards occupation.

Diagram No. 5.11 Traditional caste occupation Continuity and Change.
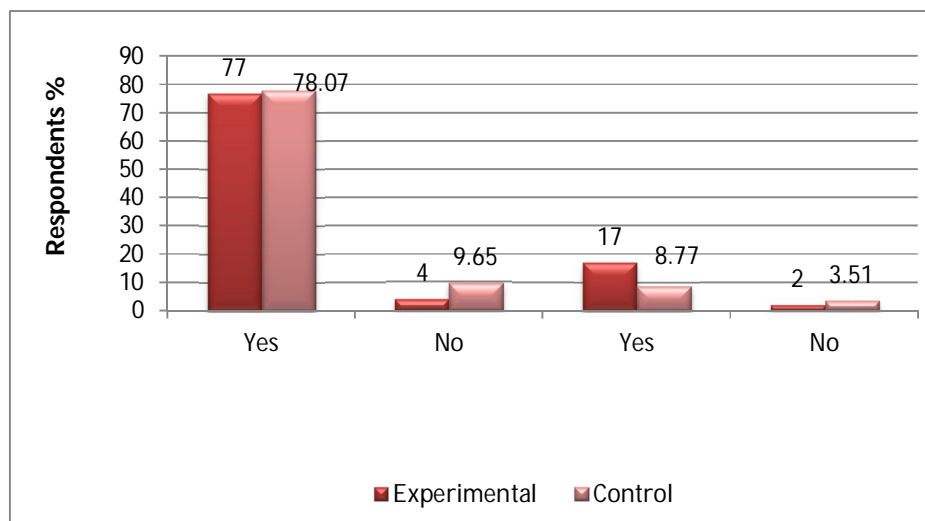
Majority of the peasants of both villages like to continue with the same traditional occupation i.e. agriculture. It was found that the percentage is high among the peasants of Experimental village (i.e.94%) and (86.84%) of Non-Experimental village peasants respectively. It is important to note that very negligible % of peasants of both villages reported that they do not like to continue with the same caste occupation (See Figure.No.5.9). Now we will see the reasons for continuing or discontinuing the traditional caste occupation. It was found that majority of peasants wished to continue with their traditional occupation i.e. agriculture as reported by 40 % of experimental and 30.70 % of Non-Experimental village peasants respectively.

Table No. 5.13: Respondents who have changed their views about occupation.

Sr. No.	Background Variable	Experimental Village N = 100		Non-Experimental Village N = 114	
		General	**Backward Castes**	**General**	**Backward Castes**
A.	Would you like to continue with the same caste				

	occupation ?				
	Yes	77 (77.00)	17 (17.00)	89(78.07)	10 (8.77)
	No	4 (4.00)	2 (2.00)	11(9.65)	4(3.51)
B.	Why ?				
	A	7 (7.00)	5 (5.00)	27(23.68)	5 (4.38)
	B	20 (20.00)	3 (3.00)	25(21.93)	2(1.75)
	C	34 (34.00)	6 (6.00)	31(27.19)	4(3.51)
	D	2 (2.00)	----	2(1.75)	1(0.88)
	E	2 (2.00)	---	7(6.14)	----
	F	4 (4.00)	3 (3.00)	5 (4.38)	2(1.75)
	G	12 (12.00)	2(2.00)	3(2.63)	----

Figures in parentheses indicate percentage to the total.

Note : A. *Lack of education, no other source from other occupation.*

B. *Agriculture is good and profitable occupation compare than other.*

C. *This is my traditional occupation.*

D. *I am educated therefore I am trying for other occupation.*

E. *While mate selection they prefer other occupation rather than agriculture.*

F. *For other occupation more money is required.*

G. *I am interested to do agro-based business.*

Whereas most of the peasants of backward castes opined that due to lack of education they had no other source of occupation and that was a major reason to continue with the occupation. Peasants generally young, of both villages expressed that they were educated, hence were trying for other new occupation. One of the interesting finding is that nearly 8.14 % peasants of both villages opined that, *for mate selection they prefer other occupation other than agriculture*. It was found that most of the young and educated peasants are thinking on the same lines possibly due to education and media exposure and influence of urban life styles.

Table No. 5.14: Expectations of parents about children's occupation.

Sr. No.	Background Variable	Experimental Village		Non-Experimental Village	
		General	Backward Castes	General	Backward Castes
A.	Your children also should continue with the same traditional occupation ?				
	Yes	26 (26.00)	6 (6.00)	41(35.96)	10 (8.77)
	No	55 (55.00)	13 (13.00)	59 (51.75)	4 (3.51)
B.	What occupation would you like to have ? For your son :				
	i. Agriculture	14 (14.00)	5 (5.00)	44(38.60)	8(7.01)
	ii. Job				
	a. Government	19 (19.00)	7 (7.00)	27(23.68)	2(1.75)
	b. Private/Co-op.	28 (28.00)	4 (4.00)	20(17.54)	3(2.63)
	iii. Agro-Business	20 (20.00)	3 (3.00)	9 (7.89)	1(0.88)
	For your Daughter :				
	i. Job (teacher)	47 (47.00)	12 (12.00)	32 (28.07)	4(3.51)
	ii. House wife	24 (24.00)	7 (7.00)	68 (59.65)	7 (6.14)

Figures in parentheses indicate percentage to the total.

Table No. 5.13 shows the expectations of parents about their children's occupation. It is pertinent to note 68 % of Experimental and 55.26 % of Non-Experimental village peasants do not want their children to continue with the same traditional occupation. It shows the occupational attitudinal changes among the peasants of both villages. The data also indicates that most of the general category peasants of Experimental village prefer their sons to work for in private/co-operative sector and their daughters to work as teacher. In Non-Experimental villages they prefer their sons to continue in agriculture and daughters to be housewives. As far as backward caste peasants are concerned, the Experimental village peasants prefer that their sons should work in government and their daughter as teachers and in Non-Experimental village

mostly they prefer that their sons remain in agriculture and daughters settle as housewife assisting their husband's occupation and family.

During my field work I noticed that due to reservation policy, heavy corruption, less vacancies in government sector most of the general category peasants of experimental village preferred their sons to work in private/co-operative sector and their daughters as teachers. In Non-Experimental village they prefer to continue with agriculture.

E) Loan

Table No. 5.15: Distribution of respondents by status of loan.

Sr. No.	Land holding pattern	Experimental Village			Non-Exprimental Village		
		Yes	No	Total	Yes	No	Total
1.	Marginal Peasant	32 (32.00)	21 (21.00)	53 (53.00)	47 (41.22)	11 (9.65)	58 (50.88)
2.	Small Peasant	14 (14.00)	7 (7.00)	21 (21.00)	17 (14.91)	10 (8.77)	27 (23.68)
3.	Medium Peasant	8 (8.00)	14 (14.00)	22 (22.00)	11 (9.65)	8 (7.01)	19 (16.66)
4.	Big Peasant	2 (2.00)	2 (2.00)	4 (4.00)	6 (5.26)	4 (3.51)	10 (8.77)
	Total	58 (58.00)	42 (42.00)	100 (100.00)	81 (71.05)	33 (28.95)	114 (100.0)

Figures in parentheses indicate percentage to the total.

Table No. 5.14 reveals that majority of marginal and small, 46 % of experimental and 56.14 % of Non-Experimental village peasants are taking loans for different purposes. During the field work researcher tried to investigate as to, why maximum marginal and small category peasants were taking loans. After careful discussion and observation it was found that due to small amount of land, high rates of pesticides and fertilizers and big family size most of the peasants are taking loans from different sources.

As shown in Table.No.5.15 majority of marginal and small peasants of both villages are taking loans mainly from District Credit Co-operative (DCC) bank as reported by 29.8 % of experimental and 26.31 and 7.89 % of Non-

Experimental village peasants respectively. It was observed that due to low rate of interest & favorable atmosphere peasants prefer D.C.C. Bank. While the second preferable source is relatives and friends followed by non agricultural societies. It is interesting to note that, very less per cent (15%) of peasants are taking loans from money lenders, due to education, mass media and social exposure. Due to high economic awareness and banking experience most of the big peasants of both (3% in Experimental and 7.01% in Non-Experimental) villages are taking loan mainly from D.C.C. bank or through nationalized bank.

Table No. 5.16 shows the actual causes of loan, it also indicates the variations among the different category of peasants. The above data indicates that marginal and small peasants of experimental village are taking loan mainly for cropping (19%) and repayment of previous loan (10%). The same causes are found in Non-Experimental village except one i.e. purchase of cattle food (10.53 %). However very few of experimental village peasants are taking loan mainly for purchase of agricultural implements and livestock (3%) followed by children's education and social function (2%).While in Non-Experimental village the main causes are purchase of agricultural implements and cattle food (6.14 %) followed by housing construction (2.63 %) respectively.

It is interesting to note that, the marginal and small peasants of both villages have vital difference i.e. the marginal peasants of experimental village have taken loan for their children's education. It shows the importance of education among the marginal peasants of experimental village. Whereas majority of medium land holding peasants of both villages are taking loan mainly for purchase of livestock and enterprises (11% in experimental village). In Non-Experimental village the purpose is different i.e. purchasing of agricultural implements and cropping as reported by 7.01 % peasants. It is important to note that the big land holding peasants of both villages are taking loan exclusively for purchasing agricultural implements as reported by 4 % of experimental and 5.26 % of Non-Experimental village peasants respectively . It shows the significance of modern agricultural technologies in agriculture viz. Tractors, Roter, Plougher, Milling machine, Irrigation technologies e.g. rain gun, drip irrigation etc.

F) Saving

Table No. 5.16: Distribution of respondents by status of saving.

Sr. No.	Land holding pattern	Status of saving			
		Experimental Village		Non-Experimental Village	
		Yes	No	Yes	No
1.	Marginal Peasant	7 (7.00)	36 (36.00)	15(13.16)	43(37.22)
2.	Small Peasant	11 (11.00)	10 (10.00)	9 (7.89)	18(15.79)
3.	Medium Peasant	13 (13.00)	9 (9.00)	7(6.14)	12(10.53)
4.	Big Peasant	4 (4.00)	-	8(7.01)	2(1.75)

Figures in parentheses indicate percentage to the total.

Table No. 5.16 shows that the saving status is high among the big and medium land holding peasants of both villages as reported by 17% of experimental and 13.16% of Non-Experimental village peasants respectively. The same trend was found among the marginal (17%) and small (11%) peasants of experimental village than the marginal (13.16%) and (7.89%) small peasants of Non-Experimental village respectively. The above data clearly indicates that the consciousness regarding saving is high among the peasants of experimental village. Table No. 5.18 shows that majority of marginal and small peasants of experimental village are saving money in post (24%) and societies (20%) followed by *Bachat gat* (10%) and local saving i.e. *Bishi* (6%) respectively. While the picture is slightly different in Non-Experimental village because they mostly prefer to save in societies (20.81%) and bank (17.54%) followed by *Bachat gat* (10.53 %) and local saving (8.77%).

It was observed that most of the peasants of experimental village are saving their money in post office. It is available in their own village, officials are friendly in behavior and variety of rural mass oriented schemes is present there, therefore they prefer post office. Many peasants from both villages said that, *"we are hesitating to go to bank because of elite atmosphere, officials do not give proper information to us and it is far from our village."*

However, the medium and big peasants of experimental village mostly prefer to save money in bank (12%) and societies (7%) followed by post office and local saving (4%) respectively. Whereas in Non-Experimental village they prefer mostly in societies (7.89%) and bank (7.01%) followed by *Bachat gat* and local saving (7.89%) respectively. The above data indicates that the attitude towards saving is much rational among the peasants of experimental village than the peasants of Non-Experimental village. It also shows some micro level attitudinal changes among the marginal and small category peasants towards investments; mostly they are saving their money in *Bachat gats*, *Bhishi* and post office. It is also interesting to note that due to *Bachat gats* and *Bhishi*, peasants are interacting closely which creates healthy interpersonal communication and also reduces the transaction hurdles that is helpful to solve the economic dilemma within the village community. Here I would like to notify that after the establishment of Self Help Groups (SHGs) in rural society the nature of micro level village economics has changed dramatically.

Table No. 5.17 provides the description about the reasons of saving it clearly indicates that most of the marginal and small peasants in experimental village, saving money mainly for three reasons i.e. children's marriage and education (35%), further future (16%) and for improvement of agriculture (11%) respectively whereas the picture is slightly different in Non-Experimental village i.e. children marriage and education (32.46%) , for buying agriculture land (16.66%) and for improvement of agriculture (14.91%). Here, one difference is found i.e. the peasants of experimental village were saving some (56%) of money for further future, but in case of Non-Experimental village they were giving very less importance to the further future. Whereas with regards to medium and big category peasants of experimental village, buying agriculture land (11%) and improvement of agriculture (7%) are the major reasons of saving followed by further future (4 %), children's marriage and education (4%) respectively. As in Non-Experimental village they also think same, they are giving equal importance to the both the reasons i.e. for buying agriculture land (8.77%) and for improvement of agriculture (8.77%) respectively. On this background it is clear that, the traditional mindsets of

peasants towards loan and saving are changing. As compared to past, now they are thinking more rationally. Thus now the question is whether communication networks play positive role in this regard?

Table No. 5.17: Distribution of respondents by place of saving.

Sr. No.	Place of Saving	Land holding pattern							
		Experimental Village				Control Village			
		M.P.1 N = 53	S.P. 2 N = 21	M.P. 3 N = 22	B.P.4 N = 4	M.P. 1 N = 58	S.P. 2 N = 27	M.P. 3 N = 19	B.P. 4 N = 10
1.	In Bank	10 (10.00)	4 (4.00)	9 (9.00)	3 (3.00)	13 (11.40)	7 (6.14)	5 (4.38)	3 (2.63)
2.	**Post Office**	17 (17.00)	7 (7.00)	3 (3.00)	-	12 (10.53)	5 (4.38)	3 (2.63)	-
3.	Local Saving	5 (5.00)	1 (1.00)	1 (1.00)	-	7 (6.14)	3 (2.63)	4 (3.51)	2 (1.75)
4.	**Societies**	14 (14.00)	6 (6.00)	6 (6.00)	1 (1.00)	18 (15.79)	8 (7.01)	4 (3.51)	5 (4.38)
5.	Bachat gat	7 (7.00)	3 (3.00)	3 (3.00)	-	8 (7.01)	4 (3.51)	3 (2.63)	-

Figures in parentheses indicate percentage to the total.

Note: *M.P.[1] – Marginal Peasant, S.P.[2] – Small Peasant, M.P. [3] – Medium Peasant, B.P.[4] – Big Peasant.*

Table No. 5.18: Distribution of respondents by reasons of saving.

Reasons of Saving	Land holding pattern							
	Experimental Village				Control Village			
	M.P. N = 53	S.P. N = 21	M.P. N = 22	B.P. N = 4	M.P. N = 58	S.P. N = 27	M.P. N = 19	B.P. N = 10
A	27 (27.00)	8 (8.00)	4 (4.00)	-	27 (23.68)	10 (8.77)	3 (2.63)	-
B	10 (10.00)	6 (6.00)	3 (3.00)	1 (1.00)	8 (7.01)	4 (3.51)	4 (3.51)	2 (1.75)
C	5 (5.00)	3 (3.00)	9 (9.00)	2 (2.00)	13 (11.40)	6 (5.26)	7 (6.14)	3 (2.63)
D	11 (11.00)	4 (4.00)	6 (6.00)	1 (1.00)	10 (8.77)	7 (6.14)	5 (4.38)	5 (4.38)

Figures in parentheses indicate percentage to the total.

Note : *MP. – Marginal peasant, S.P. – Small peasant, M.P. – Medium peasant, B.P. – Big peasant.*

Note : *A-Children's marriage and education   B-Further future*

C-For buying agriculture land   D-For improvement of agriculture

G) Cooperative and Agro-Based Practices

Figure No. 5.10 shows that, 67% of Experimental and 63.16% of Non-Experimental village peasants agree that agro based activities are beneficial for their economic development. Whereas 21% of Experimental and 21.05% of Non-Experimental village peasants opined that, to some extent agro-based activities are helpful in their economic development. Only 12 % of experimental and 15.78% of Non-Experimental village peasants reported negative response in this regard. The above data indicates that agro based activities are emerging as a major factor in the economic development of rural society.

Diagram No. 5.12 Agro based activities and economic development.
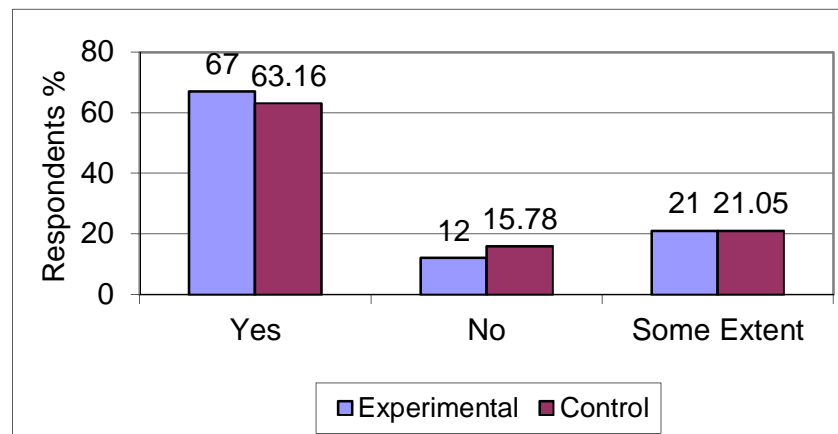
Table No. 5.18 provides the picture about respondent's involvement and prosperity in the various agro based activities. It shows that majority of peasants are involved in buffalo rearing followed by poultry rearing as reported by 88.00% of Experimental and 69.30% of Non-Experimental village, and 42.10%, as far as Poultry farming is concerned. It is interesting to note that 38% of Experimental and 49.12% of Non-Experimental village peasants are engaged in goat rearing. Due to *Dhangar* community (nomadic tribe in Maharashtra) in Non-Experimental village the percentage of goat rearing is high because sheep/goat keeping is their traditional occupation of the *Dhangar* community. It is also surprising to note that no any single peasant is involved in Emu business and sericulture, but 45% of Experimental and 23.68% of Non-Experimental village peasants were willing to do these agro based activities.

Table No. 5.19: Agro based activities involvement and prosperity.

Sr. No.	Agro based activities	Yes		No		Willing to do	
		E.V.	C.V.	E.V.	C.V.	E.V.	C.V.
1.	Emu rearing	-	-	88	103	12	11
				(88.00)	(90.35)	(12.00)	(9.65)
2.	Sericulture	-	-	67	98	33	16
				(67.00)	(85.96)	(33.00)	(14.03)
3.	Goat rearing	38	56	44	14	18	44
		(38.00)	(49.12)	(44.00)	(12.28)	(18.00)	(38.60)
4.	Poultry	42	48	34	45	24	21
		(42.00)	(42.10)	(34.00)	(39.47)	(24.00)	(18.42)
5.	Buffalo rearing	88	79	5	10	7	25
		(88.00)	(69.30)	(5.00)	(8.77)	(7.00)	(24.56)

Figures in parentheses indicate percentage to the total.

On the basis of the above data it is pertinent to note that buffalo farming is the staple agro based activity among the peasants of both villages. It was observed that, lack of proper awareness, huge economic investment, insufficient amenities and operational complexities peasants are do not interested in sericulture and Emu business.

Table No. 5.20: Respondents views regarding role of co-operatives in rural development.

Sr. No.	Land holding pattern	*Experimental Village*			*Non-Experimental Village*		
		Yes	No	Some extent	Yes	No	Some extent
1.	Marginal Peasant	38	4	11	41	8	9
	(E.V.N = 53, C.V.N = 58)	(38.00)	(4.00)	(11.00)	(35.96)	(7.01)	(7.89)
2.	Small Peasant	11	2	8	14	6	7
	(E.V.N = 21, C.V.N = 27)	(11.00)	(2.00)	(8.00)	(12.28)	(5.26)	(6.14)
3.	Medium Peasant	13	2	7	11	2	6
	(E.V.N = 22, C.V.N = 19)	(13.00)	(2.00)	(7.00)	(9.65)	(1.75)	(5.26)
4.	Big Peasant	3	-	1	6	1	3

(E.V.N = 4, C.V.N = 10)	(3.00)		(1.00) (5.26) (0.88) (2.63)

Figures in parentheses indicate percentage to the total.

Table No. 5.20clearly indicates that most of the marginal and small peasants of both villages agree that, Co-operative Societies are playing key role in rural development as reported by 49 % of Experimental and 48.24 % of Non-Experimental village peasants respectively. The medium and big peasants of both villages also were of the same opinion. From the above data it is seen that, in spite of drawbacks in the co-operative sector, it cannot ignore vital role in the process of socio-economic development of Southern rural Maharashtra (Thorner. D.: 1984, Baviskar.B.S:1980, Shah.G.:1975, Dandekar.V.M. and Jagtap:1959).

Table No. 5.21: Benefits and losses among the peasants of both villages.

Sr. No	Variables	Experimental village (N=100)	Rank
A	*Benefits due to WiMAX(experimental village)*		
1	Getting latest information about sugarcane and agriculture	33 (33.00)	I
2	Less expenditure	13 (13.00)	IV
3	Much attention in family matter	10 (10.00)	V
4	Time saving	18 (18.00)	III
5	Much attention in agriculture work	26 (26.00)	II
B.	*Losses lack of WiMAX(Non-Experimental village)*	*Non-Experimental village (N=114)*	*Rank*
1	Lacking e information about sugarcane and agriculture	36 (31.35)	I
2	Much expenditure on traveling	23 (20.17)	III
3	Less attention in agriculture work.	16 (14.03)	IV
4	Less attention in family matter	8 (7.01)	V
5	Time loss	28 (24.56)	II

Figures in parentheses indicate percentage to the total.

The WiMAX project has given various benefits to the peasants of experimental village. The data in Table No. 5.21 indicates some of the key benefits of WiMAX. Getting latest information about sugarcane and agriculture is one of the most key benefit of WiMAX as reported by 33% peasants followed by much attention in agriculture work 26%, and time saving 18% respectively. Very few i.e. 10% of peasants opined that they given much attention in family matter. However the above data also shows losses among the peasants of Non-Experimental village. Lack of WiMAX majority of 36 % peasants of Non-Experimental village reported that they lacking e-information regarding sugarcane and agriculture, followed by time loss 28% respectively. It was also found that due to lack of WiMAX many time peasants are visiting to sugar factory. Therefore for that purpose they have to spend 2 to 3 hours and about Rs. 60 for travelling for one time. Hence 23% of peasants pinpointed that lack of WiMAX that led to expenditure on traveling was one of the major loss.

In the above table discussed the benefits and losses among the peasants of both villages. Now try to know whether the fruits of WiMAX are satisfying the needs of the beneficiaries with the help of following case study.

CASE NO. – 2

Mr. Subhash Jadhav :"Computers Are Not Just Showcase Items"

*Is a 52 year old medium category peasant of Katewadi in the experimental village. Agriculture is the main vocation of the villagers of Katewadi. They cultivate generally sugarcane, and the cane fields are conspicuous in the countryside. After implementation of WiMAX Kiosk sugarcane peasants are among the first in the country to embrace the high – tech wave. When asked about WiMAX Kiosk, he said, "We cannot do anything without computers. We need computers especially for getting agricultural information and knowledge." He further added, "the world is moving forward. If there will be no electricity there will be darkness. The same is the case without computers, for we are now realizing the importance of computer through WiMAX Kiosk" Before arrival of the WiMAX project, Jadhav had to travel many times to the cane crushing factory. In the factory he had to wait for hours and days as his crop was to be weighed and crushed, along with hundreds of tonnes of produce from other peasants. Only after this process did peasants find out how much money their harvest had earned. In fact, all details about the sugar industry were available only at the factory Talking about the importance of WiMAX he said :, **"Computers are not just showcase items, it is useful for peasants,"** 'We check details, sitting in the village itself. Earlier we had to run to the factory to check for the bill." We noticed that, Jadhav is very eager to learn computer but due to his eye problem he could not. But he hopes his four grandsons will have the wisdom to get wired fast. When questions were put to him about the benefits of WiMAX Kiosk he said, "At present I am not fully satisfied about WiMAX, but we are aware of its valuable benefits for sugarcane growers, WiMAX Kiosk has given many tangible and intangible benefits to us." Finally he gave a message, "Peasants must start using information and communication technologies (ICT's) in agriculture. It will definitely create confidence among the peasants and pave the way for more rapid socio-economic development.*

Table No.5.22 Changes in the Social and Economic factors at Katewadi village since implementation of WiMAX

Factors	Before WiMAX	After WiMAX
Human Resource Generation/ Carrier opportunity	➢ No scope to raise the human resource because of lacking of guidance from the local authority.	➢ WiMAX Kiosk, Computer on Wheels, tele-medicine and health monitoring projects directly gave employment to the more than 100 people. ➢ Along with these indirect employment generation is also visible in the WiMAX project ➢ WiMAX Kiosk gives advocacy to the youth on carrier opportunity which helps to increase their job perspective.
Crop Production	➢ No advocacy and henceforth traditional family create limitations to increase agriculture production.	➢ WiMAX Kiosk gives proper advocacy to the peasant on the request of their queries. ➢ WiMAX organizes the seminar, conferences related to agriculture where experts gives advices directly to the peasants. ➢ WiMAX helps to raise the awareness among the peasant related to the new varieties, modern equipment, new scales of micro-nutrients, pesticides and fertilizers. (For more details please see figure number 5.7,5.8 and 5.9)
Mobility to tehsil, district and state capital	➢ For sugarcane weight, bill, new schemes, banking related work, land records and farm advocacy peasant of Katewadi average twice or thrice in week visited to the tehsil and district cities.	➢ All required information to the peasant are mow available in the Katewadi village which reduces the frequency of travel. Now once in a month peasant visiting to the tahsil and district headquarter ➢ Through WiMAX peasant gets status of their

	➤ For land records and checking status of their big loan proposals, peasant of Katewadi visited the state capital Mumbai.	loan proposal and do the email to ask the action taken by the respective officer. (For more details please see ____)
Income and Saving	➤ Modes of productions i.e. income sources are only limited to the agriculture. ➤ No proper information of kinds saving henceforth no such direct saving is recorded before WiMAX.	➤ Modes of productions i.e. income sources are multiplied from agriculture to agriculture allied activities like Emu culture, poultry, dairy businesses, tissue culture and so on. Along with these increased crop production raise the profit and income. ➤ Through WiMAX Kiosk villagers got the banking related information which helps to increase in the saving. ➤ Woman in the villages are very keen to ask the various saving schemes to the WiMAX operator which is fundamental characteristic of savings in the Katewadi. (For more details please see ____)
Education	➤ Katewdi have school up to 10th standards. While students are least aware about career and job oriented courses. They are taking stereotype education.	➤ Through WiMAX Kiosk students gets information of new courses, institutions, merit list, admission criteria and contacts. This helps these students to select carrier oriented courses. ➤ WiMAX also gives IT training to the youth. Which are helping to the raise the techno savvy awareness among the village youth.
Health	➤ Health education and awareness campaigns were very much limited before WiMAX project.	➤ School health monitoring programme is launched through the WiMAX at Katewadi. ➤ Routine check and data is updated on the software by which medical treatment

		is provided to the respective students.

Table No. 5.23: Comparative Picture of Extension Activities in

Experimental and Non-Experimental villages.

Section	Extension Services	Experimental Village (N = 100)			Non-Experimental Village (N = 114)		
		Frequently	**Rarely**	**Never**	**Frequently**	**Rarely**	**Never**
A.	**Regarding sugar factory**						
1.	Meetings	80 (80.00)	20 (20.00)	-	72 (63.16)	42 (36.84)	-
2.	New Programmes	92 (92.00)	18 (18.00)	-	23 (20.17)	36 (31.58)	55 (48.24)
3.	Peasants Meetings and agri-exhibition	78 (78.00)	22 (22.00)	-	18 (15.79)	24 (21.05)	72 (63.16)
B.	**Regarding cattle care**						
1.	Medical information	-	83 (83.00)	17 (17.00)	-	6 (5.26)	108 (94.74)
2.	Medical treatment	-	-	100 (100.00)	-	-	114 (100.00)
3.	Medicine	-	42 (42.00)	58 (58.00)	-	-	114 (100.00)
4.	Counseling	-	48 (48.00)	52 (52.00)	-	4 (3.51)	110 (96.49)
C.	**Other Services**						
1.	New Schemes and loan	93 (93.00)	7 (7.00)	-	-	-	114 (100.00)
2.	Seeds, fertilizers, pesticides	97 (97.00)	3 (3.00)	-	-	5 (4.38)	111 (97.37)
3.	Soil testing	96	4	-	-	-	114

		(96.00)	(4.00)				(100.00)
4.	Crop Insurance	87 (87.00)	13 (13.00)	-	-	-	114 (100.00)

Figures in parentheses indicates percentage to the total.

Apart from the sugarcane related information the WiMAX Kiosk provides other information to the sugarcane growers in their command area. Table No. 5.22 provides description about the differences in extension activities provided by sugar factories the two both villages. Regarding Sugar Factory majority of 92 % peasants of experimental village get information about new programmes of Sugar Factory and other organsiationfrequently. While in Non-Experimental village in the section (A) 62.16 % peasants get information about general meetings of concerned sugar factories frequently. Regarding Cattle Care (i.e. Section B) nobody is receiving information frequently, though 83 % peasants get information regarding medical treatment (83 %), medicine (42 %), and counseling (48 %). However, it is interesting to note that the peasants of Non-Experimental village literally do not receive any information about section (B) and Other Services (i.e. Section C) through the concerned sugar factories. Whereas about section (C) it was observed that WiMAX Kisok is providing extensive services about new schemes and loan (93 %), seeds, fertilizers, pesticides (97 %), soil testing (96 %) and crop insurance (87 %).

CASE NO. 3

Tukaram Kate   :   "WiMAX Kiosk extension service is providing
important agricultural information."

*I am 35 years of age and I have four children. I grow mainly sugarcane. In the past when WiMAX Kiosk had not been implemented in our village, we used to go to taluka level agricultural office or Krishi Bhandar (shop of agricultural products) for soil testing, seeds, and buying fertilizers. But some time they were not giving proper information so we used to face many problems and frequent traveling was not affordable and practical. When for the first time we heard about WiMAX Kiosk we were very happy. They were providing information especially about sugarcane, grapes and dairy. Later when we have demanded some other extension services to the sugar factory then immediately they started some key extension services to the peasants. Among these services I think soil testing is very important to any peasant because it shows the quality of soil which will help us to plan about appropriate crops. I think we are lucky because we get such information right in our own village free of cost, because Baramati Co-operative sugar factory have their own soil testing Department. Recently **WiMAX** has also started crop-insurance service, that will be beneficial to cash-crop growers. However some of the other extension services are also inevitable to any peasant for e.g. information regarding cattle care, general meetings, new programmes, agri exhibition and loans etc. We feel that, "**WiMAX extension activities are providing important agricultural information."***

Diagram No. 5.13Topics of Discuss at the WiMAX Kiosk.
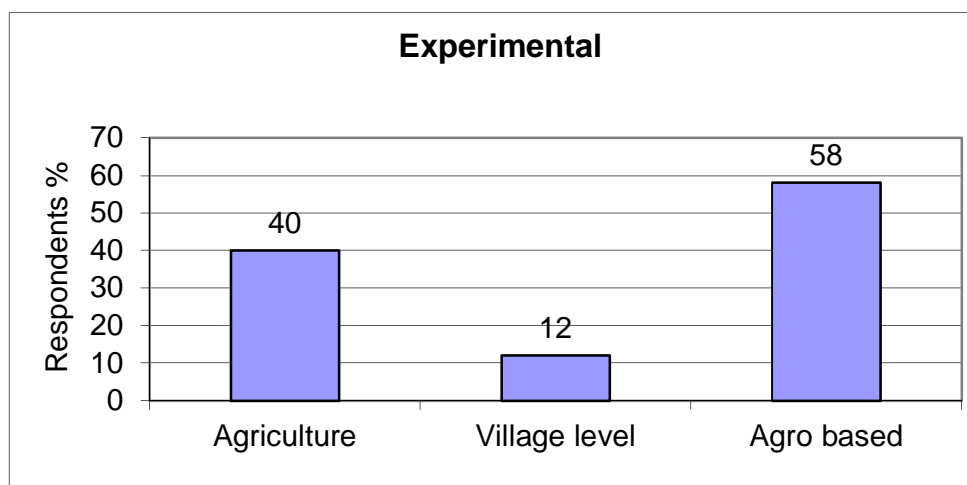
Diagram No. 5.11indicates that of the total 98% peasants of experimental village discusses topics on agriculture and agro-based subjects at WiMAX Kiosk. It proves that WiMAX Kiosk centers are emerging as a major agro information exchange centers. Whereas only 12 % peasants are discussing regarding the village level issues. During our field work it was noticed that, why they gave much importance to agro based subjects? Because it's not a common gossip centre, this place (WiMAX Kiosk) is known and established especially for agriculture purpose and another important thing is peasants are coming here with some specific agriculture work.

Table No. 5.24: Hurdles and losses among the peasant of Non-Experimental village

(N = 114)

Sr. No.	Hurdles/losses lack of WiMAX	Non-Experimental Village		Rank
		Frequency	Percentage	
1.	Unidentified pest and diseases of sugarcane, grape.	19	16.67	III
2.	Lower crop production	15	13.16	IV
3.	Loss of money, time and labour	33	28.95	I
4.	Lack of employment generation source	7	6.14	VI

5.	Lack of extension activities	25	21.93	II
6.	Lack of I.C.T. awareness	10	8.77	V
7.	Lack of Interpersonal communication	5	4.38	VII

As evident from the Table No. 5.23 that loss of money, time and labour is one of the biggest losses as reported by 28.95 % peasants. Furthermore lack of extension activities 21.93%, unidentified pest and diseases of sugarcane, grape 16.67%, and lower the agricultural production 13.16% were also found important losses. The above trend shows that peasants are very much lacking in this project and majority of losses are indicating towards sugarcane production. Though WiMAX's contribution is vital in sugarcane production but some of the peasants i.e. 13.15 % felt that lack of I.C.T. awareness and interpersonal communication are also big losses. Hence it may be concluded that, there is a urgent need of I.C.T. related project such as WiMAX. Now at this juncture let us know more about these problems with the help of following case study number 4.

CASE NO. - 4

Dattatray Kale : "Due to various losses we now realize importance of WiMAX"

*41 year old marginal peasant of Non-Experimental village said, "I am growing sugarcane because of black fertile soil. I am producing minimum 30 to maximum 40 tonnes cane I am sending my cane to co –operative sugar factory. I know about WiMAX it has multiple benefits. As far as my village is concerned we do not have any such type of facilities. We didn't find the Non-Experimental measures of new pest and disease son crops like grapes and sugarcane. Therefore our crop production is lower and faces loss of profit. This is our major loss due to lack of WiMAX as per my knowledge. We are facing two other vital problems i.e. delay to know tonnage of sugarcane and due to all these problems we also face money, time and labour problems. The problem regarding information about tonnage of sugarcane is most important to us, because we are living in a remote village, flood and heavy rain is most common problem in our village. Therefore many times it is too late to know this information, hence it creates many management level problems. Thus, **due to the above losses we have realized the importance of WiMAX for our Agricultural Development.***

Table No. 5.25:Hurdles involved in WiMAX

Sr. No.	Hurdles in WiMAX	Experimental Village		Rank
		Frequency	Percentage	
1.	Insufficient specific information	32	32.00	I
2.	Irregular availability of operator	16	16.00	III
3.	Lack of infrastructure facility	11	11.00	V
4.	Inadequate internet/phone	21	21.00	II

	connectivity			
5.	Irregular electricity	13	13.00	IV
6.	Inadequate operator's knowledge	7	7.00	VI
	Total	100	100.00	

It is widely expected that I.C.T's are playing an important role in the development process. But at the same time the most difficult stage for any I.C.T initiative, is to sustain them. In the light of the above discussion, table no. 5.24 shows some of the key hurdles involved in WiMAX Kiosk. For instance, among the various hurdles reported by the peasants of experimental village, insufficient specific information (32 %) and inadequate internet/phone connectivity (21%) were found to be prominent hurdles. The irregular availability of operator and electricity was perceived to be a major factor as well. About 18 % of the peasants opined that lack of infrastructure facility and inadequate operators' knowledge as one of the major hurdles involved in WiMAX Kiosk. Let us know whether there any other hurdles involved in WiMAX Kiosk through a case study number 5.

CASE NO. - 5

"WiMAX has lacking women's involvement and deprived societies' participation"

This ground reality is expressed by Mrs. Shobha Samudre, an agricultural woman of Katewadi experimental village. She further said, 10 years ago computer was a miracle for us, I never had seen this instrument but after implementation of WiMAX Kiosk in our village we realized the importance of computer. Due to WiMAX Kiosk our contacts with villagers and fellow agricultural women have increased. When asked about the problems/hurdles involved in WiMAX Kiosk she told that, 'First of all the main problem is women's participation and involvement within the WiMAX Kiosk, because still some rural women are hesitating to visit common places and generally men go to WiMAX Kiosk. Initially I was interested to know this magical instrument of computer and internet. So frequently I used to visit the WiMAX Kiosk regarding agricultural work. Oh! Oh! you are asking me about hurdles my son, I belong to Backward and deprived societies and mostly in this category people are landless. The WiMAX Kiosk is mostly accessed by members of the co-operatives who grow sugarcane. But the poorest, landless laborers and deprived groups currently do not have any reason to visit the WiMAX Kiosk because they do not need the services connected with sugarcane growing and harvesting. Hence regarding women's problem I suggest that women are trained to become WiMAX Kiosk operators, also the sugar factory must conduct some agriculture related seminars and workshops then it will create healthy women participation. About the marginal and deprived society's people, Vidya Prathisthan's ICT wing should start some other I.C.T. centres not only for this community but also for other peasants who are growing other crops too. After fulfilling this gap definitely it will lead to a positive atmosphere towards development.

Diagram No. 5.14 Needs of WiMAX among the peasants of Non-Experimental village.
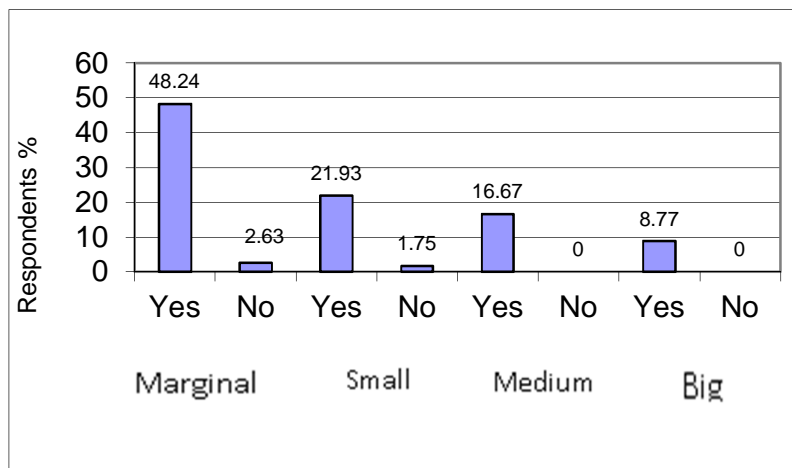
Here, hypothesis number 4 i.e. **"People of non-experimental villages (Zargadwadi) needs WiMAX Kiosk"** is analysed with the help Diagram No.5.12. From this it is well accepted that the peasants need information for better agriculture, and they depends on the information supplied by the various media especially in this era of Information and Communication Technologies (ICTs). In this context Diagram No. 5.12 clearly indicates the eagerness and need of WiMAX among the peasants of Non-Experimental village (95.62%). It indicates the need felt regarding ICT's in agriculture and rural development, irrespective of caste and class background. Villagers of Zargadwadi indeed need the ICT based project like WiMAX especially to gain information the modern agriculture activities as well as for general purpose. During discussion with the respondents of Zargardwadi villagers it's revealed that their eagerness and hopes to learn the things for ICT projects like WiMAX are increased. From the above discussion hence, it is proved that, people of non-experiment villages needs WiMAX. Thus, here, Hypothesis number 4 .**"People of non-experimental villages (Zargadwadi) needs WiMAX Kiosk"** is proved.

In India, the utilization of I.C.T. in agriculture and rural development is in the take off stage and obviously it is facing many field problems as discussed in the previous table. However the present Table No. 5.25 presents synoptic views of suggestions for the effective utilization of WiMAX.

Table No. 5.26: Suggestions for effective utilization of WiMAX.

Sr. No.	Suggestions for effective utilization of WiMAX	Experimental Village		Rank
		Frequency	Percentage	
1.	To increase the WiMAX centers	3	3.00	VII
2.	WiMAX centers must be open for a minimum of 8 hours	11	11.00	V
3.	Number of computer operators also be increased	9	9.00	VI
4.	To give information regarding other crops	26	26.00	I
5.	To give information regarding employment & education	19	19.00	II
6.	Inverter facility must be installed	15	15.00	IV
7.	To start internet and modern facility effectively	17	17.00	III
	Total	100	100.00	

From the above table 26 % peasants suggested to give information regarding other crops rather than sugarcane, information about employment and education (19 %) respectively. It was found that peasants are eager to access e-information hence 17 % peasants opined to start internet and modem facility effectively. Further, 26 % peasants expressed that inverter facility must be installed and WiMAX Kiosk must be opened for a minimum of 8 hours daily. It is important to note that only 3% peasants said that to increase WiMAX Kiosk, it means that majority of peasants suggested that they want variety of information rather than increasing the number of WiMAX Kiosk.

It is now understood with the experiences of one of the key person who is playing a mediator role between WiMAX and peasants through the following case study.

Popat Chowgule : "We need agricultural workshops and I.T. related training"

"I am working as computer operator in WiMAX Kiosk centre at Katewadi village (an experimental village) from last year. I am very clear about the infrastructural facilities and problems associated with WiMAX Kiosk. I think, in this centre the infrastructural facilities are very good, internet and modem connectivity is regular, we have inverter too. Being a key messenger to the peasants it is necessary to know about some agricultural information, so **we need some agricultural workshops and I.T. related training**. No doubt it will be helpful to improve the quality of WiMAX Kiosk." He also glimpsed at some of the key factors regarding WiMAX Kiosk. He said " An average of 30 to 40 peasants visit the WiMAX Kiosk centre every day, and total 450 peasants in this village are accessing computers for various reasons such as crop cultivation practices and sugarcane billing. WiMAX is not only beneficial to big peasants but also useful to marginal and small peasants, some of the peasants are illiterate but they are now connected with the new information and communication technologies through WiMAX.

Testing of Hypothesis number 5 i.e. "**WiMAX is an effective ICT tool for rural development**" is analysed with the following variables

1. Members of Woman Self Help Group (SHG) in Katewadi village got marketing related information of their goods from the WiMAX Kiosk. SHG groups in Katewadi applied for various governmental schemes through WiMAX Kiosk.

2. The social status of Woman and Backward community members in the WiMAX implemented Katewadi village is more advanced than the non-experimental village Zargadwadi. This change is governed by the WiMAX Kiosks where Woman and Backward community members are involved in the various schemes.

3. It is found that, there is greater awareness of ICT tools like computer internet, WiMAX, Wi-Fi among the people in the Katewadi experimental village. In contradictory the people of non-experimental

village i.e. Zargadwadi are lagging behind things related to information and communication technology. The WiMAX project at Katewadi raises greater awareness among the villagers related to ICT and its applications especially for agriculture and allied activities.

4. WiMAX project directly gave employment to more than 100 people. With this village youth got training of Information Technology (IT) at WiMAX kiosk which helped to raise the IT awareness which further raised the employability among the youth. According to the operator of WiMAX Kiosk, at the time of results and admission many students approached to WiMAX and surfed the carrier oriented courses, institutions and their admission procedure. Youth are searching jobs, recruitment drive and apply through the internet. WiMAX Kiosk also provides the guidance to prepare Curriculum Vitae to village youth. Therefore role of WiMAX for building carrier among the Katewadi youth is inevitable. From the above discussion it is found that, WiMAX helped to generate the human resource in the experimental village Katewadi.

5. Through WiMAX Kiosk farmers easily got advice related to purchasing of new machinery, pest control machines and pesticides, high yielding varieties crops, information of sugarcane billing, mobile recharge and so on.

6. The income and saving attributes in the WiMAX implemented Katewadi village were very progressive. Peasants in the Katewadi village involved in the agriculture allied activities since WiMAX Kiosk and this resulted in their economic prosperity and increase in saving trends.

Hence from the above notions hypothesis number 5 i.e. "**WiMAX an effective ICT tool for rural development**" is tested and it is proved.

Testing of Hypothesis number 6 i.e. "**WiMAX is better than traditional media tool for rural development**" is found through the following discussion

Zargadwadi a non-experimental village only accessing the information through traditional media tools like news paper, radio and television where as another village Katewadi have modern ICT tools in the form of WiMAX. The WiMAX gives wireless internet connectivity as well as it have one Kiosk which is equipped with all modern facilities like internet connection to Computer and Laptop, Fax Service, Scanning Service, Printing Service and so on. Therefore it is interesting to find the effectiveness of WiMAX over traditional media. Below mentioned are findings of the analysis for this hypothesis.

1. WiMAX saves time and money of peasants in the Katewadi village. Peasants got all the required information related to farming, sugar cane billing and advocacy of pest control, goat and emu farming in the WiMAX Kiosk. Whereas Zargadwadi village peasants were unable get this information through traditional media tools.

2. Educational structure of WiMAX implemented village Katewadi is more upward than the non-experimental village Zargadwadi village. Here it is pertinent to note that, WiMAX technology gives more clear idea to youths and children in Katewadi for advanced educational courses and their institutions where as it is not seen in the Zargadwadi village.

3. Katewadi peasants easily applied for agriculture loan through online from WiMAX Kiosk while Zargadwadi village do not have this facility and peasants unable to get benefit.

Hence from the above notions hypothesis number 6 i.e. "**WiMAX is better than traditional media tool for rural development**" is tested and it is proved.

Thus, the contribution of agriculture in the economy of India is highest even with its semi-old technology and ICT can directly contribute in

commercialization and in increasing value added services within the sector which ultimately tends to empower the rural communities. Therefore it is proved that, how ICT tool like WiMAX is effective for strengthening and reforming agricultural activities through modern ways well as playing major role in rural development in Baramati region. Next chapter gives vital conclusions and suggestions with reconceptualization of present ICT model and gives scope of future study.

CHAPTER –VI
CONCLUSIONS AND SUGGESTIONS

6.1 Introduction

In this chapter an attempt has been made to mention vital suggestions to improve the role of communication networks in the process of development communication with special reference to the rural society. The study has centered on the key issue of understanding the role of WiMAX / Information and Communication Technology (ICT) in rural development as well as socio-economic development.

6.2 Conclusions

Conclusions are mentioned separately in two parts. The first part deals with the role of WiMAX in Rural Development and the second part deals with the role of WiMAX in Social and Economic changes. These are mentioned below.

6.2.1 Role of WiMAX for Rural Development

1) WiMAX helps to find alternative paths of livelihood which is one of the essential prerequisite of rural development. It is found that, majority of peasants of both the villages are likely to continue with the traditional occupation i.e. agriculture. However, 68% of Experimental and 52.26% of Control village peasants do not like their children to continue with the same traditional occupation. It shows the high attitudinal changes among the peasants, relatively more among the Experimental village peasants due to higher exposure to different mass media Exposure and Communication channels. In context to this finding other related study shows, information is one of the vital aspects of development; hence through communication a person gets to know the availability of different kinds of information that will be helpful to think on availability of different kinds of work. Once he

has this type of information then he can easily choose between alternatives. After having the proper idea the person will be able to choose the appropriate work for his livelihood. Lack of communication, on the other hand will force him to remain in his traditional occupation, whether he is especially qualified for it or not (Rao, Y.V.L. 1966:98).

2) WiMAX improves economic status of rural poor. It is concluded that, when the person gets proper information about alternative income-producing activities then he will tend to move into other jobs or set up small business. In the Experimental Village it was found that, most of the peasants are moving towards dairy co-operatives, poultry, emu culture and the young boys are either interested to set up small agro business and got jobs in different co-operatives sectors. Both communication and economic development, by helping each other in their growth, makes the total process a self-perpetuating one. With economic development, the mass media and the interpersonal communication patterns tend to expand, leading to a great widening of horizons, aided by education, mobility and the like, all of which are parts of the total communication networks (ibid:100). Thus, this helps the person as well as his family to improve the economic condition (Epstein T.,1962; Deshmukh, C.D.,1957).

3) WiMAX avails the commerce and banking services for peasants and needy villagers in the Katewadi (experimental) village. It has been found that, due to low rate of literacy, poverty and inadequate information in rural area, peasants are always facing lot of problems especially about banking and commerce related issues. This picture is very common in Zargadwadi (non-experimental) village whereas in contrast there are 95% peasants in the experimental village who are taking advantages of commerce and banking activities. It is possible through communication where person gets to know about the availability of different kinds of information that will create a condition to think rationally and take proper decisions. Most of

the peasants opined that due to the different communication networks they can receive lots of information about banking and commerce through advertisements, programmes, news, articles and mainly though peer group's face to face interaction.

4) WiMAX creates a condition to think rationally and take proper decision about commerce and banking. The data also shows that majority of marginal and small peasants of both villages are taking loan mainly from District Credit Co-operative (DCC) bank as reported by 29.8% of Experimental and 7.89% of Non-Experimental village peasants respectively. It was also found that ten years ago majority of peasants depended mainly upon moneylenders for loan. Now the situation has dramatically changed, peasants are more conscious about these issues. Thus, it can be concluded that communication helps people to learn and think rationally which will be beneficial for bringing further development in the individual and his family.

5) Traditional rural society was governed by big landlords, where the wealthy landlords were cornering the business and trade activities of a village community. Today in the 'open skies' era communication reaches all the sections. Today, the village economy is more decentralized and diversified allowing villagers from all strata of the community to take active participation in the entrepreneurial activities. In this background, communication networks like WiMAX have helped expansion of the entrepreneurial class. Therefore it is concluded that, WiMAX helps to build entrepreneurship qualities. By liberally informing and educating all masses about markets and methods it helps villagers of all caste and class to take advantage of growing opportunities. Information about markets and methods no longer remains a monopoly (See Hartmann et. al.,1989; Rao, Y.V.L., 1966; Johnson, K., 2000).

6) Access to information is of fundamental pre-requisite in any developmental process. For that it is necessary to create e-awareness among the beneficiaries in villages. In this context the present study proves that, 85% peasants of experimental village agreed that computer and internet services i.e. WiMAX Kiosk was beneficial to them, out of which 73% were interested to learn it. It means that, WiMAX has been helpful to promote e-awareness especially among the rural peasants.

7) WiMAX helped to create positive conditions for development of modern agriculture in Experimental village. WiMAX Kiosk's beneficiary peasants easily got advice related to purchasing of new machinery, pest control machines and pesticides, high yielding varieties crops, information of sugarcane billing, mobile recharge and so on.

8) Woman Self Help Groups (SHGs) in the Katewadi village is very active since implementation of WiMAX project. Marketing related information of their goods was received from the WiMAX Kiosk. SHG groups in Katewadi applied and took grants for various governmental schemes through WiMAX Kisoks. Henceforth it is concluded that, WiMAX is one of the major reasons behind the growth of self-help groups.

9) National Informatics Centre (NIC) is apex institution of Government for information services which also has indirect association with Intel's WiMAX project at Baramati. NIC only consults the Vidya Prathisthan's Institute of Information Technology for web enabling services and support some infrastructural needs of WiMAX. It is concluded that, NIC with Intel gives an opportunity to use the information services like WiMAX which is now supporting for the rural development at Baramati.

6.2.2 Role of WiMAX/ (ICT) in Social and Economic Changes

1) WiMAX has created greater awareness and participation about Information and Communication Technologies (ICTs). Development is confirmed when the people for whom it has been proposed acknowledge its

importance. The participation of people in the process of development enhances the rate at which development must progress. The WiMAX so far has been harboring this approach. In this context it is interesting to note that, 97 % of peasants of Experimental village (*Where WiMAX has been implemented*) know about computer, nearly 77% are familiar with WiMAX Kiosk. On the other hand only 49.99% of peasants of control village (*Where WiMAX has not been implemented*) know about computer and 44.74% are familiar at city level. The participation and awareness about ICT is high among the big and marginal peasants of Experimental village. However the frequency of visiting time to the WiMAX Kiosk mainly depended upon the sex, time and the information need. Similar findings were recorded by (Raina, M; 2004, Kolhli V.,1999).

2) Modern ICT tool i.e. WiMAX helps to increase agriculture production i.e. sugarcane, wheat and maize. Agricultural sector, a prime pillar of Indian economy, which contributes around 25% of G.D.P. and 69% of labourforce, is engaged in agriculture and allied activities. In Baramati region sugarcane is considered as a major cash crop. Due to WiMAX it was found that, the production of sugarcane increased by 30 tonnes as compared to the past production. The above finding clearly proves that, WiMAX has helped to create positive atmosphere for promoting economic development which is faster, efficient and reduces inequality.

3) WiMAX is time saving ICT tool and is tremendously helpful to provide the information services in the experimental village. It is concluded that, through WiMAX enabled services; a peasant could save his traveling time and transportation costs by more than 80 to 90%. As a result of WiMAX, the mobility for farm advocacy is decreased. WiMAX saved time, labour and money of the peasants. Recent evidence shows that peasants, including small holders are gradually shifting their production portfolios in favor of high-value commodities and are willing to take high risks. But they are

confronted with a host of constraints such as high transaction costs in acquiring resources, marketing of tiny marketable surplus and inadequate information (Joshi et al., 2003; Ballabh and Sharma, 1989; Hiremath and Ballabh,1996). Peasants need reliable and timely information about best practices of production, processing, marketing etc.

Intel's WiMAX project is conducted by the Vidya Prathisthan's Institute of Information Technology (VPIIT). WiMAX base tower is situated and maintained from the Vidya Prathisthan's Institute of Information Technology at Baramati. They are supplying the wireless signals to the respective WiMAX Kiosks. It is suggested that, Vidya Prathisthan's Institute of Information Technology manage it more effectively to increase the internet connectivity and make sure to update hardware and software in every WiMAX Kiosk.

4) WiMAX has provided proper forum for healthy interpersonal communication. In experimental village WiMAX is providing e-information to the villagers which they are accessing satisfactorily. At the same time it was also found that WiMAX has provided a proper forum for healthy interpersonal communication among the peasants. There were 92% peasants of experimental village who believed that due to WiMAX Kisok their interpersonal communication has increased. Rogers and Svenning (1969:10), found that in less developed countries where little or no mass media are available, other channels like personal trip to cities and interpersonal communication with change agents etc. provides information to the peasants. It is interesting to note that, here in the experimental village peasants are using ICT's but at the same time they are also dependent upon interpersonal communication. It means that, rural masses still prefer interpersonal communication as one of the important source of information and communication. The results of this study are in agreement with the earlier studies by Vijayaragavan,K,1981; Agrwal and Pandey,1985; Dube S.C.,1960.

5) WiMAX is playing a key role in human resource development. WiMAX has proved helpful in generating employment opportunities for the local population. The Kiosk got employment to two qualified computer experts each to manage web and e-mail administration, Windows – NT and database administration. It shows that, WiMAX has been helpful in creating opportunities for local human resource development. It is found that, young people express great interest in computer training, as this will help them to find better job opportunities, it will create trained and skilled human resource.

Efforts at all level should be taken to improve the rural services like hospital, schools, SHGs, training to rural youth and peasants, banking and finance services and rural artisans with an objective to make ICT project an idea which one can be considered and followed by others as role model.

6) For instance, among the various constraints reported by the beneficiaries of WiMAX, insufficient specific information (32%) and inadequate internet/phone connectivity (21%) were found to be prominent hurdles. In India, the utilization of ICT in agriculture and rural development is in the takeoff stage and obviously it is facing many ground level hurdles. However electricity was perceived to be a major factor. Thus, for ICT initiatives such as WiMAX, to be successful and sustainable in the long run, multi-pronged development strategy is essential.

WiMAX gives platform for rural development. WiMAX set conditions for upliftment of rural society. From this study it is clearly witnessed that, WiMAX is clearly helping for rural development in Katewadi experimental village.

7) After examining WiMAX it was found that, the benefits of the rural ICT projects should be measured not only from the economic and financial point of view, but also in terms of the real benefits empowering the local

communities. Value of the benefits in the long run towards poverty-eradication and social empowerment which are the ultimate goal of any social venture should not be ignored. Just focusing on financial sustainability may distract the very objective of rural ICT endeavors. It is important to concentrate on making the rural ICT efforts self-sustainable through offering different income generating activities in addition to development and social services.

However, today communication networks have shown wonders in galvanizing the process of overall development. ICT's have facilitated the "real time" information exchange in fastest and quickest manner. That day is not far when every Indian peasant will click on a mouse, looking ahead for a wide spectrum of information gateway that will provide him a place in the "global village".

8) Zargadwadi non-experimental village till date is accessing the traditional media tools like news paper, radio and television where as another village Katewadi have modern ICT tools in the form of WiMAX. The WiMAX gives wireless internet connectivity as well as it has one Kiosk which is equipped with all modern facilities like internet connection to Computer and Laptop, Fax Service, Scanning Service, Printing Service provided to the Katewadi villagers. Therefore it is interesting to analyse the effectiveness of WiMAX over traditional media. Below mentioned findings analyses this hypothesis.

9) People of non-experimental villages (Zargadwadi) need WiMAX Kiosk similar to Katewadi. It is concluded that, 96% peasants of non-experimental village know the benefits of WiMAX project and they are likely to implement one WiMAX Kisok in Zargadwadi.

This study finally concluded that, ICT project like WiMAX in the Katewadi village is helping for rural development. WiMAX is helping to raise the income and savings of peasant and rural poor as banking, trade

and commerce facilities are easily reached to Katewadi villagers through WiMAX. It is concluded that, the agriculture production increased in the Katewadi since proper farm advocacy delivered through WiMAX Kiosks. WiMAX gives employment opportunities as well as is helping to strengthen the woman self-help groups and cooperative sectors in Katewadi, Baramati.

It is further concluded that, WiMAX saves time, money of peasants and provide quick and reliable information related to agriculture and allied industries. WiMAX revolutionizes to raise the ICT awareness among the students, youth, peasants, labour and villagers in Katewadi Experimental village. Finally it is concluded that, the ICT tools like WiMAX is playing main role in rural development and it is confirmed with the help of Katewadi Experimental village in Baramati.

10) WiMAX is proved as cost saving tool in the process of rural development. WiMAX implementation at experimental village is helping to save up to Rs.7000 to 10000 annually. Initially the money is spent to visit the sugar factory and Krishi Vigyan Kendra for various purposes. However, it is concluded that, WiMAX is not only helping the rural development but is also a cost saving tool.

6.3 Suggestions for improving the status of WIMAX/ rural ICT projects

After examining the (WiMAX) following key suggestions have been made.

1) This study suggests that, before implementing any ICT projects such as WiMAX, the information needs of a particular community should be thoroughly assessed. Development practitioners and software developers might have in mind a very wide range of resources and applications that are of potential use to a community. However it is information that has a

direct impact on the livelihood of the people that matters the most, and any application should be developed only after, an accurate assessment of these local needs. Participatory rural appraisal, participant observation and other survey instruments have been used for several years, to ensure community ownership of development programmes. These tools could be used in the context of ICT initiatives.

2) Prior to implementation of any ICT project participatory beneficiary involvement is necessary during the development of software. Once the information needs of the community are assessed, content and software applications should be developed with continuous involvement and feed back from the beneficiary community. In connection to it the National Informatics Centre (NIC) has developed a software which is easy to use and all the information is provided in Marathi, the local language. Lack of local participation in content creation, as well as in software development partly explains why much of the information including that on sugarcane growing and agricultural prices lies unutilized and has not been updated since 1998. If an incremental approach were followed, by which, content that responds to the most pressing information needs of the community and software that is appropriate for the local conditions, are developed in collaboration with local staff, the Baramati Group of Co-operatives (BGC) would have probably been able to update and make good use of the information initially provided by NIC(Simone.C,2004;4) At the same time it would develop capacity of managers/operators of information services to identify and supply the information needs of the users.

3) Planning and management of ICT project is very crucial for sustainability of project. This should be achieved through bottom up approach. For the successful implementation of any ICT related project effective planning is essential while a top down approach will most probably lead to a waste of resources in the initial period of the project without ensuring its future sustainability.

4) It is suggested that, special attention should be provided to Women and Deprived sections during launching of any ICT project. It is believed that ICT may have created a new class of untouchables living in information poverty at one extreme and a new cadre of high technology entrepreneurs at the other. As far as WIMAX is concerned in the experimental village, it was observed that women generally visit to the Kiosk to obtain sugar factories' services. Without finding means to get women involved in the use of ICT and in particular to ensure that women are trained to become information operators then there is a less chance that they will be further marginalized. With regards to poor in the Experimental village, the Kiosk was mostly accessed by the members of the sugar co-operatives. The poorest landless labourers currently do not have a reason to visit the Kiosk, because they do not need the services connected with the sugar cane growing and harvesting. Hence it is suggested that information on government schemes offering employment, or on educational opportunities for children, and health tips and care would be of great importance to the poorest. Once such kind of information is made available, efforts should then be made to improve access by the poorest to the WiMAX Kiosk.

5) Empowerment of grass root ICT operators : Finding people with the right mix of skills and motivation is a necessary condition for any project to succeed in bringing ICT to rural communities. In the case of WIMAX, operators at the village information centres generally come from the grass roots, and have a great faith in the potential of ICT to improve the standard of living of their community especially of the rural youth. Many operators have the capability of teaching computer skills and software to children and youth. If they are given the necessary incentives these grassroots operators can become masters for ICT in their concerned villages easing access to information for peasants, providing training to children, and creating new economic opportunities through ICT.

6) Integrated and collaborative approach is essential for ICT project to become a successful model. Therefore it is suggested that, integration and collectivism of rural folk must be raised before starting the ICT project. The use of ICT in agriculture and in general and rural development in particular remains restricted in India. The use of ICT should not be restricted to simply establishing information flow channels; rather we should find a way to integrate it with the various livelihood needs (natural, social, human, physical and financial) of the rural community. The narrow ICT coverage is found to be financially non-viable. Further no single agency can effectively deliver this critical input. Besides the public sector, the need for a pro-active participation by the private sector, NGOs and other civil society organizations is being increasingly felt. These organizations should realize their social responsibility, finally it is suggested that for any ICT initiative to be successful and sustainable in the long run collaborative efforts are indispensable.

7) It is suggested that, creating suitable infrastructure is a factor responsible for the success of the ICT project. The WiMAX Kiosk is facing many problems because of unsuitable infrastructure and power failure. Hence any ICT related projects requires basic infrastructural requirements and systems development (such as dongle, modems, battery, super fast internet connectivity, input-output devices and furniture etc.) together with availability and responsiveness of technical support and expertise.

8) It is suggested that, inter linking the "Old with New" Communication network generate more attraction of ICT projects. There is a urgent need for developing new mechanisms to link ICT's with traditional face to face interpersonal communication; building on existing systems to develop more decentralized information management and exchange; developing

new ways of building on existing agricultural and rural information systems rather than building new ones and promoting the integration of internet, ICT and traditional communication networks within the new pluralistic perspectives to agriculture and rural extension (Sharma, R., 1997:102).

9) Learning from success stories have created vision for implementation of new ICT projects. The ICT vision and action plans must be based on success stories. Replication of visible success stories from other places should be given top priority. It will reduce uncertainty around planning of resources, and will add to goodwill with higher chances of success. New systems' implementation that may fail can delay the process of computerization for years by hardening the cynicism prevalent amongst staff as well as policy makers.

10) Participation in the local institutes in the ICT projects: It was found that (Bajwa, S.B., 2002; Sood, D.D., 2001; Bhaskar, G. and VenkteshwarRao, 1999; Francis, C., 1995) when the ICT related projects are at the pilot stage they work fine (including WIMAX). But when they are implemented fully the question of sustainability arises as there exists a gap between the training provided to workers at pilot stage. Therefore, the need arises for redevelopment or learning in the application of tools for effective implementation of such type of projects as well as there is need on part of the government to develop an overall strategy for the participation of local institutions such as the Grampanchayat and Yuvak Mandals to take the ICT to the rural masses.

11) Involve Universities and academic Institutions in the ICT projects: State, Central Universities and Research Institutes must implement ICT based evaluation research project and also conduct M. Phil. and Ph.D. researches on this subject while the students can be effective 'no cost

trainers'. National Service Scheme(NSS) students can play key role in this context.

12) Find appropriate place for launching the ICT project: For any ICT project the planners should seriously think about the appropriate place which is more convenient to the whole user community. Especially for the rural ICT projects the implementing agency must select the appropriate place for WiMAX Kiosk which may be at the heart of place of Village / Taluka or nearby Grampanchayat office or Market place. Hence Villagers can easily get multiple information and also help to save their time and money. During field work in Experimental village majority of beneficiaries reported that the present place of Village Information Centre (VIC) is not convenient. Hence they suggested to change this place to the nearby village Grampanchayat.

13) Analyse the Socio-Cultural Sensitivity of the class who is going to use the ICT project: Government and policy makers should observe the technological and social changes taking place due to ICT and must exercise their moral authority by framing appropriate policies and rules.

14) Maintaining Co-ordination between the beneficiary and operators through the formal and informal discussion may reduce the hurdles of ICT project. Several studies (Bhatnager and Schware 2000; Kaimowitz D, 1990; Kumar G.M., 2001; Adhiguru, P. and Murthyunjaya, 2004) show that there are serious problems of co-ordination between various implementation agencies and government departments. Since National Informatics Centre (NIC) is a central government organization with a separate administrative channel, some time the goals of NIC do not match with the state governments goals. It was found that there is not much grass root level co-ordination among the officers from various agencies and also between agencies and user departments. This leads to implementation

problems in large projects. Lack of sharing among officers buries much of the knowledge generated in the process of implementation without finding any use. In regards to WIMAX we found that lack of proper co-ordination between the NIC and Baramati Group of Co-operatives, WIMAX has faced various problems. Only at the initial stage NIC has given much attention to WIMAX, as reported by Senior official of Baramati Group of Cooperatives Hence it is suggested that there is an urgent need to co-ordinate and concentrate serious efforts of both agencies i.e. Baramati Group of Cooperatives and NIC and to rethink about the sustainability of WIMAX.

15) ICT project must start within given time as delay in the launching the project loose attention and faith of beneficiary. The project development and implementation cycle needs to be reduced. The delays not only waste critical resources, but cause loss of faith in stakeholders. Hence it is suggested that government and implementing agency should take maximum efforts to complete such type of projects within limited time.

16) ICT projects come with some innovative ideas to attract more beneficiaries. ICT projects can definitely play a key role in this endeavor if the local Grampanchayat/Panchayatsamitis are encouraged and supported to set up ICT based Village Information Centers(VIC). In this connection in an inaugural session of the ACCOCHAM (Associated Chambers of Commerce and Industry of India) Summit on "India in a Knowledge millennium" former Prime Minister, Mr. Atal Bihari Vajpayee declared that, "knowledge based society will enable us to leapfrog in finding new and innovative ways to meet the challenges of building just and equitable social order and seek urgent solution"(Venkatsubramaniam, 2000).

17) More than 70% people in India are using mobile phones and it is proved as a very effective tool for information and creating awareness. In context to rural information needs very few organizations came forward to

launch mobile based applications related to agriculture and rural development but it has limited life. However, projects like WiMAX Kiosk have proved to be very efficient at Baramati and has wide scope for future. It is suggested that, WiMAX project at Baramati should develop and launch mobile based application for village folk. This application may be in local language and easy to use which gives information of weather forecast, market rates, new varieties, new government schemes, farm advocacy and so on.

6.4 Suggestion towards the reconceptualization of present communication model.

This sub-section deals with two vital suggestions regarding the present communication models of WIMAX and agro-rural development.

1) The Proposed conceptual framework for WIMAX/ rural ICT projects

"*Agriculture is the backbone of the Indian economy and the villages are the life lines of growth in India*." G. Bhaskar (2001)

India covers vast geography of nearly 32.9 million sq. km. with population of 1027 million (2001,Census) distributed in 28 states and seven centrally administered union territories covering 6,00,000 villages. Agriculture continues to be the occupation and way of life for more than half of Indian population even today. The peasants, the land less agricultural labourers hold the key for improving the overall Human Resource Development scenario in the country. Indian agriculture had been on traditional lines till the first waves of Green Revolution in late 60s. The Green Revolution gave a sudden boost to the production and productivity of major cereals in the assured irrigated areas of Punjab, Haryana, and Western U.P. in north, and Godavari, Cauvery deltas in the south. Quick dissemination of technological information from the Agriculture Research System to the peasants in the field and reporting of peasants' feedback to the research system is one of the critical inputs in

transfer of Agriculture Technology. The communication support during last 55 years has mainly been conventional.

The extension personnel of the Department of Agriculture disseminated the technology manually. This approach has not been able to reach majority of the peasants who are spread across the whole country. This gap between socially privileged and socially deprived remains a challenge for the Communication and Extension system even today. To reach over 110 million peasants, spread over 500 districts and over 6000 blocks is an uphill task. The diversity of agro-ecological situations adds to these challenges further. The success of Green Revolution was mainly achieved due to homogeneous extension approach for the assured irrigated area. Now as we move to address the needs of rain-fed eco-systems, the communications and extension strategy becomes more complex. Peasants' needs are much more diversified and the knowledge required to address them is beyond the capacity of the grass root level extension functionaries. Today it is possible to find a solution to this situation by using the potential of Information and Communication Technologies (ICT) to meet the location specific information needs of the peasants. The Information and Communication Networks are expanding very fast. The number of internet connections in India has crossed the two million mark and the number of telephone connections is over 22 million. The internet connectivity has touched almost all the districts in the country and is moving down to the block and village levels. Pilot projects to connect rural community to the cyberspace are underway at various locations. The initial response of the rural people, particularly women has been very encouraging. National Institute of Agriculture Extension and Management (MANAGE) has established internet connectivity in 28 districts of 7 states namely Andhra Pradesh, Bihar, Himachal Pradesh, Jharkhand, Maharashtra, Orissa and Punjab under National Agricultural Technological Projects (NATP). Over 200 blocks have already been connected on internet under N.A.T. P. (Sharma, V. P., 2004:2)

Harnessing ICT for Agriculture and Rural development: Indian Cases

Besides WIMAX project there are around 20 successful cases of application of ICT that have made a difference in the delivery of services in rural India. ICT is emerging as an effective and efficient tool to support the agro-based livelihood of the rural people as outlined below.

1) More subject matter coverage

Able to disseminate knowledge intensive information such as market intelligence weather forecast, post-harvest processing, etc.

2) Decision support

Can provide alternative solutions to a set of problematic situations/scenarios and therefore improve the quality of decision making.

3) Minimize time and distance barriers

Can virtually link the national and global knowledge systems.

4) Empower rural intermediary organizations

Enhance the capacity of local governments, local extension service centres, peasants' unions/associations, NGO's, community radio stations, agro processors, agricultural input providers, rural credit organizations. ICT will provide an alternative path for agriculture and rural development. The tenth five year plan states that the use of ICT is an important pillar of agriculture and rural extension.

The government's supportive policy has contributed to the emergence of a pluralistic extension system in India with emphasis on application of ICT in agriculture also. Public sector institutions (e.g. Department of Agriculture Research Institutes, MANAGE, NIRD, State Agricultural University, NGO, Co-operatives and various private farm related input marketing firms, are actively venturing into ICT based initiatives for providing information in the areas of agriculture technology, production, processing, marketing and other farm related aspects (Murthunjaya et al. 2005:2). These initiatives vary in purpose, type and nature of information, funding agencies, facilitation, methodologies and

modes of implementation, some innovative projects involve setting up of information centers at the village level such as WiMAX that provide facilities of using computer with access to the internet and offer several other multipurpose services. Some other initiatives involve developing networks, connecting research and extension organizations for effective and need based information. At the same time several studies show that some of the rural ICT projects are facing lots of problems including WiMAX. The present model of WiMAX clearly indicates its weakness. Presently, WiMAX has been providing e-information mainly regarding sugarcane. Also at this stage WIMAX has not been able to fully provide internet and V-SAT facility due to financial problem. Hence the proposed conceptual framework suggest that rural ICT projects should collaborate with public-private partnership (such as E-choupal, M.S. Swaminathan Research Foundation).

Empowerment of deprived sections through ICTs

During field work it was also observed that, the people from backward castes and weaker sections are mostly deprived from the mainstream ICT revolution. Therefore the present conceptual model suggests that, Ministry of Agriculture, Rural Development and Social Empowerment, Human Resource Development and Information Technology, should jointly think and plan to start special Village Information Centers (VICs) exclusively for the empowerment of such communities. Now-a-days' information is one of the important indicators of development. Once they will start to use this e-information, it will create dramatic socio-economic changes among these communities.

Employment through ICTs

At this juncture millions of jobs are available in the IT sector. If government introduces short term computer training courses for young educated students from deprived sections through these Village

Information Centres (VIC) it will increase self employment opportunities in the rural society in general and among the deprived section in particular.

Thus the present study suggests that the proposed conceptual framework will be beneficial for the sustainability of rural ICT projects, if the project implementers will follow this framework as a guiding model.

2) The proposed Communication Model for Agriculture and Rural Development

Given the central role of communication in development, it will be important for an agriculture and rural agency to have small communication support groups, if feasible, directly under its own control to help the local extension agent or agro-rural information officer. Such groups perform or arrange for the performance of four tasks.

1. The production of messages using appropriate media.
2. The transmission of those messages to the locations where they are needed.
3. The necessary utilization support or co-ordination with the ultimate receivers of the information so that the development task is effectively carried out.
4. Bringing feedback and evaluation information from the recipients and intermediaries back to the attention of the extension agent or managers of the development activity so that not only the communication support activities but the development programme itself can be modified to ensure that it effectively meets the development goals.

It might be more helpful to think of the ultimate goal of development support communication as providing the means for people to have, on demand access to the information they wish to utilize for developing themselves. This implies that the messages produced are relevant and understood within the context and view points of the

receivers, giving them a choice of information content so that they can receive rural and agricultural information. Moreover Roger's six point communication component, can further supplement the communication strategy for agro-rural development.

Roger's six point communication strategy

1. Use the traditional media as creditable channels to reach the most disadvantaged audiences.

2. Identify the key communicators among the disadvantaged/deprived segment of the total audience, and concentrate development efforts on them.

3. Use change agent aides who are selected from the disadvantaged to work for development agencies.

4. Provide means for the disadvantaged audience to participate in the planning and execution of development activities and in the setting of development priorities.

5. Establish special development agencies that work only with disadvantaged audience. An example is the Small Farmers Development Agency (S.F.D.A) in India, founded in 1970 to provide agriculture information and credit to small scale farmers only.

6. Produce and disseminate communication messages that are redundant to the 'ups' because of their ceiling effect but which are of need and interest to the 'downs' (Rogers E.M. 1962: 271).

Role of Extension Agents

Especially at block and village level the real communication task starts from the extension agent, an integral part of most of the agro - rural extension services throughout the world, which is expected to implement agro-rural programme at grass-root level. However, if an individual does not fit into a particular local as linker or extension agent, he could indeed become a negating factor in villagers adopting new ideas. On the other

hand many people claimed that several agro-rural information officers and change agents pay special attention to the opinions and suggestions of the rural elite and ignore the poor and deprived people. Hence, it is suggested that the extension agents should not confine themselves only to the feedback from community leaders but should give due consideration to the opinions of the people at the grass root level while making plan for agriculture and rural development. Henceforth for an ideal agro-rural development plan, interaction is required between the disadvantaged masses and the change agents. Lack of proper interpersonal communication between these two components, may cause the failure of the agro rural projects.

Tactics for Extension Agent

1.   The extension agents must serve as a mediator between the different central organizations and beneficiaries. He has to collect information about the people and disseminate information (message) to the villagers so that they can receive understand and interpret it in accordance with the message. At the same time he has to initiate communication with key communicators in order to get their support. After getting feedback a, b, & c from individual and the audience, he with his communication support teams should re-evaluate the communication strategy in order to provide his agency with the information needed for further activities.

2.   For the effective feedback and communication between the extension agents and villagers it is necessary that the change agent must interact and involve with the villagers of all the stratas utilizing all his social and personal influence.

3.   Sometime due to several (religious, beliefs, customs traditions) reasons extension agents are not able to communicate and disseminate his ideas in the society. Hence it is suggested that they can form a group with prominent villagers to discuss new

techniques. Once this groups of important members at the village have adopted new techniques this can help in the adoption for the other villagers, even if the new practices are not fully in accordance with the existing social values (Uddin M., 1990:28)

Group of Small Media

In many ways, extension agents serve as an important bridge between the development agencies and the peasants. Thus, ways and means should be identified to equip these agents with the necessary skill and knowledge, especially in the task of information transfer. It is widely accepted that effectiveness in message dissemination is dependent on the technical knowledge and communication skills of the information source. By and large extension agents are equipped with the necessary technical know-how. However many of them lack the skill in communicating the information to the receivers (See Abdul Azizal 1983:286-291). The use of Audio Visual Aids (AVA) has been found to facilitate information transfer (See Musa, and Kamsha, 1990 Rahim 1986). This proposed model focused on the small media utilization in the information dissemination process. Small media refers to such items like slide projectors, overhead projectors, videos, posters, photographs, flipcharts audio cassettes, slide tape series and the like. Information and Communication Technologies (ICTs) are also playing vital role in rural context. In other words, the term 'small media' as used for this model refers to both the hardware and software. Several studies show that small media are relatively durable and are easy to update the dynamic nature of knowledge and require constant updating of available information. Thus efforts should also be made to formulate an appropriate and situationally relevant media mix. Such information will facilitate media planners and development workers to develop a comprehensive and effective communication strategy especially for rural development programmes.

Traditional Media

Traditional media is still surviving and is used as meaningful channel of communication in traditional or developing societies. Their unobtrusive nature is, perhaps the reason why they have been ignored for most of the time by the mass media oriented communication experts and development planners (Costeng, 1988:151).

Fortunately, many development planners and decisions makers in the Third World now appreciate the value of using traditional media as an alternative communication channel. Hence due to the traditional nature of the Indian rural society, we have selected traditional media as one of the major network of information dissemination for the proposed model. Thus now the time is to rethink and realize the positive and productive use of this ignored medium of communication.
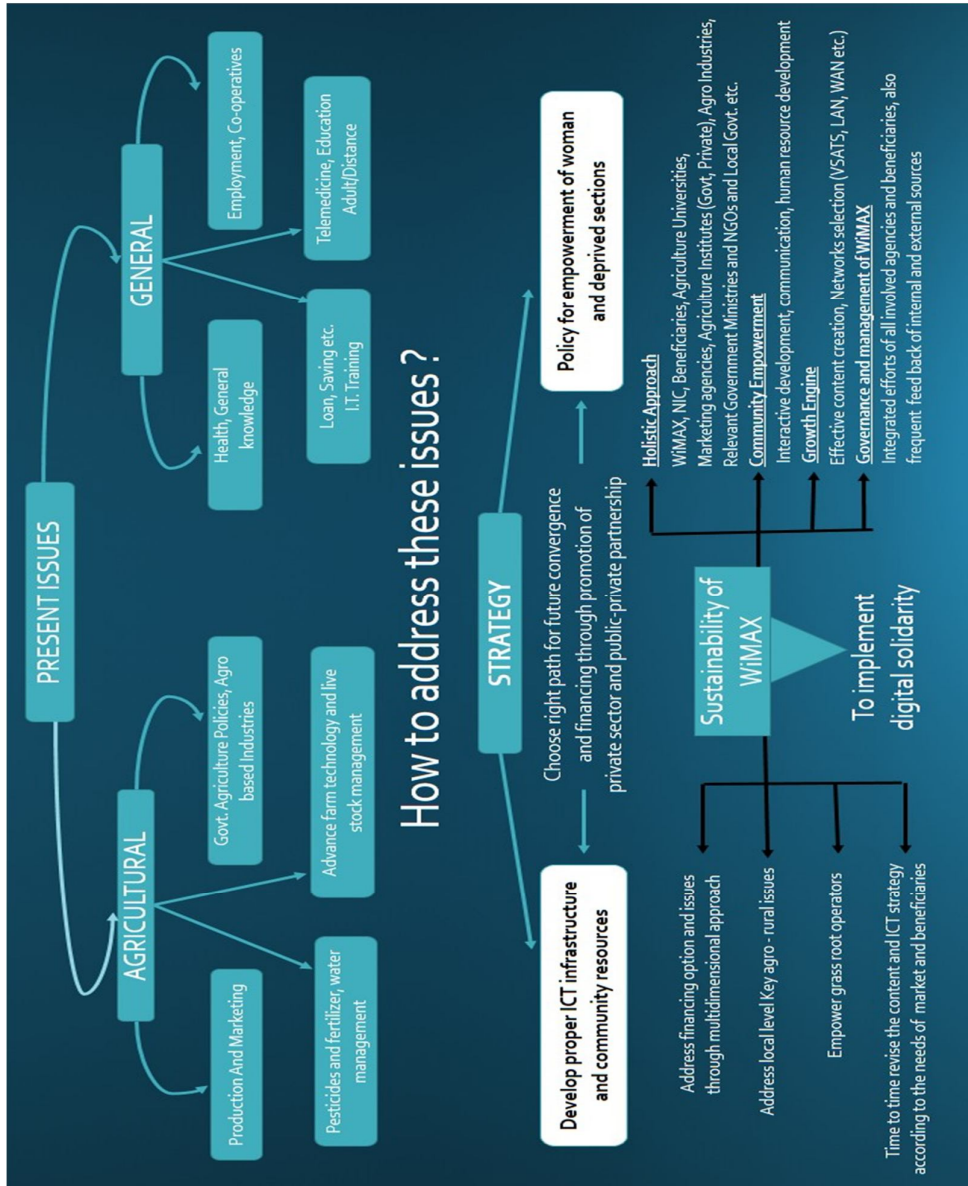
Figure No.6.1 Conceptual Model of WiMAX project for Rural Development

6.5 Scope of future study

1) Already it is found that, ICT like WiMAX is governing the rural development in the Katewadi Village. However, other such ICT projects for rural development in run by the MS Swaminath Foundation in the villages of South India and e-choupal, WiMAX project run by the Andhra Pradesh state government, WiMAX enabled internet service provided by the Vigyan Ashanram near Pabal in Pune district of Maharashtra have further scope to analyse the role and sustainability in rural development of these ICT based projects. Therefore this study out comes with the benchmark to find the advantages of WiMAX in rural development.

2) ICT projects like WiMAX have very big scope to implement in the e-Governance. Therefore it is interesting to take study on various application of WiMAX in e-governance.

3) Many European nations have started mobile WiMAX projects in the rural areas. This study has been relevant to check the impact and hurdles in the operation and management of governing mobile WiMAX project.

4) Rural American peasants use WiMAX networked systems to monitor crops and animals or even operate certain equipments from a distance, saving peasants' time and inconvenience. It also can take to monitor land in person or control all devices manually (Codr, Rajan;2008). It is noted that, still scientific study of such projects is not done so far. Therefore, it is needed to undertake study of the technical profile, management, applications and hurdles of such WiMAX projects operated in the rural America.

5) Infrastructure upgradation is necessary in the old ICT projects. Therefor it is needed to undertake future study on limitations and infrastructure reformation of old ICT projects.

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Annexure I

INFORMATION AND COMMUNICATION TECHNOLOGY (ICT) FOR RURAL DEVELOPMENT: A CASE STUDY (2006-2012) OF MANAGEMENT OF WI-MAX PILOT PROJECT BARAMATI.

PART-I
Wi- MAX Village Project
EXPERIMENT VILLAGE(KATEWADI)

NAME OF PEASANT-

AGE-   GENDER-

OCCUPATION-

ANNUAL INCOME-

1)   Peasants Introduction to WI-MAX :

Q.1   Do you know computer ?

        1) Yes   2) No

Q.2   If yes, where you first time familiar with computer ?

    1) City   2) Shop   3) WI-MAX

Q.3   From which year you take benefits of WI-MAXCenter ?

    1) 2 years   2) 5 years   3) 7 years   4) 10 years

Q.4   From which source you get information about WI-MAXcenter ?

    1) News paper   2) Fellow peasant   3) Sugar Factory

2)   Visit to WI-MAX center

Q.1   Whenever you visit to WI-MAXcenter ?

    1) Once in a day   2) Twice in a week   3) One in a month

Q.2   Mainly which time you visit to WI-MAXcenter ?

    1) Morning   2) Afternoon   3) Evening

3)   WI-MAX and Economic Development

1)   Land under sugarcane cultivation ? (In acre)

    1) 1 acre   2) 2 acre   3) 3 acre

    4) 4 acre   5) More than 5 acre

2)   Per acre sugarcane production before WI-MAX ?

1) 20 tonne   2) 30 tonne   3) 35 tonne   4) 40 tonne

5) 50 tonne   6) 60 tonne   7) 70 tonne

3)   Per acre sugarcane production after WI-MAX ?

1) 20 tonne   2) 30 tonne   3) 35 tonne   4) 40 tonne

5) 50 tonne   6) 60 tonne   7) 70 tonne   8) Above 70 tonne

4)   Time Saving

A)   Weighing

1)   How much time required to know the weighing of sugarcane before WI-MAX ?

1) 6 to8 days   2) 10 days   3) 15 days   4) other

2)   After WI-MAX how much time required ?

1) 1 day   2) 2 days   3) 6 hours   4) 2 hours

3)   What do you think due to speedy process of weighing the weight of sugarcane in increasing ?

1) Yes   2) No

B)   Tunage Time :

4)   How much time required to understand tunage of sugarcane before WI-MAX ?

1) 3 days   2) 6 days   3) 15 days   4) Any other

5)   After WI-MAX how much time required ?

1) 4 hours   2) 12 hours   3) 1 day   4) Any other

C)   Bill :

6)   How much time required know the billing of sugarcane before WI-MAX ?

1) 8 days   2) 15 days   3) 1 month   4) Any other

7)   After WI-MAX how much time required ?

1) 8 hours   2) 12 hours   3) 1 day   4) Any other

D)   Contacts to Sugarcane factory.

8)   How much time you visit to sugarcane factory before WI-MAX ?

1) Weekly   2) Monthly   3) Within once two month

4) Any other

9) After WI-MAX how much time you visit to WI-MAX ?

1) Monthly   2) Twice in year   3) Any other

E) Time Benefits

10) Benefits of time saving ?

  1) Less expenditure

  2) More attention in agricultural activities

  3) More attention in family activities.

  4) Any other

5) Employment Generation :

1) Do you think WI-MAX , responsible for employment generation ?

1) Yes   2) No

2) Computer Operators in WI-MAX are from the same region ?

1) Yes   2) No

3) Can WI-MAX   is beneficial to local computer literate for employment ?

1) Yes   2) No

6) Extension Activities of WI-MAX

1) Can WI-MAX providing following extension activities :

Sr. No.	Extension services	1) Yes	2) No
A.	Regarding sugar factors		
1.	Meetings		
2.	New Programmes		
3.	Pesants meetings, Demonstrations		
B)	Regarding Cattle Care		
1.	Medical information		
2.	Medical treatment		
3.	Medicine		
4.	Counseling		

C)	Other		
1.	New Schemes and Loans		
2.	Seeds, fertilizers, Pesticides		
3.	Soil testing		
4.	Insurance		

7) Changing Awareness about ICT.

1) Do you think that computer is highly beneficially for peaseant before WI-MAX ?

1) Yes   2) No

2) Do you know the following parts of computer ?

A) Yes   B) No

1) Mouse   2) Key board   3) Monitor

3) Do you interested to learn computer ?   1) Yes   2) No

4) Do you interested to buy computer ?1) Yes   2) No

5) Do you feel your children also learn computer ?1) Yes   2) No

6) Do you know internet ?   1) Yes   2) No

7) Do you interested to access more agricultural information through internet ?

1) Yes   2) No

8) Increasing Peasants Interpersonal Communication

1) What do you think, due to WI-MAX center your contact and communication with follow peasants in increased ?

1) Yes   2) No

2) On which subject you are discussing at WI-MAXcenter ?

1) Agricultural   2) Village   3) Sugarcane

9) Hurdles in WI-MAX

1) Are you facing following problems regarding WI-MAX ?

1) Electricity   2) Technical   3) Human   4) No

10) Suggestions

1) Give your suggestions regarding WI-MAX ?

1) To increase the WI-MAX centers

2) WI-MAX centers will be must open minimum 8 hours.

3) Number of computer operators also increase

4) To give information regarding other agricultural products.

5) Inverter or Battery backup system must be installed.

INFORMATION AND COMMUNICATION TECHNOLOGY (ICT) FOR RURAL DEVELOPMENT: A CASE STUDY(2006-2012) OF MANAGEMENT OF WI-MAX PILOT PROJECT BARAMATI.

PART - II

B) FOR NON EXPERIMENT VILLAGE

NAME OF PEASANT-

AGE-   GENDER-

OCCUPATION-

ANNUAL INCOME-

I)   Introduction to WI-MAX Center

1)   Do you know computer ?

    1) Yes   2) No

2)   If yes where you first time familiar with computer ?

    1) City   2) Shops   3) WI-MAX center

    4) Milk Center   5) Sugar Factory

3)   Do you know about WI-MAX ?

    1) Yes   2) No

4)   Do you think WI-MAX is beneficial for peasants ?

    1) Yes   2) No

5)   Do you think such type of project will also starts in your village ?

    1) Yes   2) No

II)   Difference in Economic Development

1)   Land under sugarcane cultivation ? (in acre)

    Specify :

    1) Upto 1 acre   2) 2 acre   3) 3 acre

    4) 4 acre   5) More than 5

2)   How much sugarcane you produced per acre before eight years ?

1) 20 tonne   2) 30 tonne   3) 40 tonne

5) 50 tonne   6) 60 tonne   7) 70 Tonne

3)   How much sugarcane you produced per acre in this year ?

     1) 20 Tonne   2) 30 Tonne   3) 35 Tonne

     4) 40 Tonne   5) 50 Tonne   6) 60 Tonne   7) 70 Tonne

III) **Difference in Time Saving**

A) **Weighing**

1)   After sugarcane cutting how much time required to know the weighing ?

     1) 1 Day   2) 2 Day   3) 3 Day   4) 10 Days

2)   Can late weighing of sugarcane decreases the weight of sugarcane ?

     1) Yes   2) No

B) **Tunage Time**

3)   How much time required to know the tunage of sugarcane ?

     1) 1 day   2) 2 days   3) 3 days   4) 4 days   5) 8 to 10 days

C) **Billing**

4)   How much time required to know the billing of sugarcane ?

     1) 8 days   2) 15 days   3) 1 month

D)   Contacts to sugar factory

5)   How much time you visit to sugar factory ?

     1) Weekly   2) Monthly   3) Once within two month

6)   Do you think due to contact to sugar factory you losses money, time and labour ?

     1) Yes   2) No

E)   Time Loss

1)   Lack of WI-MAX Center, have you facing following losses ?

     1) More expenditure on travelling.

     2) Less attention to agriculture activities

     3) Less attention to family activities

     4) All the above

4)   Employment Generation

1)   Do you think WI-MAX is responsible for employment generation ?

        1) Yes   2) No

5)   Extension Activities of sugar factory ?

1)   Can your sugar factory providing following extension activities in your village ?

Sr. No.	Extension services	1) Yes	2) No
A.	Regarding sugar factors		
1.	Meetings		
2.	New Programmes		
3.	Pesants meetings, Demonstrations		
B)	Regarding Cattle Care		
1.	Medical information		
2.	Medical treatment		
3.	Medicine		
4.	Counseling		
C)	Other		
1.	New Schemes and Loans		
2.	Seeds, fertilizers, Pesticides		
3.	Soil testing		
4.	Insurance		

6)   Difference about I.T. awareness

1)   Do you think, computer is beneficially for peasant ?

        1) Yes   2) No

2)   Do you know the following parts of computer ?

        1) Mouse   2) Keyboard   3) Monitor

3)   Do you interested to learn computer ?

        1) Yes   2) No

4)   Do you interested to buy computer ?

        1) Yes   2) No

5)   Do you feel your children also learn computer ?

        1) Yes   2) No

6) Do you know internet ?

    1) Yes   2) No

7) Do you interested to access more agricultural information through internet ?

    1) Yes   2) No

7) Differences in peasants interpersonal communication

1) Do you feel lack of WI-MAX center in your village your contact and communication with fellow peasants is decreased ?

    1) Yes   2) No

2) Do you interacting with fellow villages at one place in your village ?

    1) Yes   2) No   3) Rarely

8) Hurdles / Losses

1) Lack of WI-MAXcenter in your village have you feel the following loss ?

2) Late weighing of sugarcane

3) Delay to know tunage of sugarcane

4) Loss of money, time and labour

5) Lack of employment generation source

6) Lack of extension activities.

7) Lack of I.T. awareness

8) Lack of interpersonal communication.

9) Unable to the importance of computer and internet

10) Unable to learn computer.

11) All the above.

Annexure II

PHOTOS

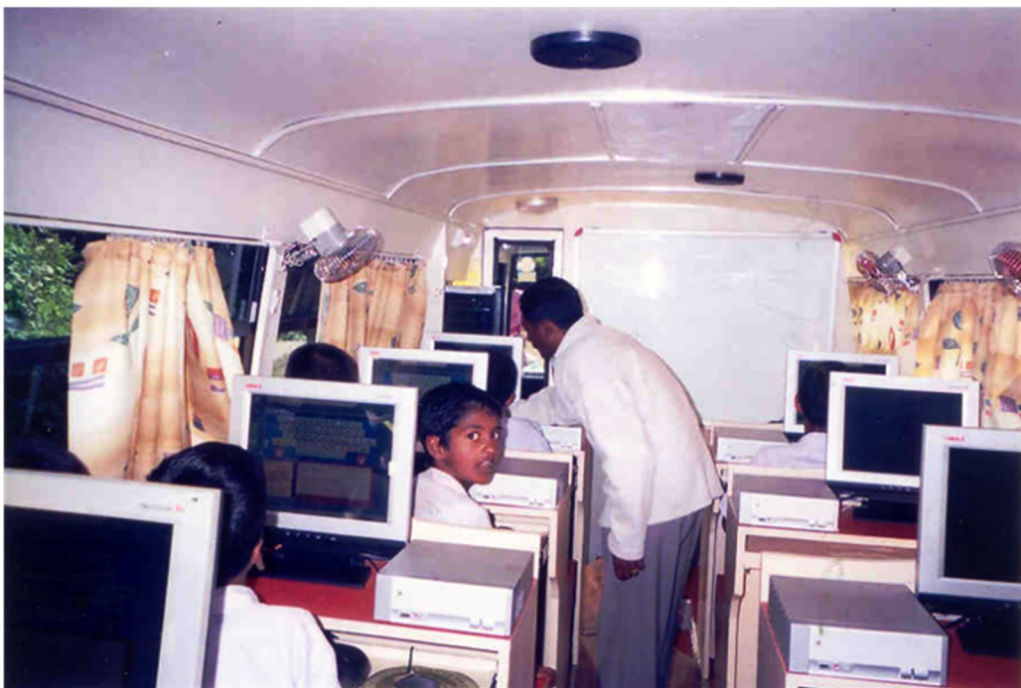## WiMAX Kisoks at Experimental Village Katewadi, Baramati

WiMAX Kisok- Infrastructure and Training to Rural Youth and Woman Self Help Group.

WiMAX Project- Telemedicine Facility at Rui Govt. Hospital Baramati.

ICT/WiMAX Awareness Project for Students at Katewadi, Baramati.

WiMAX Kisok at Katewadi in News

काटेवाडी येथे नागरी सुविधा केंद्रातून शेतमालाची विक्री

काटेवाडी, दि. १४ (वार्ताहर) : काटेवाडी (ता. सासवड) येथे केंद्र सरकारला कर्जाने उभारण्यात आलेल्या नागरी सुविधा केंद्राच्या माध्यमातून जवळील शेतमालाची विक्री करण्यात येत आहे. त्यामुळे शेतकऱ्यांना फायदा होत आहे.

'सुविधा' शॉपिंग मॉल्स व नवशक्ति कंपनी समवेत काटेवाडी येथील कमीत कमीत शेतीचा अधिकृत कार्य झाल्यामुळे या नागरी सुविधा केंद्राच्या माध्यमातून या परिसरातील उस, दाळींब व सर्वेतरची उत्पादिते पडेल, भरतीतल्या बट शेतकऱ्यांच्या शेतमालन सुविधाच्या सर्व मॉल्स विक्री केंद्रम उभविल्या बरून देण्यात आला असल्याची माहिती प्रकल्प समन्वयक संदीप सुतकर, केंद्रचालक प्रकाश गाडे यांनी लोकमतशी बोलताना दिली.

सुविधा मॉल्स कंपनी येट शेतमालमे जाऊन पेमेन्ट निश्चितमध्ये खरेदी करणा असल्यामुळे शेतीच्या बांधावरच छरेदी होत करणे शेत असल्यामुळे उत्पादक शेतकरी सुविधा आहे. सुविधा मॉल्स कंपनी येट शेतमळून इत्र व

शाळ पडेल, भाजीपाल्य छरेदी कात असल्यामुळे शेतकऱ्यांचा विक्री खर्च, बहुतेक अडता कंपनीला आही शेतमी बचत झाल्यामुळे मिश्रितायरे प्रसन्य वाढ झाला असल्याचे पेढील द्राक्ष उत्पादक स्वाम किलीम कोरे यांनी सांगितले. या परिसरात संदीप होती द्राक्ष उत्पादक गेल्या प्रमाणात असल्यामुळे पेढील द्राक्ष प्रावर्तन मार्केटीतल बाढ भरली आहे. त्यामुळे शैलराबल प्रेश व इंग व संखाच्या करणात असल्याचा मॉल्स वंबनी या परिसरातील द्राक्षांची छरेदी करण्याबाठी कॉम शक्ति केंद्रशा संपर्क आहेत. त्यामुळे प्रत्यिक्षा व परिसरातील शेतकऱ्यांच्या अधिक बाबद मिळण्याची सुधशेकेंद्र असल्यामुळे व केंद्रच्या माध्यमातून मॉल्स कंपनी खट्ठे-बाजीरांना खरेदी करण आहेत. त्या व परिसरातील शेतकऱ्यांचे चालील वस्तू द्राश व हल उत्पादक पडेल, भाजीपालत इत्यादी मार्ग या नावाकित मॉल्स कंपनीकडे पाठविण्यासाठी शेतकऱ्यांनी खप पेण्याचे आवाहन कॉम शक्ति सेंट काटेवाडीचे केंद्रचालक प्रकाश गाडे यांनी केले आहे.

सुविधा ऑॉल्सला द्राव पाठविण्यासाठी निवडयाना महिला वर्ग.   (फोटो : गजानन हगवणे)