"ROLE OF IRRIGTION IN AGRICULTURAL LAND USE"

(A case study of Mouza Pinda Khel District Bannu)

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CHAPTER # 1

INTRODUCTION

1.1 STUDY AREA

The study area Mouza Painda Khel is in District Bannu .The total area under the study is about 1781 acres having five thousand (5000) population according to DCR.Out of the 1781 acres area, 503 acres area is covered by herbs, shrubs, bushes and Dates trees. Dates are productive fruit but the other is valuable source of fuel and income source for the people.

In this area, cultivation was mostly dependent upon rain fall up to 2000, after 2000 agriculture is carried on by using tube wells as a source of irrigation. A tributary of Thar Khaoba River is Spena Tangi .It is situated in the East of the study area. A huge amount of water flow in it but not use for irrigation purpose because it is seasonal. The water of Spena Tangi transports a huge amount of clay which is suitable to increase the soil fertility of the soil of Mouza Painda Khel.

1.2 LOCATION OF THE STUDY AREA

A. Absolute location

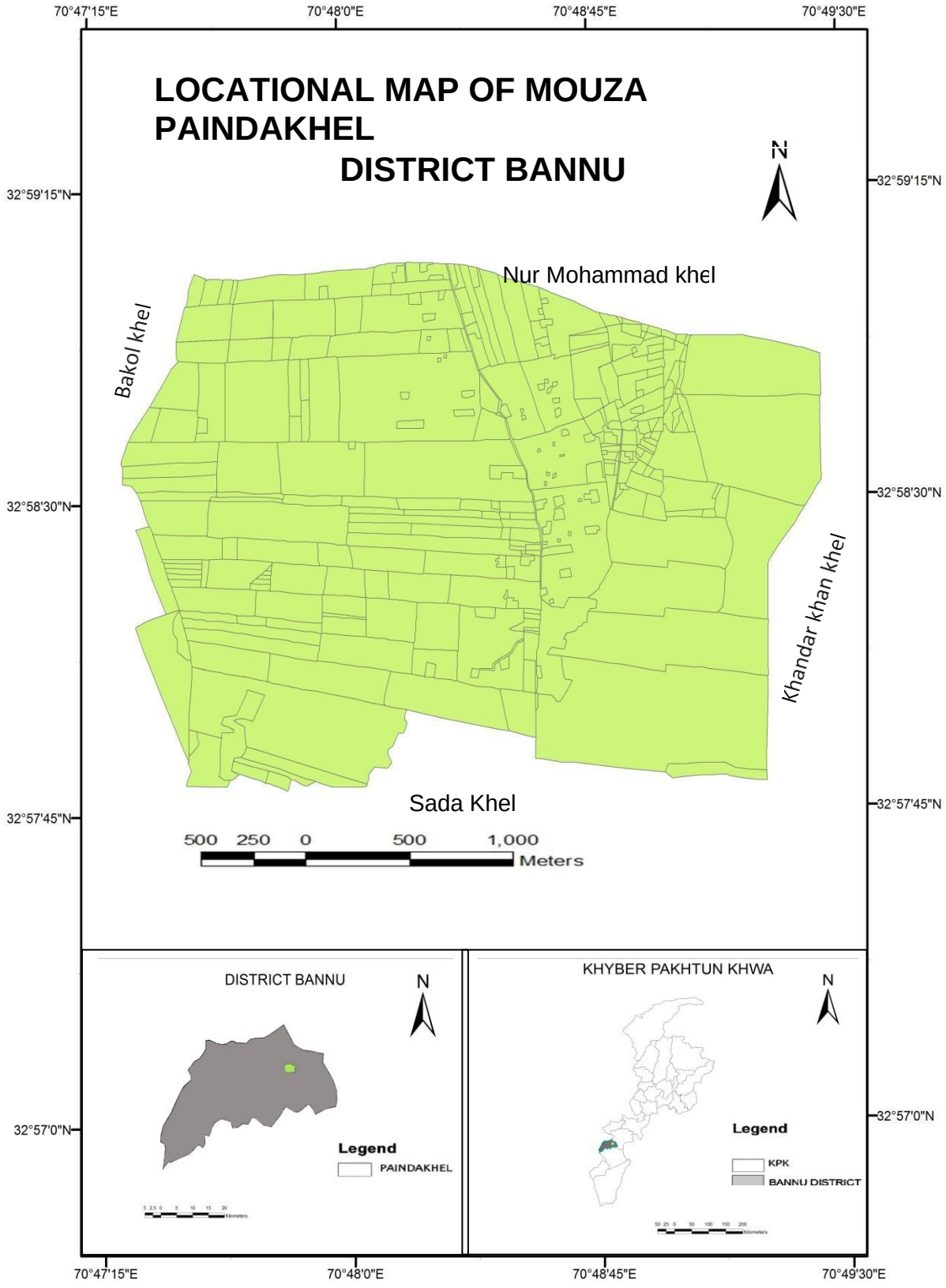
Mouza Painda Phel extends from

32°57′49.23”North to 32°59′05.96″North latitude

70°47′18.90“”East to70°49′25.95″East longitude

B. Relative location

The study area is surounded by following mouza. West of our study area is bounded to Bakol Khel, at the North of it is bounded to Mouza Nur Mohammad Khel. East of our study area is bounded to Mouza Khander Khan Khel and the south of it is bounded to Mouza Sada Khel. The study area Mouza Painda Khel is in District Bannu. District Karak is to the north East of Bannu and District Lakki Marwat is in the south of District Bannu and North Waziristan Agency is in the West of District Bannu



MAP NO. 1: MOUZA PAINDA KHEL LOCATION DISTRICT BANNU

1.3 CLIMATIC CONDITIONS

Pakistan has tropical and subtropical climatic conditions. The average rain fall in Pakistan is 250-460mm/y while the average rain fall in the study area is pronouncing 150mm to 260mm/y. As the average rainfall in Pakistan defines the arid conditions for this area, therefore the soil is mostly sandy, but not truly deserted and barren area. As for as temperature of the area is concerned, a lot of variation is to be found there. In summer season, the mean annual temperature reaches to 45ºC and in winter, the temperature falls down up to 7ºC.

However, due to high temperature in summer, usually winds blow at a speed of more than 25 km/ hour which is the basic source of sand dunes formation. The soil which has abundant sand elements is usually disturbed by these winds and changes occur in soil structure.

TABLE NO.1: MONTHLY TEMPERATURE OF DISTRICT BANNU 2014

Months	**Minimum temperature**	**Maximum temperature**
January	4.6	19.8
February	6	20.7
March	11.7	25.5
April	15.7	19
May	22.6	38
Jun	24.2	38.8
July	27.5	38.1
August	27.6	37.6
September	24	37.9
October	15.77	31.7
November	8.4	25.3
December	4	21

1.4 TEMPERATURE

Study area is in district Bannu. Temperature of this area is extremely high in Jun, July, August, and September.

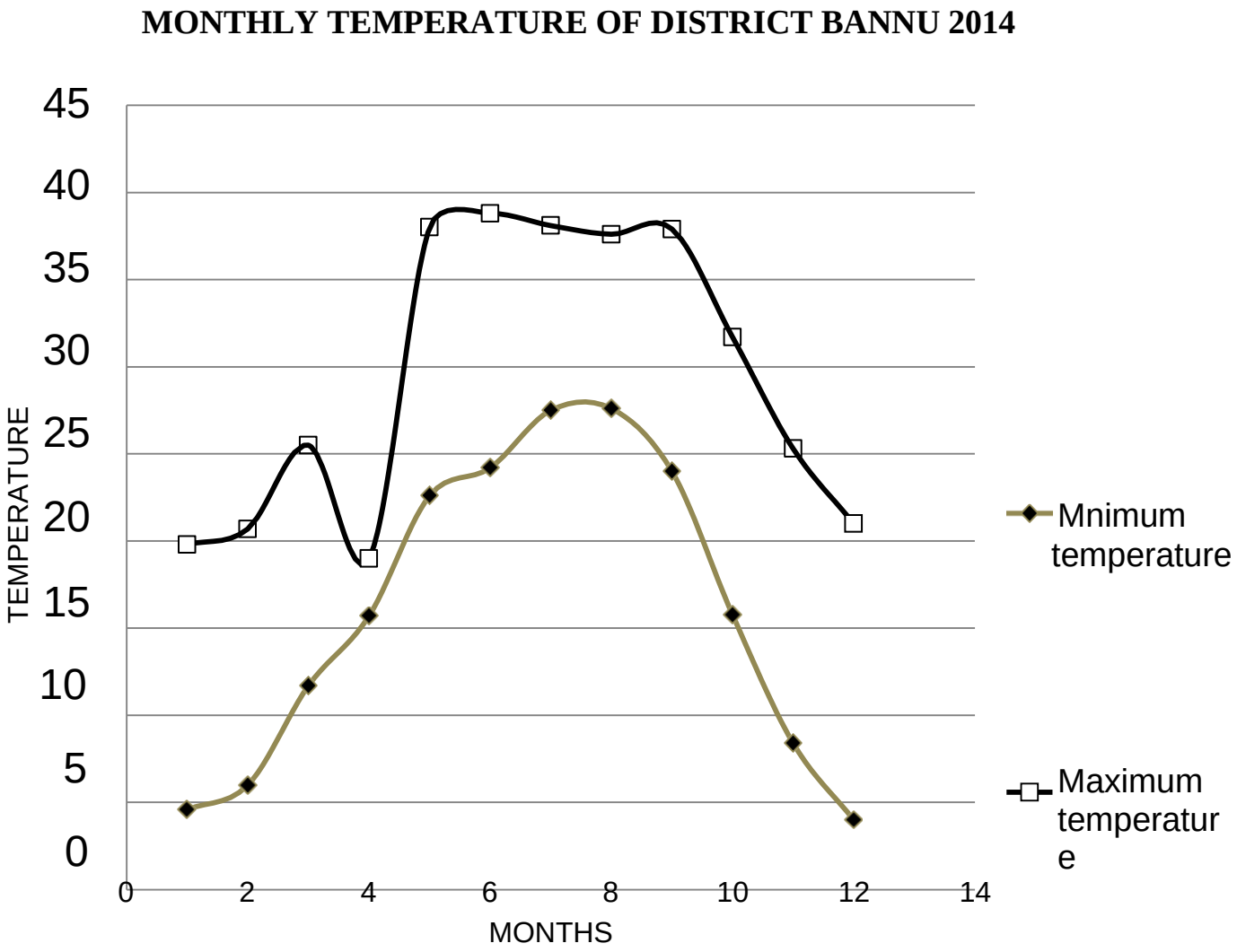


FIGURE NO.1 : MONTHLY TEMPERATURE OF DISTRICT BANNU 2014

1.5 PHYSIOGRAPHY

Study area Mouza Painda Khel is a part of Bannu basin. Bannu basin is one of the oldest geologic basin of Pakistan whose stratigraphy is same to the other basins of Pakistan like Peshawar basin, Kohat platue, etc. It is situated at the South East of Peshawar basin and Kohat platue. Mostly Bannu is plan area with some mountains at its Northern border. As regarding to our study area soil fertility, this area is mostly deserted, having no fertile soil and is geographically classified into two parts from West to East.

Part:1

This area includes the irrigated area of Mouza Painda Khel from west to spena tangi. As discussed earlier, as it is a desert area, the climatic conditions are not favorable for cultivation. However, the soil is mostly sandy and has some clay proportion also. Before 2000, when irrigation system was not available for agriculture, then agriculture was totally dependent on rainfall. Now a day, modern tube wells system is in practice which is suitable for cultivation.

Part:2

Barren land is to the East from spena tangi in Mouza Painda Khel. The area has seasonal stream (Spena Tangi) with occasional floods every year, bringing clay and that clay can be deposited by making a small tributary there which will enhance the fertility of the area more than irrigated land.In this area herbs, shrubs, bushes and date trees can grow.

1.6 SOIL TYPE

Moreover sandy soil exists in some areas, while some areas have soil with mixed proportion of sand , silt and clay. The population distribution of the Mouza Painda Khel is 60 percent depend upon on agriculture. Area which is suitable for cultivation is well populated as compared to the area with sandy soil which is unpopulated. There are also some sand dunes at various places which are formed due to high speed winds in June and July.

1.7 LAND USE

Land use means the utilization of land for various purposes. Every piece of land is utilize for different purposes, such as residential ,commercial, agricultural, industrial and open spaces. The world is facing a lot of problems due to tremendous increase in population. By this increase in population, the shortage of land is becoming a serious issue. Therefore land use surveys are under taken to make an inventory of the situation for adopting of the proper utilization of land

resources. It is conducted to known about the use and misuses of land to propose strategy for the sustainable land use planning.

1.8 LAND USE SURVEY

At first glance the meaning of land use is simple, land use means, the different ways in which the land is utilized for various purposes. Every piece of land is utilized for various purposes. Every piece of land is reserved for different purposes e.g. residential, commercial, agriculture and open spaces or vacant land.

1.9 IMPORTANCE OF LAND USE

The main important purpose of the land use is to get precise picture of land resources in land use survey is not only concerned with productive area but also those parts of land which are left unproductive due to some reasons so that some measures are suggested for sustainable land use.

1.10 LAND USE CLASSIFICATION

According to revenue record total geographical area of village Painda Khel is 1781 acres boldly the land of this village is divided into following land use categories.

- Cultivated land
- Cultivable waste
- Culturable waste
- Uncultivated land

1.10.1 CULTIVATED LAND

It is the currently being used for agricultural purposes. It includes land under different types of crops such as : Wheat, gram, radish, carrot, and trifolium repine.

1.10.2 UNCULTIVATED LAND

The land area on which cultivation is not possible is called as uncultivated area or Area not available for cultivation. It is composed of mountains, torrents, forests, grave yards, settlement, roads, paths etc. The uncultivated land is further divided into two categories.

1.10.3 CULTIVABLE WASTE

The land which is fit for cultivation but left un cultivated due to natural or cultural factors. In 1992 cultivable waste had 514 acres area while in 2014 it reduced to 503 acres.

1.10.4 CULTURABLE WASTE

Culturable Waste Land: This includes land available for cultivation, whether taken up or not taken up for cultivation once, but not cultivated during the last five years or more in succession including the current year for some reason or the other . Such land may be either fallow or covered with shrubs and jungles which are not put to any use. They may be accessible or inaccessible and may lie in isolated blocks or within cultivated holdings.

1.11 CROPING PATTERN

Cropping pattern of the study area is influenced by natural and cultural factors. Important factors are climate, soil characteristics; water availability and land tenure system.in the study area two cropping seasons are practiced known as Rabi season and Kharif season.

1.11.1 RABI SEASON

Rabi crops are sown in November that is start of winter season and harvest in spring season from March to May. The main Rabi crops of the study area are Wheat, Gram, and Trifolium ripens, Carrot and Radish.

1.11.2 KHARIF SEASON

Kharif is summer cropping season. These crops require high temperature during the growing season.Kharif crops are sown from April to June and harvested in early winter from October to November. People of the study area are not interested in Kharif crops only minor crops are vegetables.

1.12 CHANGES IN MOUZA PAINDAKHEL

Chang can be observed in cropping pattern of our study area in maps .They had prepared with the help of GIS software Arc map. These maps show us the following changes.

- Change crop type.
- Change in settlement.
- Change in UN cultivated land.

1.13 IRRIGATION

Irrigation is the replacement of rainwater with another source of water. Irrigation is describes as the act of artificially applying water to soil to allow plant growth. This can also include applying water to a lawn, fields or garden.

Pakistan has an agricultural economy but there is very little or no rainfall in most places so irrigation becomes necessary to support the agriculture base. According to World Bank statistics report 2010-11 Pakistan has a 76.0 to 70.2% agricultural irrigated land of total agricultural land. Irrigation is very important in agriculture and play vital role to increase the capability of grow to the land.

The oldest irrigation system was practiced in Mesopotamian plain where by crops were regularly watered throughout the growing season by coaxing water through a Matrix of small channels formed in the field.

1.14 ROLE OF IRRIGATION IN AGRICULTURE

Global population is projected to grow by about 65% within the next 50 years. At the same time average per capita is expected to rise. The global water crises has drawn worldwide attention to the urgency of achieving more efficient use of water resources, particularly in agriculture to increase crops production and achieve world food security. Considering that a major shear of the world water resources is used for agriculture and that food requirements are increasing while global water resources are limited irrigated agriculture and the roll of efficient irrigation system and techniques have recently assumed greater importance in increasing food production.

Employing more than 50% of the total population of the developing countries, agriculture is still the primary activity and is assumed to play major role in the economies of most of these countries.

The large water resources available to developing countries their total irrigated area is still accounts for a mere 2.7% of their total land area and only 6.7% of their agriculture land.Therefore making the best use of water for irrigation to improve agriculture which is depend on ground water.

1.15 TUBEWELL

Large accumulations of water found deep inside the earth (over 15 m) and are drawn out by digging a deep boring and taking out the water with the help of an electric or diesel motor.

1.16 CONDITION REQUIRED FOR THE CONSTRUCTION OF TUBEWELL

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1. A large amount of underground water should be available.

2. There should be regular supply and cheap electricity.

3. Good fertile land should be available so that the cost of construction and electricity can be compensated.

1.17 MERITS OF TUBEWELLS

1. Tube wells are deep and so they are useful in the dry period.

2. These can irrigate a larger area and the water is not polluted.

3. Large amounts of water can be pulled out in a short while.

4. No manual labour is required.

5. Tube wells can be used only when required and the amount of water can be regulated.

1.18 DEMERITS OF TUBEWELLS

1. Tubewells can irrigate a much smaller area than other means of irrigation.

2. This means cannot be used in areas where underground water is brackish.

3. There is a regular expenditure on electricity or diesel.

4. There is depletion of underground water. Tube wells effect water table.

5. It can only be constructed in areas where the soil is soft for digging.

1.19 PURPOSE OF THE STUDY

Research purpose is to study the role of irrigation in Mouza Painda khel and to interpret and analyze the changes in cropping pattern and Land use.

1.20 SELECTION OF THE STUDY AREA

While selecting the study area the following considerations are taken into account. Agriculture is practice intensely in the study area. In spring season it become lash green. Ground water irrigation is practice .People are installing Tube wells From 2000A.D. By the Improvement of irrigation crops cultivation increased.

1.21 OBJECTIVES OF THE STUDY

Following are objectives of research:

- To find out positive and negative aspects of tubewells.
- To find out the land use changes and cropping pattern of Mouza Painda khel.
- To analyze introduction of new crops and vegetables in study area.
- To examine how barren land of the study area is brought under cultivation.
- To analyze use of the water of a seasonal stream in study area.

CHAPTER # 2

LITERATURE REVIEW

Haq et al. (1973) have worked on „‟the utilization of groundwater of poor quality n irrigation supply‟‟ According to the authors Indus plain is one of the largest, reservoirs of water supply. In Pakistan, the supply of surface water is one the important problems that has created the demand for the groundwater .the shortage of rainfall is one of the major factor, to initiate groundwater irrigation for crop growth. High evaporation needs high amount of groundwater, which creates the possibility of high crop production. In several areas, where surface water is not supplied in proper way, there is an increasing demand of groundwater. This deficiency of water is managed by groundwater irrigation, which is helpful for crops.

Haider, et al. (1976) have studied „‟the economic feasibility of gypsum application in SCARP area Pakistan‟‟‟. According to their research work, lowering watertable, as well as increased salinity in water, are the factors that have affected the agriculture landuse in Pakistan. Due to insufficient surface water for agriculture, the tubewell irrigation increased the cultivated area as well as agriculture products, but it has also caused further lowering of the watertable. In some of the areas the tubewells were also harmful to make soil saline, which adversely affected the yield of crops.

Rahman (1976) has worked on the „‟scope of the drainage in the northern Indus plain‟‟‟.According to the author, the problem of water logging and salinity started in the Indus plain due to development of canal irrigation during the 19 century. The aerial survey and the subsequent WAPDA investigation show that thirty percent of the area in northern zone of the Indus Plain has water table at a depth of less than 3 meter. The installation of tubewells is the best remedy of the problem to supply water during the period of water shortage. With the installation of tubewells, on the one hand depletion of water table took place, while on the other hand the production of crops increased.

Main, H. (1995) has worked on „‟Assessments and feasibility of development of additional surface water in potowar area of Panjab‟‟ According to the author, the development of dams have positive impacts on agriculture and socio economic condition of rural areas. It also increased the net farm income, cropping intensity and cropping yield. It also resulted the in the increased of the production area and change of the traditional Cropping pattern area into the high value cropping pattern. This additional supply of surface water has positive impacts both on agriculture and poverty of area.

Rinaudo, D.J et al. (1997) have worked on "linkage water market functioning, assess to water resources and farm production strategies: example from Pakistan". According to their research work, farmers of Pakistan have installed private tubewells due to insufficient canal water supply, and used this groundwater source for agriculture products. The farmers of Pakistan have developed both the surface as well as groundwater system in those areas where the irrigation system facilities are easily available. This system of irrigation is also highly developed in south of Punjab due to large quantity of water, used by the farmers for farm development and agriculture production.

Smets, et al. (1997) have worked on "Salinization and crop transpiration of irrigation field in Pakistan‟s Punjab"". According to their research work, in Pakistan, specifically in Punjab province, canal water as well as the demand of tube well installation rapidly increased for pumping of the groundwater because Salinization was one of the most important causes of the increasing demand of tubewell for irrigation purpose. It is helpful to decrease the salinization, by lowering the watertable. Tubewell are helpful to increase the crop production as well as to improve quality of groundwater which have good impacts on soil texture, which in turn has also positive impact on production of crops as well as agriculture landuse.

Dick, R.M (1996) has worked on "Groundwater market in Pakistan "This study revealed that, the demand of groundwater resources is increasing in Pakistan. The groundwater resources are found all over Pakistan, but it is more dominant in canal area of Khyber Pakhtunkhwa and Punjab. In Pakistan the land owners use tubewells and pumps, while others purchase the groundwater from the owners. Distance is one of the resistance factors because of which the groundwater cannot reach to all areas which create problems for farmers. Cropping pattern, surface water. Groundwater, farm structure are some of the factors, that influence installation of private tubewells.

Khan, et al. (1996) have worked on "The energy input and crop production in D.I.Khan Pakistan". According to the authors, tractors and bullocks were used in rainfed and wells agriculture field in past, but due to development in technology, these sources of energy were replaced by the electrical motors. The tubewell installation also brought drastic change in field of agriculture. The crop production of rainfed areas was less, as compared to area irrigated by canal, while the yield per hectares, in tubewell irrigated area was highest.

Kahlown, M. et al. (1996) have worked on "contribution of small dames in development of water resources of Potowar region"" They have analyzed, Potowar region both for public as well as well as community water resource development schemes for irrigation for irrigation purpose. The irrigated area is increasing in potowar region due to water schemes, and total irrigated area has increased by 48 percent. Groundwater also played important role in increasing cropping area. This groundwater is used for rabbi and kharif crops, and is helpful for developing of wells which is used for irrigation purpose.

Ahmad, et al. (2002) have carried out study on "The sustainable use of groundwater for irrigation in Pakistan". According to their research, the demand of groundwater is increasing in the areas, with the highest production. Indus basin irrigation system is one of the largest surface irrigation of the world, with different methods of irrigation, such as canal and tubewell. According to authors, thrity six percent of total agriculture area in Pakistan is under tubewell irrigation. The tubewell irrigation plays a very important role in the agricultural growth of the country, which is also helpful to solve the problems of waterlogging and salinity as it has increased the agriculture products. The tubewell has also negative impacts on agriculture in some areas as it has lowered the watertable, which is one of the problems of agriculture in Pakistan.

Zhu, Jin et al. (2002) have worked on "the impact of human activities on groundwater resources in the southern edge of Tarim basin, Xinjiang, China". According to the authors, the population growth, development of industrial and agricultural production, have caused the artificial oasis to expand and also the demand for water has increased abruptly. The artificial irrigation system and reservoirs are slowly replacing the natural river system and lakes. It has caused the depletion of groundwater resources during the past 46 years from 1950-1995 in the south piedmont flood plain of Tarim basin. The groundwater level depth has been estimated 3 to 5 meter.

Saeed, M.M et al (2002) have worked on "Diagnostic analysis of farmers skimming well technology in the Indus basin Pakistan". According to authors, in Indus plain the farmers mostly dig the wells and developed canal system of irrigation to regular supply of water. To maintain the groundwater, proper design is made for extraction of wells, after selecting proper location for digging. The farmer face the problem during the digging of wells, such as, the proper location, depth of water, horizontal strata and water quality etc. The main purpose of digging of wells to solve the problem of water shortage.

Rose grant, M.et al. (2002) have worked on "The role of rain fed agriculture in future global food production". According to their research work, in some regions, water plays important role in improvement of rain fed crops. In some areas rained crops has low production, but in other rain fed areas the crops and food production are higher. This higher production in rained crops is due to, regular supply of water, high priority to rained agriculture availability of market facilities. The proper agriculture education to farmers is also beneficial to increase the use of rained area for agriculture.

Hussain, I et al. (2003) have worked on "Land and water productivity of wheat in western Indo-gengetic plains of India and Pakistan" The authors have made a comparative study of wheat production in India in Pakistan. According to the researchers, the average yield of wheat is higher in India in Pakistan, but the quality of wheat is not better. The supply of water for wheat crop in both India in Pakistan is the same, due to same water system of irrigation but the diverted system of water is leading India in wheat production. In both the countries rainfall, land quality, soil salinity, sowing date and irrigation system are the factors which create difference between

crop production, as well as yield. In Pakistan, physical factors cause low production, while in India heavy rainfall is responsible for high production of crops.

Steenbergen V.F et al (2006) have worked on "promoting local management in groundwater" According to their research, local management for groundwater resource plays a key role to develop and use groundwater resource plays a key role to develop and use groundwater resource in local areas. In arid region such as Pakistan, India, Egypt and Yemen where the groundwater resources are important for higher crop production, management of water resource, and planning for development of more water resources in area are of almost importance. These two programs will have positive results on the production of groundwater resources.

Shah, et al. (2006) have worked on "The some aspects of south Asia s groundwater irrigation economy: analysis from a survey in India, Pakistan, Nepal Terai and Bangladesh". According to the authors, the south Asia has been the largest user of groundwater irrigation resources for agriculture in world since 1960. In India, Nepal, Pakistan and Bangladesh groundwater is main source of irrigation, which irrigates about seventy five percent areas in these countries. Canals are also used for irrigation especially for wheat and rice, while groundwater source is used for cereals and pulses. The tubewell irrigation supplies water to all agriculture area, where regular supply of water is not possible. Due to groundwater irrigation system, the economy of this region has changed positively.

Wang, J et al (2006) have worked on "privatization of tube well in north China: determinants and impact on irrigated areas, production and water table". According to the authors, the demand of tub well installation in china is increasing because tub well system has great impact on economy. In china for tub well system is in private sector, to install tub well in maximum villages of china for extinction of irrigation system. The tub well installation has positive impact with increase in the irrigated areas, of china, enhancing the water resources as well as production and income. But on the other hand, tub wells are lowering the groundwater.

CHAPTER # 3

RESEARCH METHODOLOGY

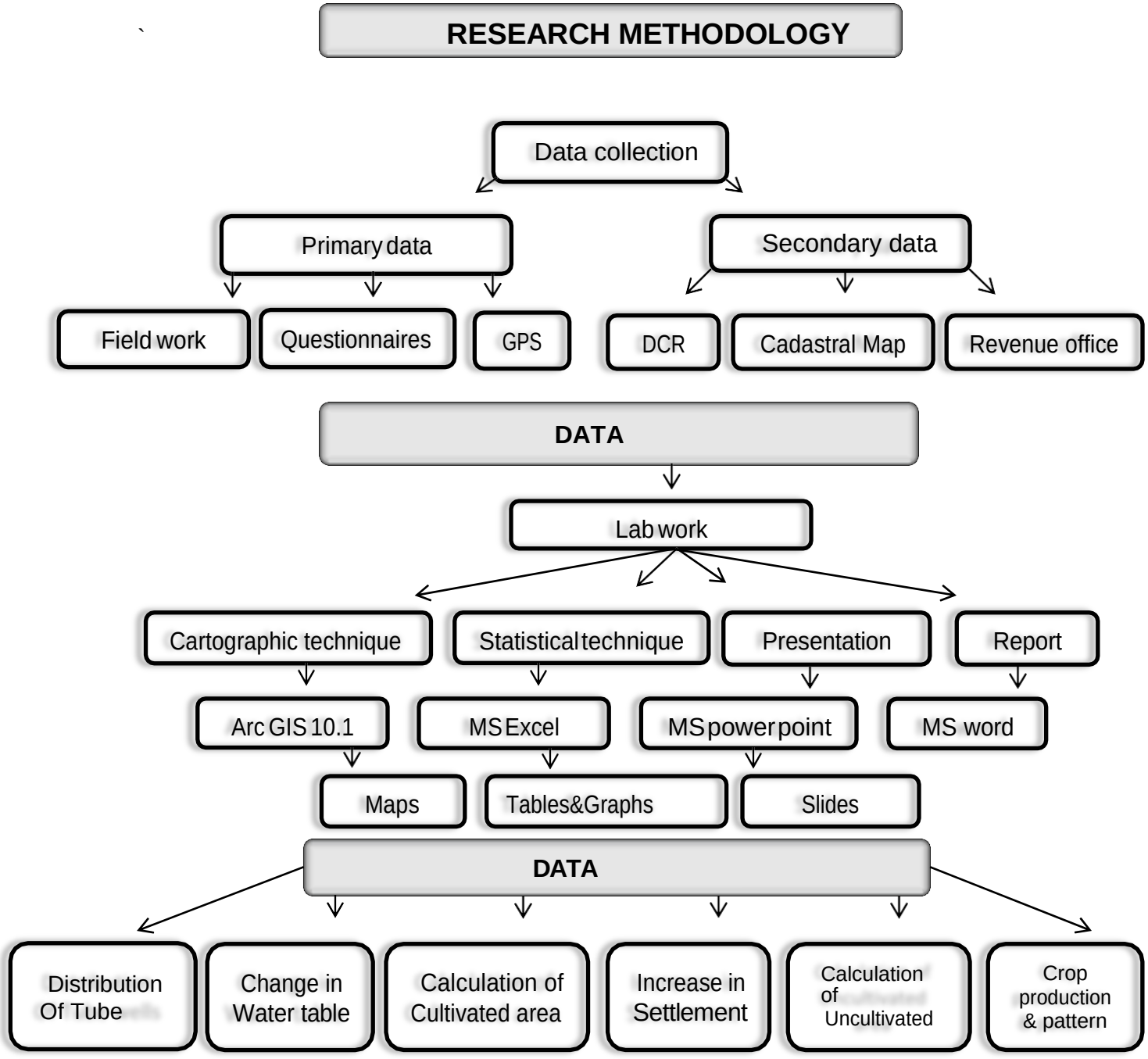


Fig. 2

3.1 METHODS OF DATA COLLECTION

Following are the methods of data collection:

- Primary data
- Secondary data

3.2 PRIMARY DATA

Random questionnaire sampling conducted in field for data collection. Primary Data also collected by personal observations during field visit to village Painda Khel. Data collected from questionnaire give information about following

Tube wells (2000 to 2014)

Water table (2000 to 2014)

Crop production (1992 & 2014)

3.3 SECONDARY DATA

A part from questionnaire data collected from other sources such as DCR, Revenue office Domel tehsil political office. Data collected from these areas which gives information about the following

Temperature (2014)

Rain fall (2014)

Mouza and Bannu maps (1992 & 2014)

Area of cropping pattern (1992 & 2014)

3.4 DATA FROM REVENUE OFFICE

(Pat war khana)

- Shajra kistwar 1992 & 2014 (cadastral map known as latta).
- Khasra girdawari 2014 (Owner ship, cropping record).
- Laal kitab 2014 (land use record).

Revenue office data provide information of the following

- Total area of Mouza Painda khel.
- Cultivated area of Mouza Painda Khel.
- Uncultivated land area Mouza Painda Khel.
- Type of crops in cultivated area Mouza Painda Khel.

CHAPTER # 4

ANALYSIS

4.1 DATA ANALYSIS

Data analysis is one of the most important steps of research. To analysis of study area we used statistical Technique & cartographic techniques.

4.2 STATISTICAL TECNIQUES

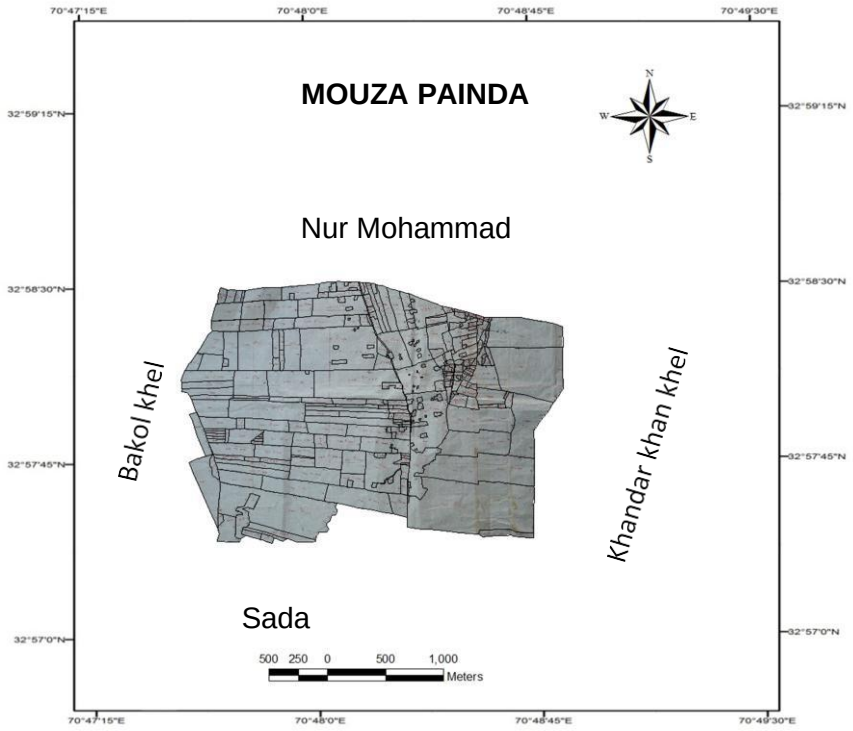
Tables, graphs are constructed In Microsoft office Data tabulated for agricultural land use and symbolized in pie chart, bar graphs, line graph.

4.3 CARTOGRAPHIC TECHNIQUES

Maps made by the help of Arc GIS 10.1

4.4 MAP DIGITIZATION

The map digitization is done after georefrencing of map first of all add picture of the latta (cadastral map) and georefrenced the map. Select regions for individual polygon map like creation of polygon of fields, settlement, streets and road. For thematic map select style, display and legend. In preparation of layout for printing of thematic map of land use labeled the latitude and longitude on the borders of map. This result the thematic maps. Layout of locational map land use, cropping pattern and map of ground water potential.



MAP NO. 2: MOUZA PAINDA KHEL

4.5 GROUND TRUTING

Add the Mouza in Arc GIS 10.1 software and georeferenced it. To know its accuracy check it in the Google earth by converting the shape file into kmz format for ground trothing. It shows the location of study area .That is good and perfect.

FIGURE NO.3

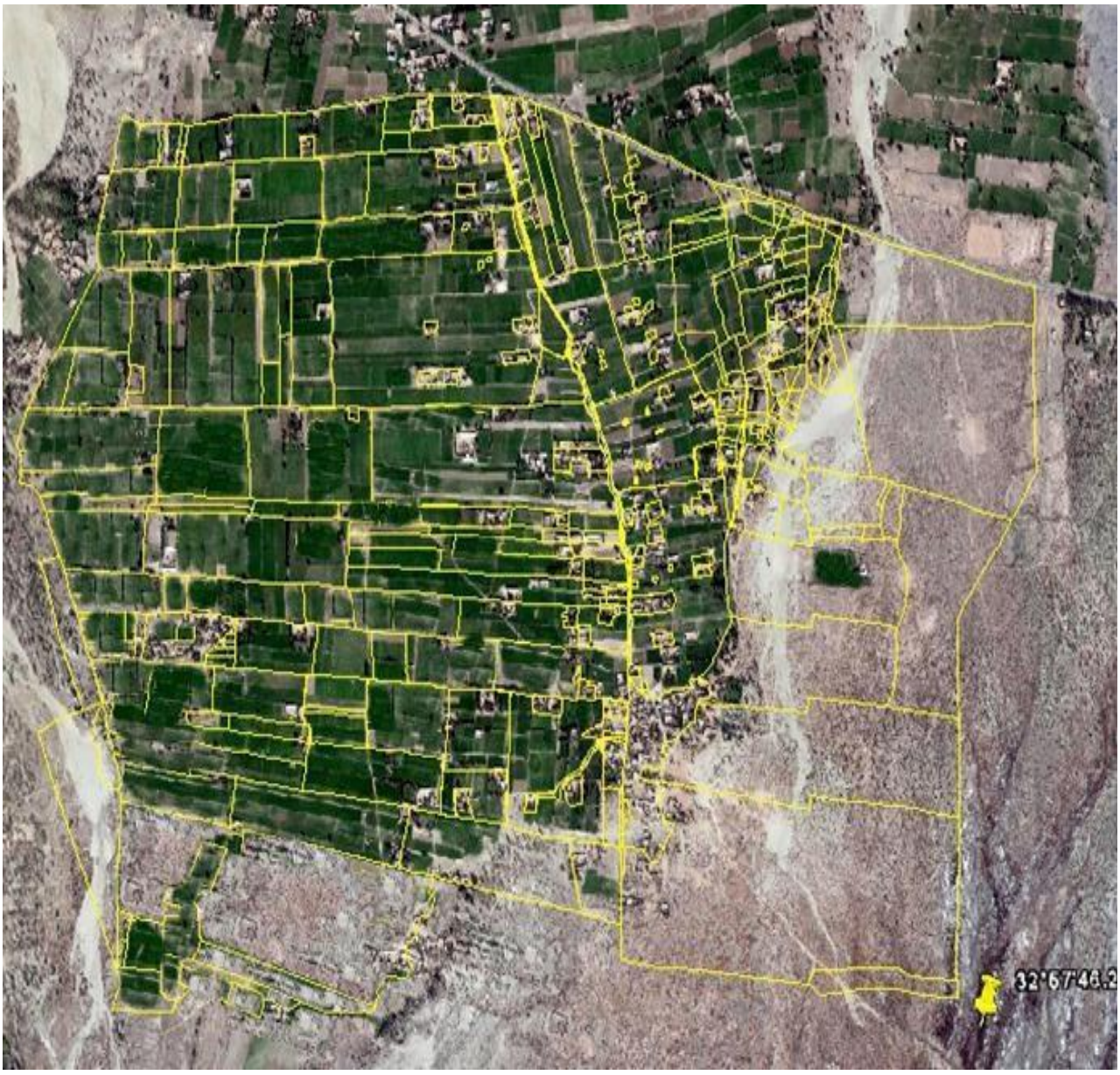


TABLE NO. 2: AGE OF RESPONDENTS

RESPONDENTS AGE GROUPS	RESPONDENTS	PERCENTAGE
40_49	18	44%
50_59	11	27%
60_69	9	22%
70&above	3	7%
Total	41	100

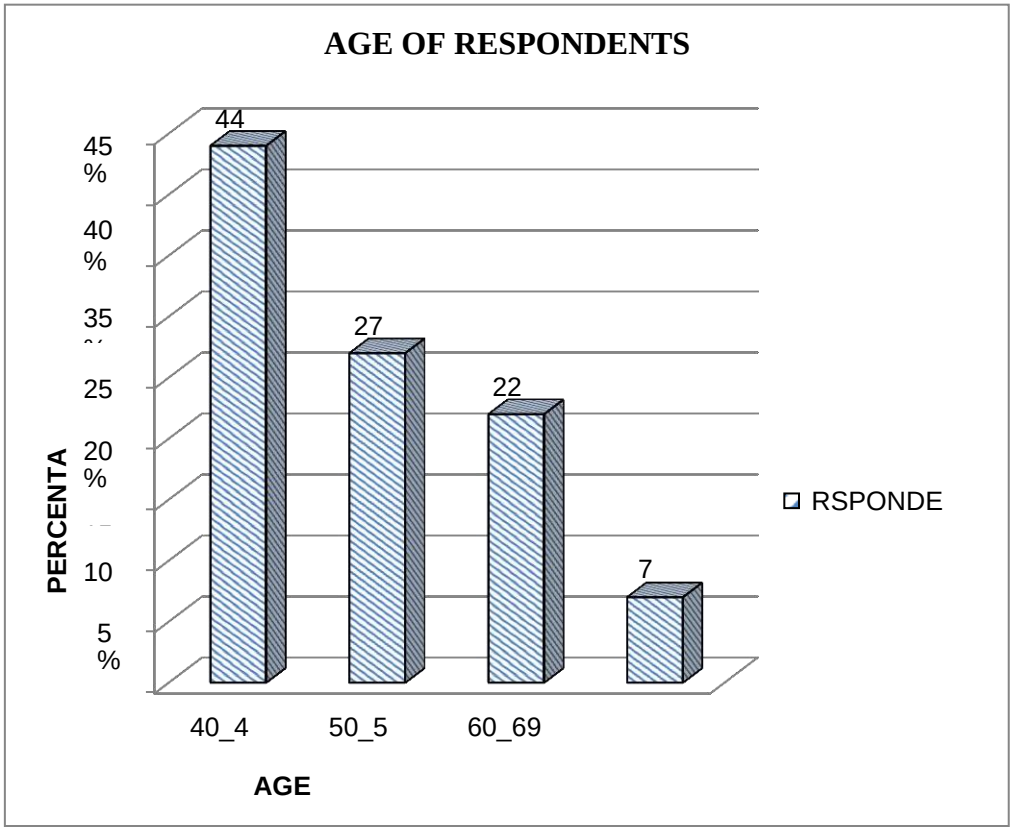
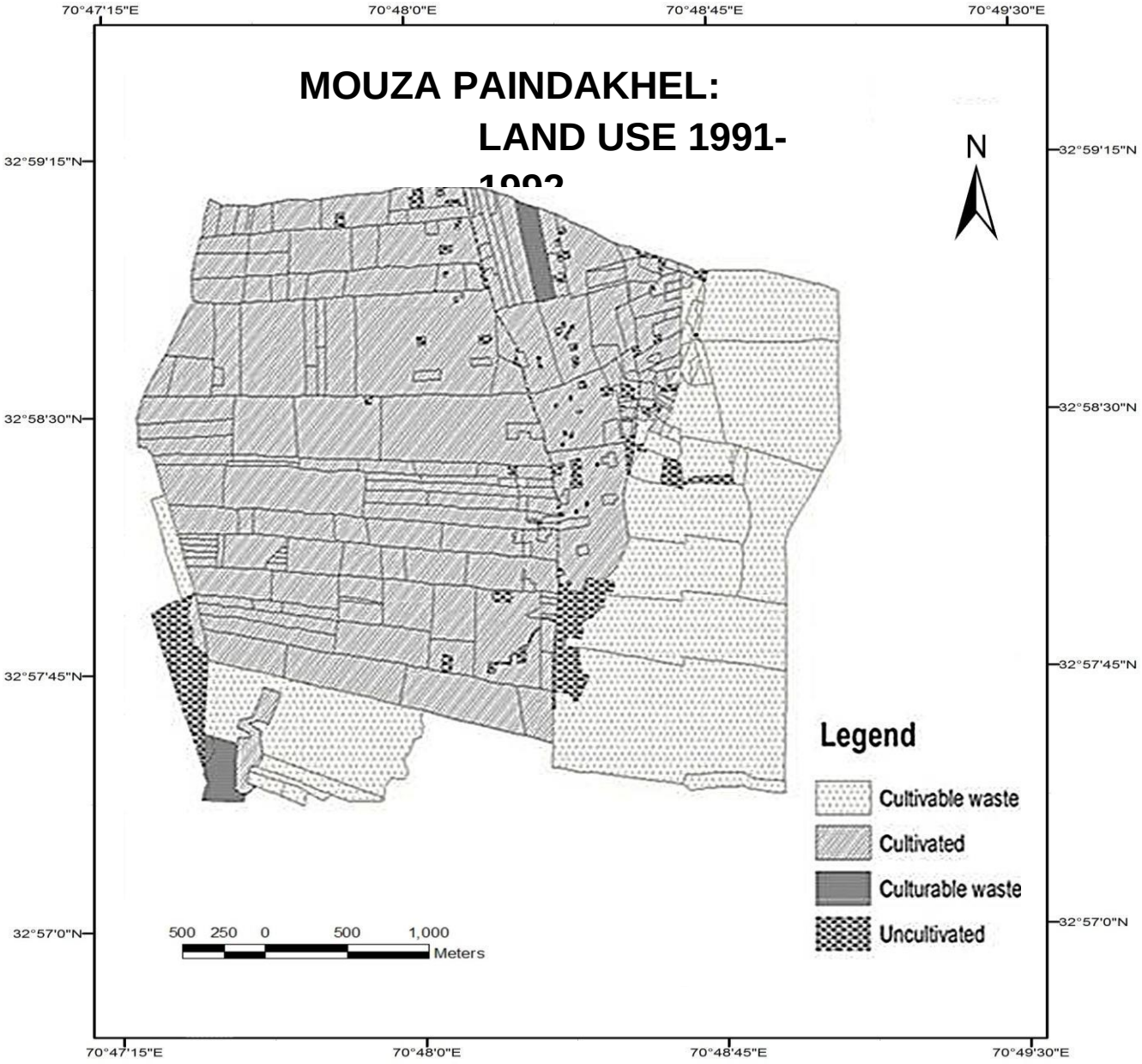


FIGURE NO.4: AGE OF RESPONDENTS

This graph shows Age of cultivators .There are total 41 respondents in which 11 respondents of 40 to 49 age group are 44% . 9 respondents of 60 to 69 age group are 27 %. 60 to 69 age group are 22% and above 70 are 7%.

4.6 LAND USE PATTERN

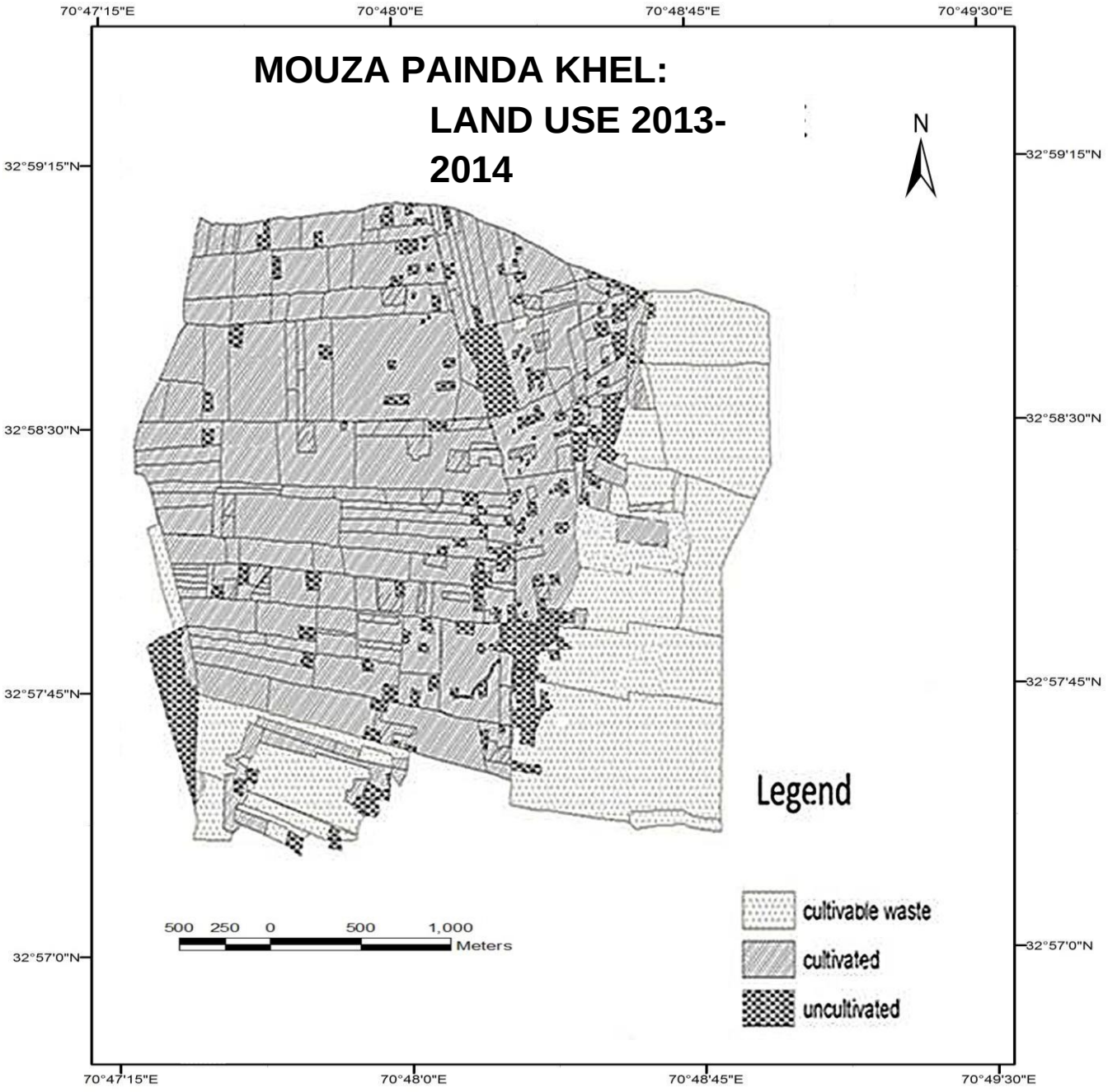
Land use map of mouza Painda Khel 1991-1992 had large cultivated land area and small uncultivated area. Mouza Painda Khel had 65 .3% cultivated land and 34.7% uncultivated land.



MAP NO. 3: MOUZA PAINDA KHEL LAND USE 1991-1992

Source: Revenue record of Mouza Painda Khel

Land use map of mouza Painda Khel1 2013-2014 the decrease in cultivated land area is mainly because of increase in settlement. After mouza Painda Khel in 2014 Area have 60 % cultivated land and 39.4% % uncultivated land. The production rate of crops is increasing from year 2000 to 2014 as compared to the production rate of crops 1992 to 2000 because now irrigation system is developed.

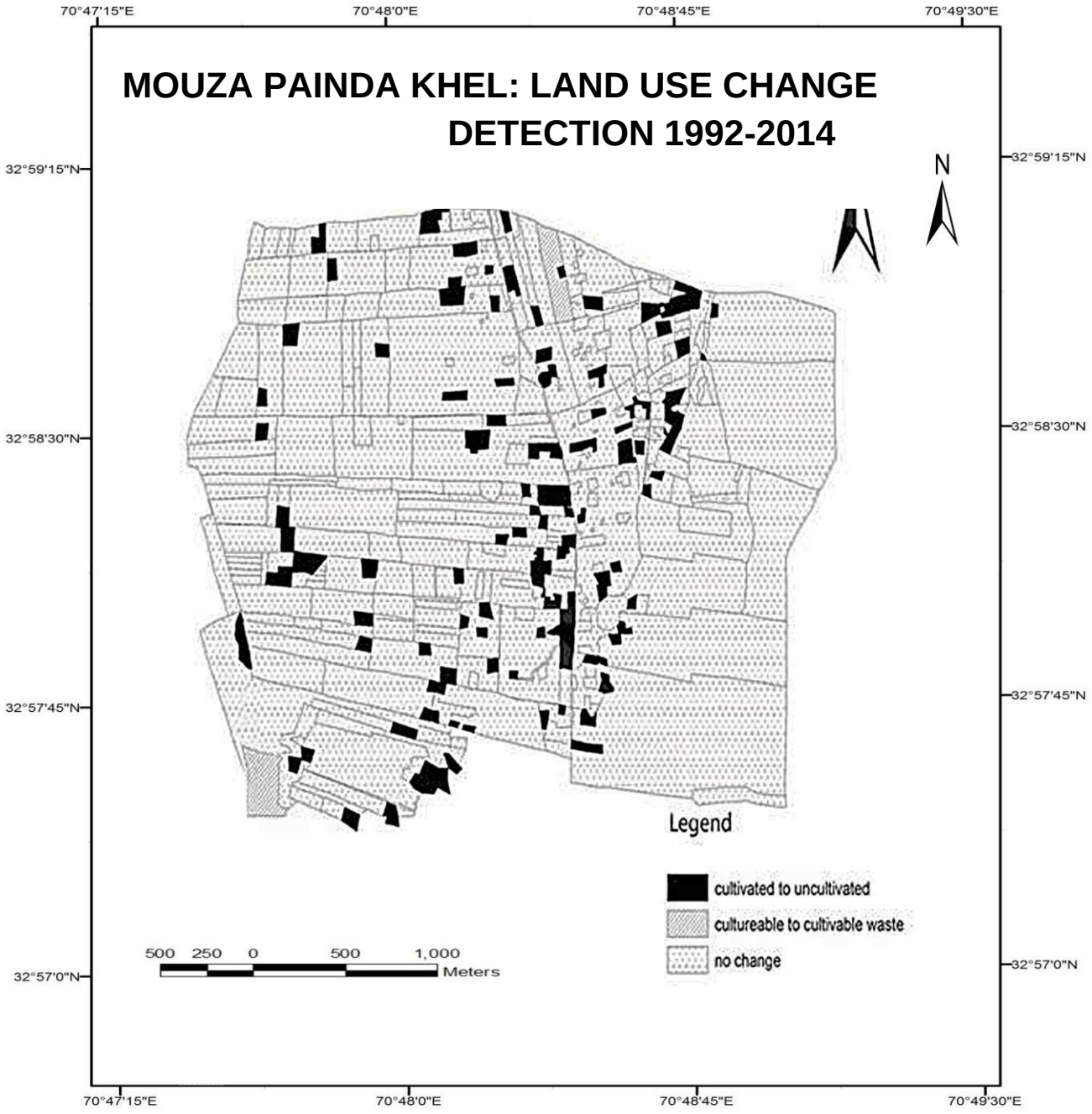


MAP NO. 4: MOUZA PAINDA KHEL LAND USE 2013-2014

Source: Revenue record of Mouza Painda Khel

4.7 LAND USE CHANGE DETECTION

The black colure in this map is showing that area which is turn from cultivated to uncultivated most of the residential people build house, Mosques, schools, parking in agricultural area and the some of the area convert from Culturable to cultivable waste.



MAP NO. 5: MOUZA PAINDA KHEL: LAND USE CHANGE DETECTION 1992-2014

4.8 MOUZA PAINDA KHEL: CULTIVATED AND UN CULTIVATED LAND USE 1991-1992

This graph is showing us about land use in mouza Painda Khel in 1991-1992 is 65 .3% cultivated land and 34.7% uncultivated land.

TABLE NO. 3: MOUZA PAINDA KHEL: CULTIVATED AND UN CULTIVATED LAND USE 1991-1992

Land use 1992	Area in acres	Percentage
Cultivated area	1163	65.3
Un cultivated area	618	34.7

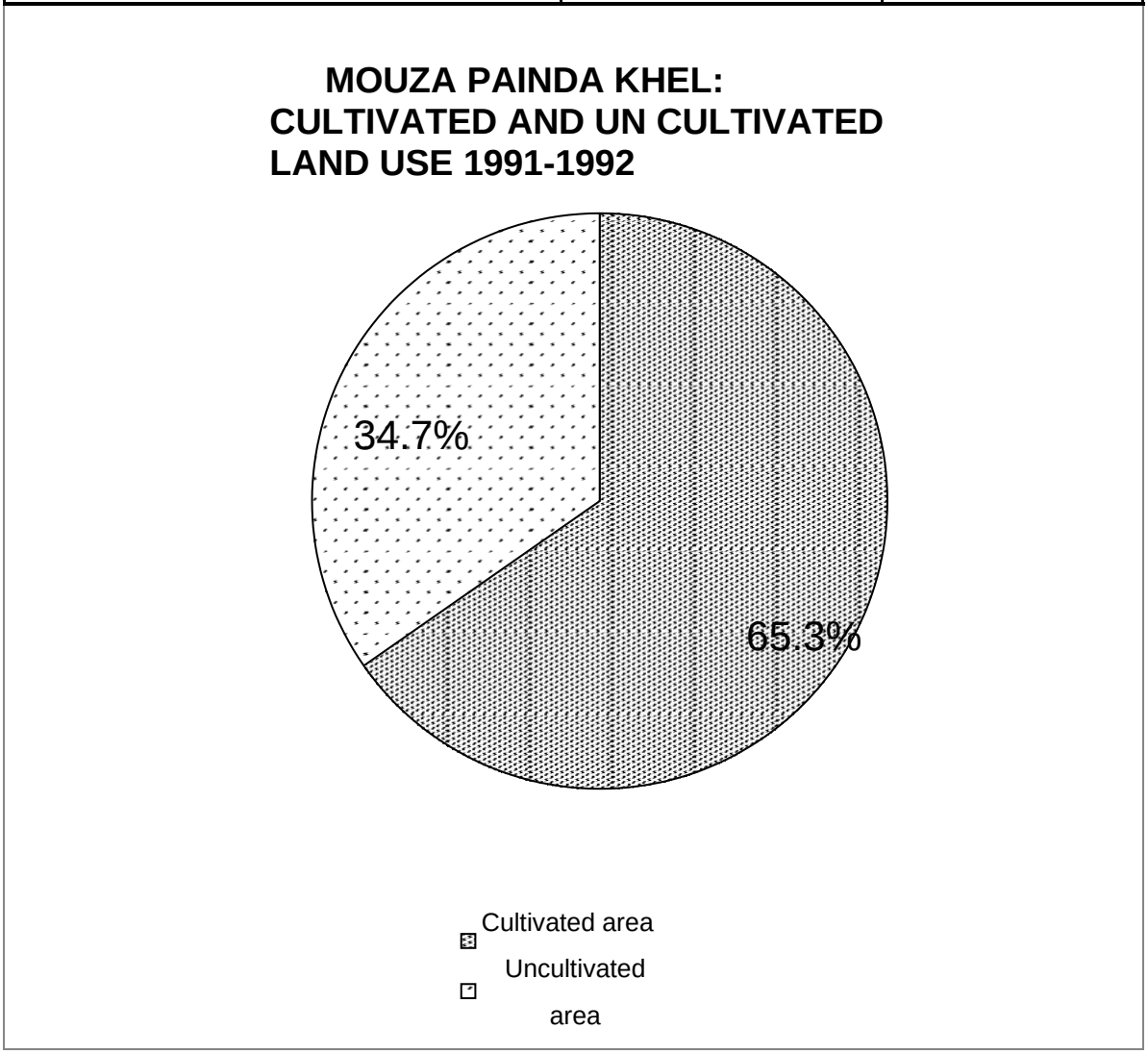


FIGURE NO 5: MOUZA PAINDA KHEL: CULTIVATED AND UN CULTIVATED LAND USE 1991-1992

Source: Revenue record of Mouza Painda

4.9 MOUZA PAINDA KHEL: CULTIVATEDAND UN CULTIVATED LAND USE 2013-2014

According to the revenue record .This graph is showing us about land use of mouza Painda Khel in 2014, having 60 % cultivated land and 39.4% uncultivated land.

TABLE NO. 4: MOUZA PAINDA KHEL: CULTIVATEDAND UN CULTIVATED LAND USE 2013-2014

Land use 2014	Area in acres	Percentage
Cultivated area	1079	60.6
Un cultivated area	702	39.4

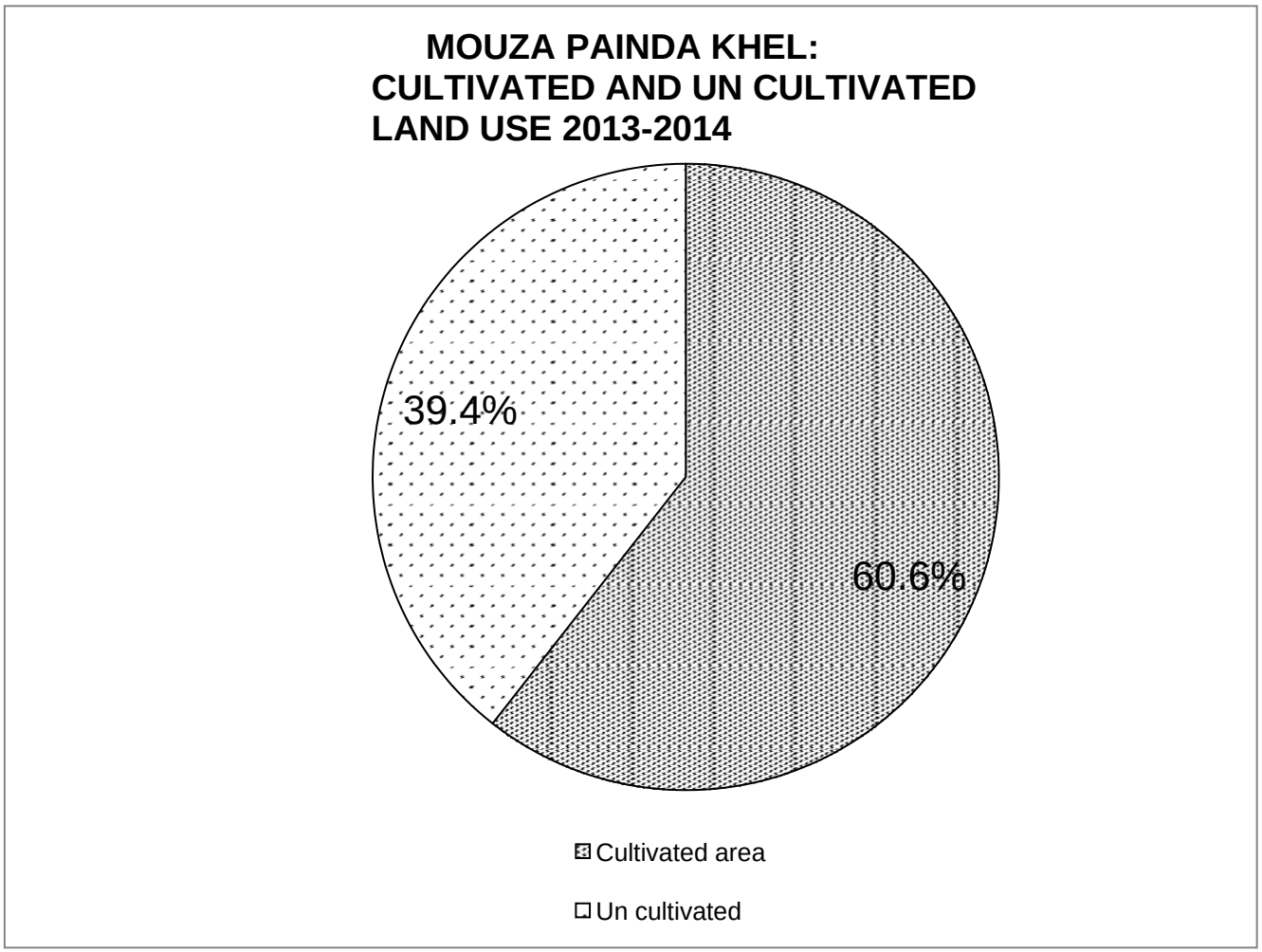
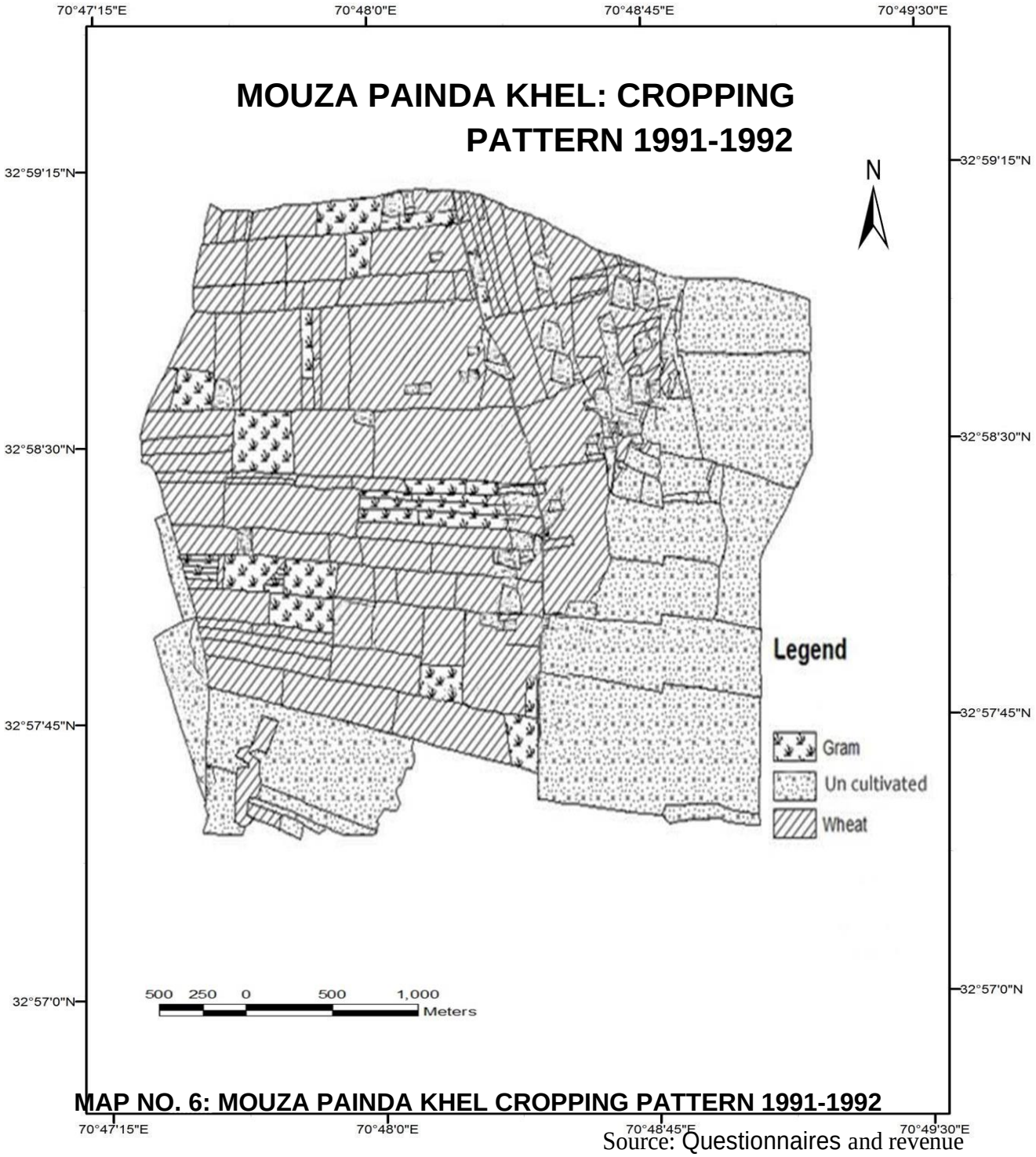


FIGURE NO 6: MOUZA PAINDA KHEL: CULTIVATED AND UN CULTIVATED LAND USE 2013-2014

Source: Revenue record
of Mouza Painda Khel

4.10 PREVIOUS CROPPING PATERN

Majority of population of the study area depend upon agriculture .In past people were practicing the cultivation of Wheat and Gram .So that these crops covered more area .

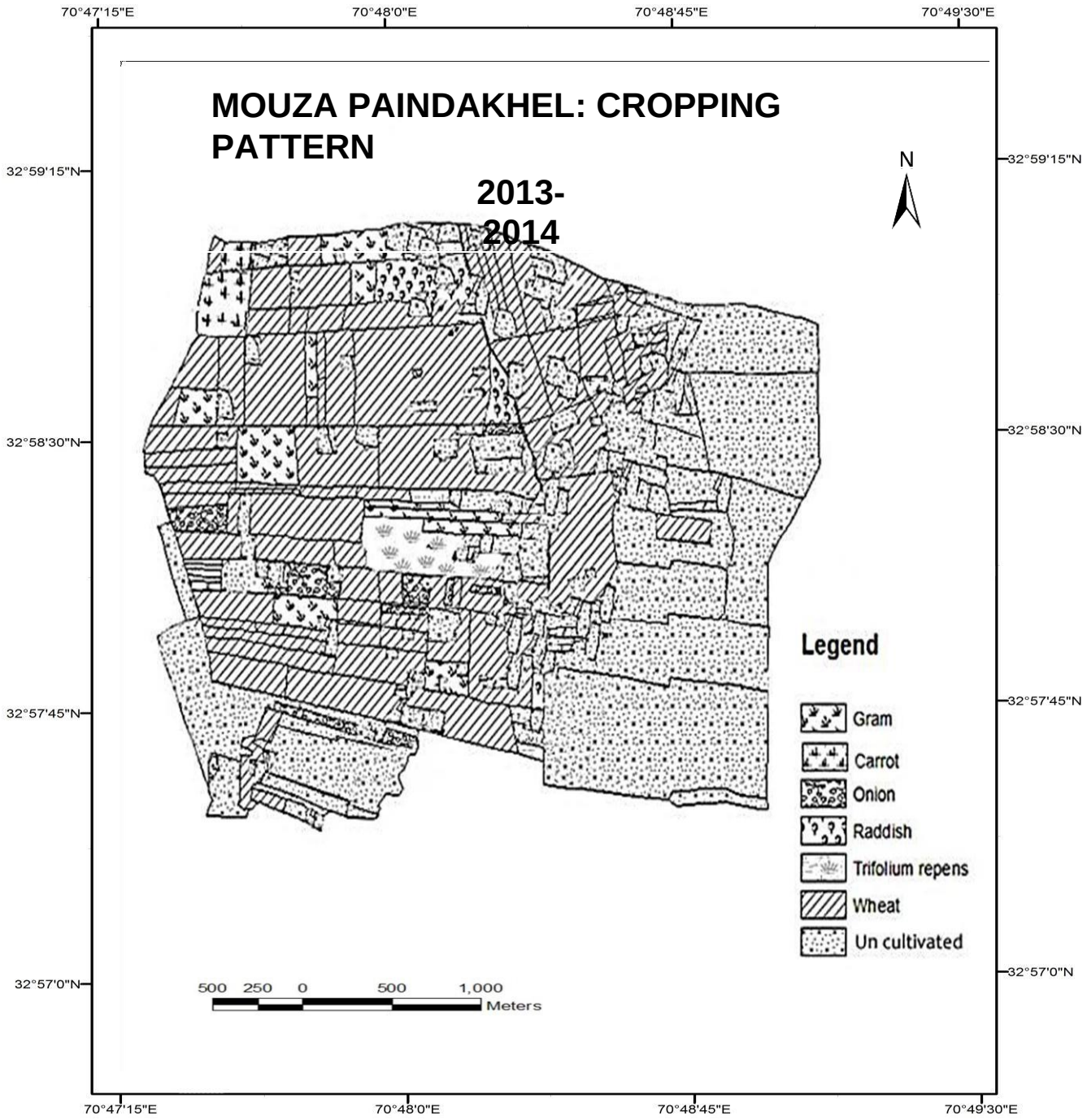


MAP NO. 6: MOUZA PAINDA KHEL CROPPING PATTERN 1991-1992

Source: Questionnaires and revenue record of Mouza Painda Khel

4.11 CURRENT CROPPING PATTERN

People installed tube wells for irrigation purpose. After 2000 farmers were cultivating different types of crops. The area of onion is 172acres, carrot is 11acres, trifolium repens 9 acres and radish is 5 acres.



MAP NO. 7: MOUZA PAINDA KHEL CROPPING PATTERN 2013-2014

record of Mouza Painda Khel

Source: Questionnaires and revenue

record of Mouza Painda Khel

4.12 AREA OF CROPPING PATTERN

Before 2000 A.D cultivators were cultivating only Gram and Wheat but now with the improvement of irrigation method they take interest to cultivate different types of crops. The area of cropping pattern is showed in graph.

TABLE NO. 5: AREA OF CROPPING PATTERN

Crops	1992	2014	Percentage 1992	Percentage 2014
Wheat	951	796	82	73
Onion	0	172	0	16
Gram	212	86	18	8
Carrot	0	11	0	1
Trifolium repens	0	9	0	1
Radish	0	5	0	1
Total	1163	1079	100%	100%

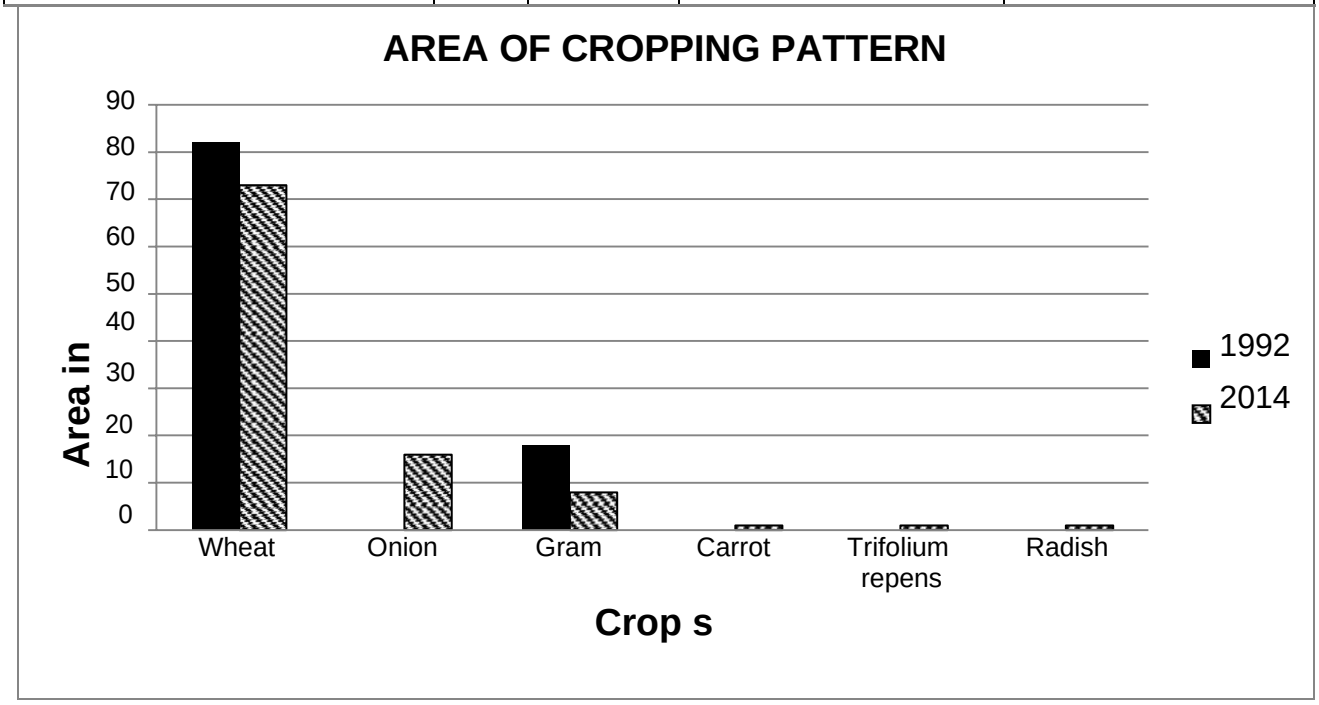


FIGURE NO 7: AREA OF CROPPING PATTERN

Source: Questionnaires and revenue record of Mouza Painda Khel

4.13 MOUZA PAINDA KHEL CROPS PRODUCTION

Graph shows the change in crops production. According to the revenue record the production of cultivated crops in 1991-1992 and production of crops cultivated in 2013-2014 and the production of crops which is cultivated by ground water irrigation method (tube wells) that is increased. Wheat is the leading crop .Its production in 1991-1992 is 6932 maund and its production increase to 38000 maund in 2013-2014.

TABLE NO. 6: MOUZA PAINDA KHEL CROPS PRODUCTION

Year	Wheat	Onion	Gram	Radish	carrot	Total
1992	6932	0	2894	0	0	9826
2014	38000	5421	6475	235	512	50643

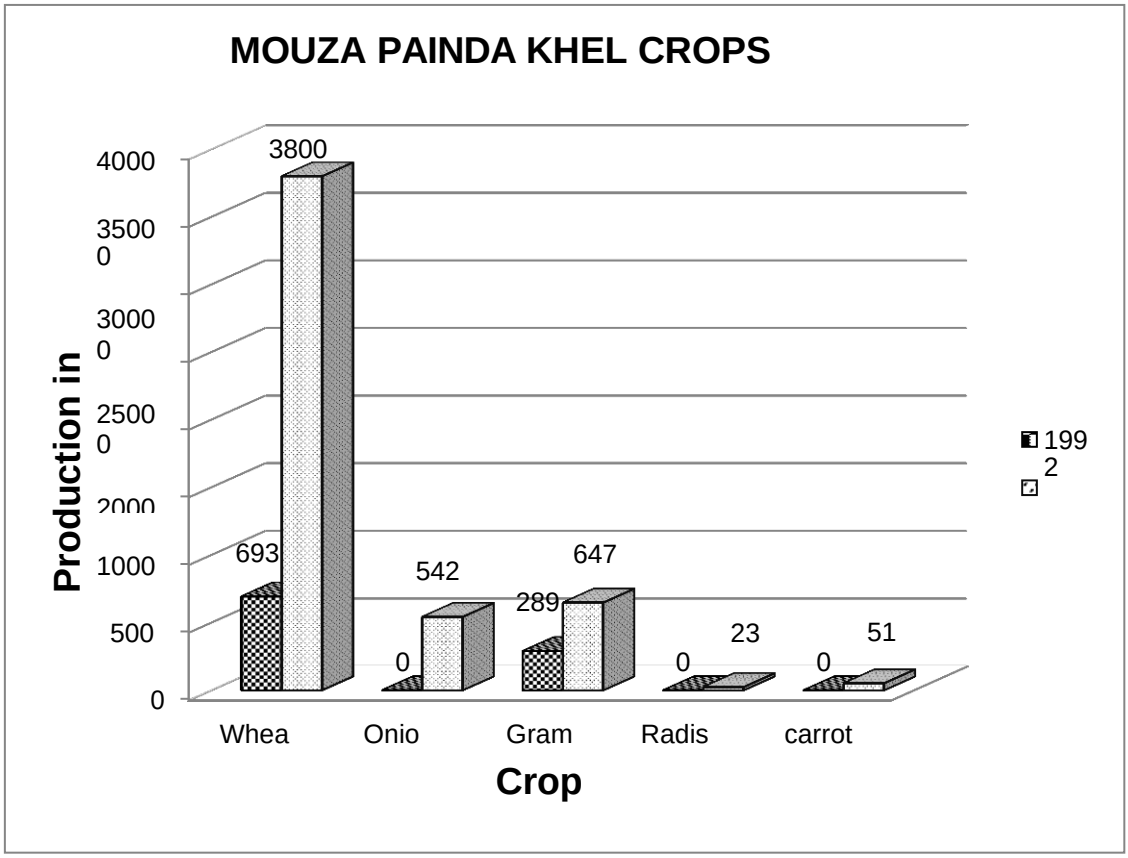


FIGURE NO . 8: MOUZA PAINDA KHEL CROPS PRODUCTION

Source: Questionnaires and revenue record of Mouza Painda Khel

Trifolium rapens, Radish, Wheat

FIGURE NO.9

4.14 IRRIGATION

Before 2000 A.D study area irrigated by the rain water .Now the tube wells irrigation is practice

FIGURE NO. 7: MOUZA PAINDA KHEL: AREA IRRIGATED BY TUBE WELLS 2000_2014

Irrigated area	Non irrigated area
1079	702

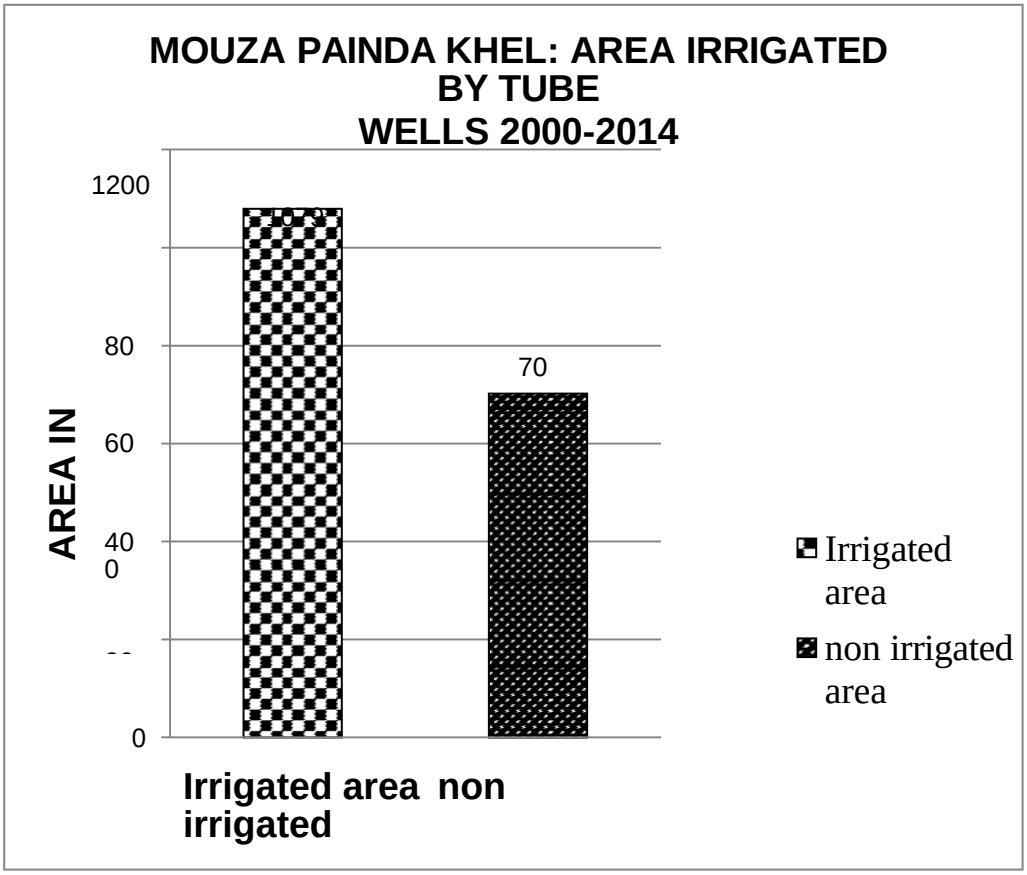
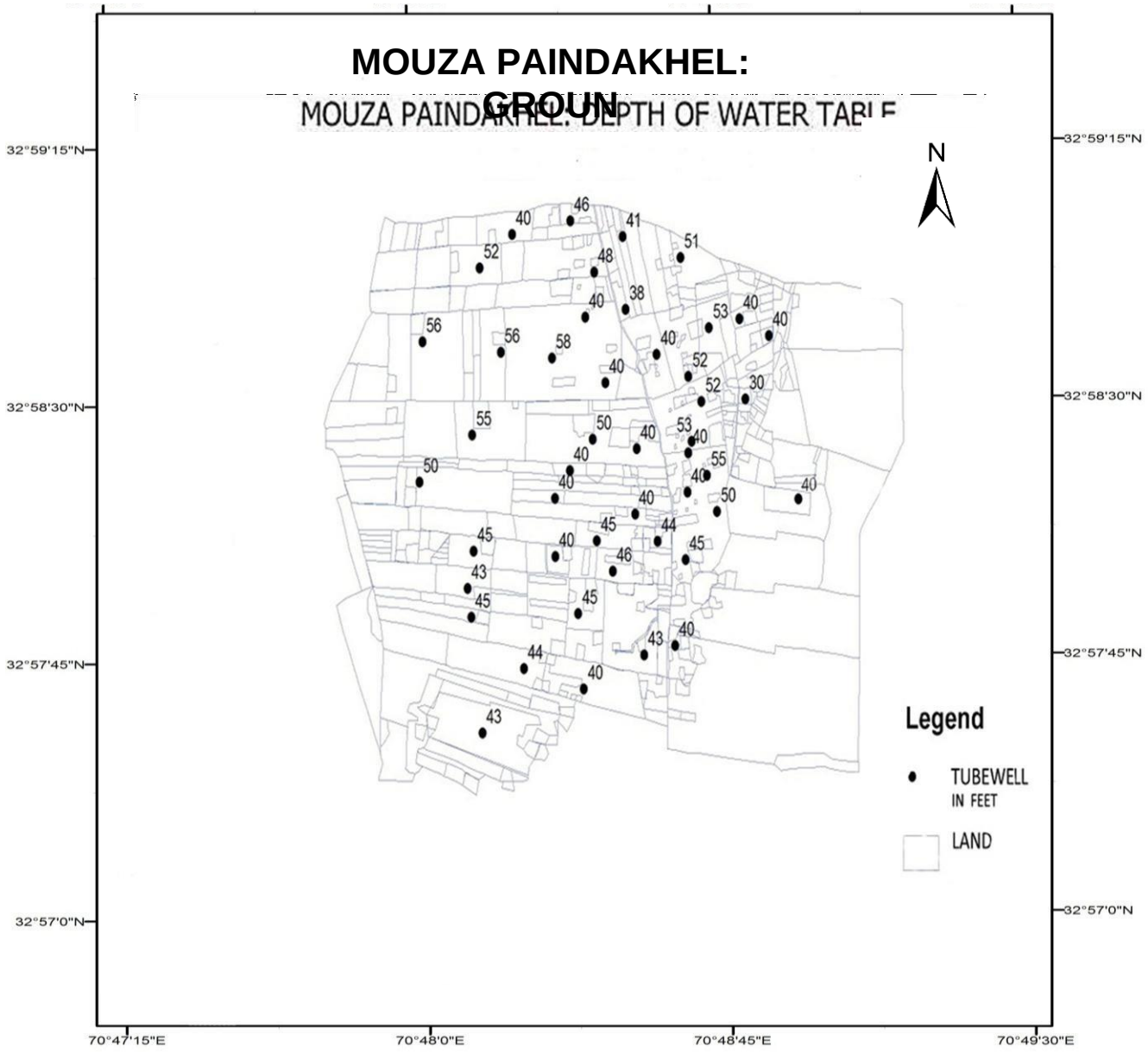


FIGURE NO. 9: MOUZA PAINDA KHEL: AREA IRRIGATED BY TUBE WELLS 2000-2014

Source: revenue record of Mouza Painda Khel

4.15 MOUZA PAINDA KHEL WATER TABLE

This map show the distribution of tube wells in study area .The tube wells are labeled with water table in feet .Painda Khel is plain area and when government provided the electric facility to this area then people strated installation of tube wells . With the passage of time the water table go down. First tubewell installed in 2000 A.D where the water table was at 30 feet . The last tubewell installed In 2014 have 58 feet water table. It means that the ground water table continuously decreases by the installation of new tube wells.



MAP NO. 8: MOUZA PAINDA KHEL GROUND WATER POTENTIAL

Source: Questionnaires and revenue record of Mouza Painda Khel

4.16 WATER TABLE: 2000-2014

The graph shows positive co-relation between tube wells and water table. Increase in number of tube wells is affecting water table of mouza Painda Khel. From 2000 to 2014 there are 43 tube wells had installed .Cultivators constantly practicing ground water (Tube wells) irrigation due to which water table go down.

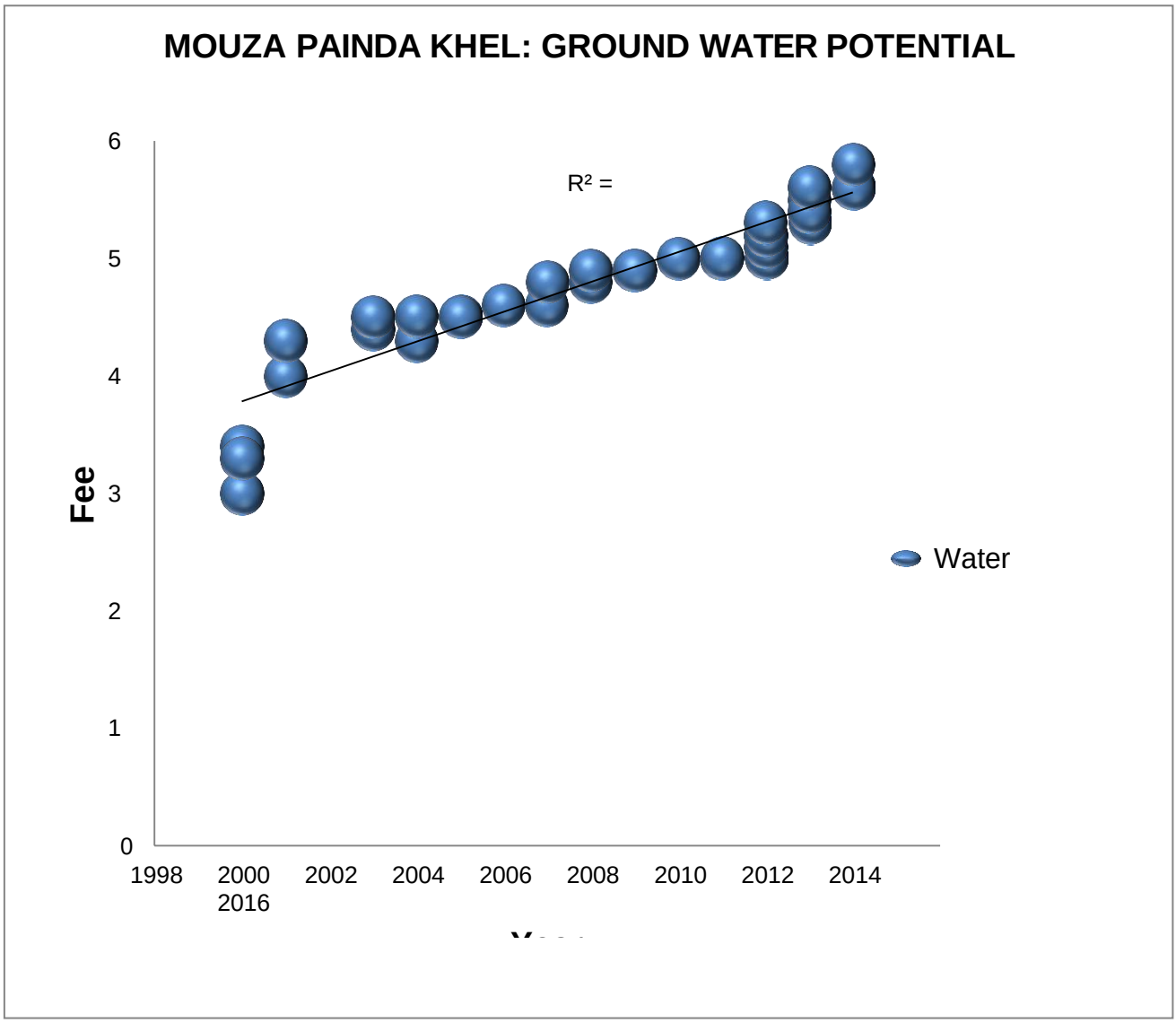


FIGURE NO. 11: GROUND WATER POTENTIAL 2000-2014

Source: Questionnaires

4.17 GOOGLE EARTH VIEW 2014

The right side area in image is barren land which is completely covered by sand which is not suitable for cultivation. Cultivated area in red circle is 6.14 acres. In left side of this area is a small sessional tributary Spina tangi highlighted in blue line.

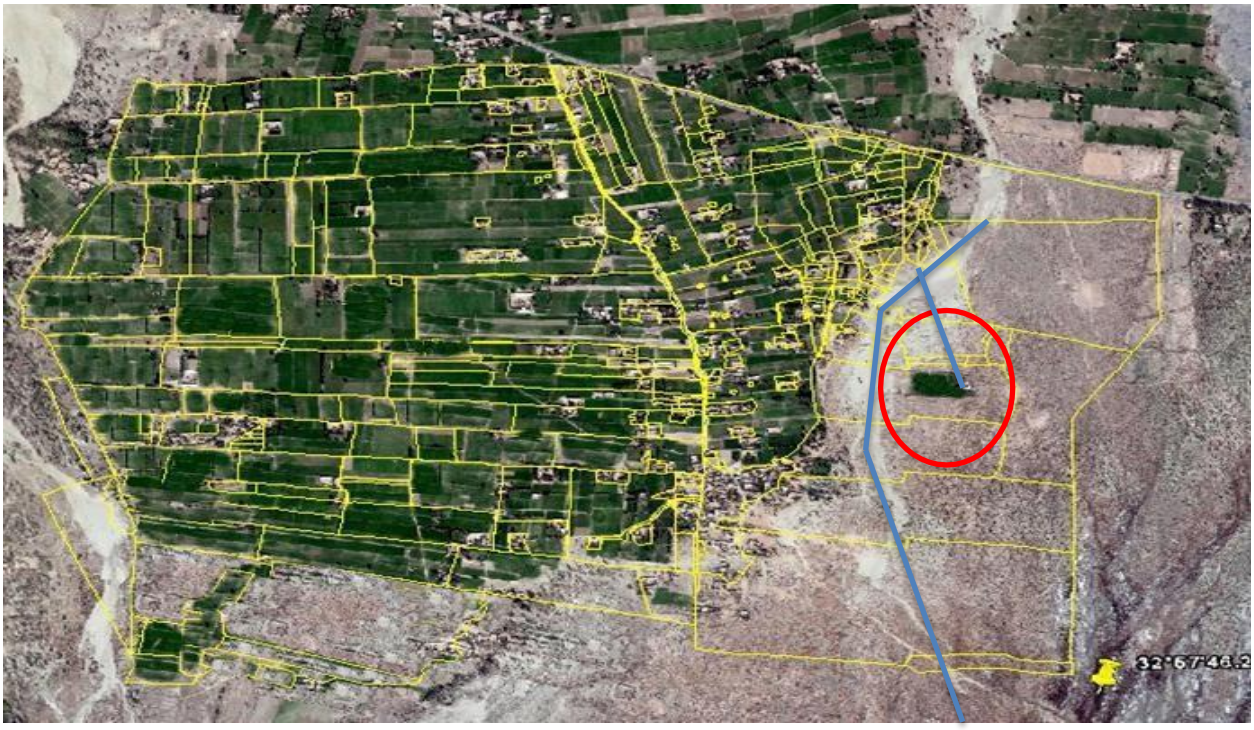


FIGURE NO 12

4.18 SPINA TANGI ALGHADA

A huge amount of rain water flow in this area but cannot use for irrigation because it is seasonal. The water of Spena Tangi is transport a huge amount of clay. This clay is suitable to increase the fertility of sandy soil. It is situated in the East of Painda Khel.

FIGURE NO 13

4.19 SOIL DEPOSITIONS BY SPINA TANGI ALGHADA IN BARRENLAND GOOGLE EARTH VIEW: 2005-2009

512 acres land area is barren because sand amount is dominant. In this area a small canal had cut from the spina tangi alghada and water had drained to that field. In about five year spina tangi alghada deposited clay soil which bed is 4 feet.

19-10-2005

FIGURE NO 14 **11-8-2009**

4.20 WHEAT CROPS CULTIVATION ON DEPOSITED SOIL

12-3-2011

FIGURE NO 15

31-7-2011

The crop cultivation practice here because of the fertile soil which was deposited by the Spina tangi (tributary of river kasho) .The remaining area is still sandy barren land. This barren area will be converted to cultivated land.

WHEAT CROPS 22-1-2013

FIGURE NO 16 **10-11-2013**

4.21 WHEAT CROPS PRODUCTION

Area is 6.14 acres and only wheat cultivation practice here .It"s production is 288 maund in 2013 and in 2014: 315 maund.

FIGURE NO 17

FINDING

We found from our research

- The method of irrigation changed from rainfall to tube wells in 2000 and onwards in the study area.
- The production rate of crops is increasing from year 2000 to 2014 as compared to the production rate of crops 1992 to 2000.
- Due to irrigation system new crops are now in practice in the study area. Wheat is dominated crop.
- Agriculture land is completely irrigated by tube well.
- 6.14 acre area of cultivated land increased.
- Developed irrigation system decreased the water table.

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