Summer Training

At

Gujarat Ecology Society, Vadodara, Gujarat

(May 10, 2021, to July 9, 2021)

A Project Report On

Haripar-Village Study Segment

Submitted by

Mr. Markana Divyesh Dineshbhai

(0078)

School of Development Studies

MBA-Rural Management

Batch-09

(2020-2022)

1, Prabhu Dayal Marg,Near Sanganer Airport, Jaipur,

Rajasthan – 302029.

July-2021

CERTIFICATE

It is to certify that **Mr. Markana Divyesh Dineshbhai,** *Student of a School of Development Studies, IIHMR University, Jaipur, Rajasthan has successfully completed the summer training at the* **Gujarat Ecology Society, Vadodara, Gujarat.**

This is the bonafide record of the work carried out by him under my supervision and guidance during the summer training from May 10 to July 9, 2021.

Date: 07/07/2021

Place: Vadodara, Gujarat

Signature of Faculty/Guide (Organization)

Dr. Deepa Gavali,
Acting Director,
Gujarat Ecology Society,
Vadodara, Gujarat.

CERTIFICATE

Gujarat Ecology Society
Synergy House, Subhanpura, Vadodara - 390 023, Gujarat, India.
Tel.: (0265) 2283329, 2283341, Fax: (0265) 2284664
Email: info@gesindia.org, Website: www.gesindia.org

TO WHOMSOEVER IT MAY CONCERN

This is to certify that ***Mr. Divyesh Markana,*** second year MBA student, IIHMR University, Jaipur has done his training with Gujarat Ecology Society from 8th May 2021 to 9th July 2021. During his tenure he was trained to collate the secondary information from census data book and undertook direct interactions with the locals for primary data collection. He has the spirit to work at the ground level and communicates with the locals.

With best wishes

Deepa Gavali

Dr. Deepa Gavali
Director (Acting) and Secretary
Date: 15.03.2020
Place: Vadodara

ACKNOWLEDGEMENTS

"aut viam inveniam aut faciam- Either I will find a way, or I will make one"

The internship I was given by the Gujarat Ecological Society was a great learning opportunity for me. It gave me the necessary exposure to professionals throughout my internship. Even though the world is battling a pandemic today, I was honoured to have the opportunity to work. working closely with the wonderful people from GES who guided me and agreed to offer a necessary platform for summer training even in these difficult times by working online from home.

I would like to take this opportunity to express my deepest thanks to my organizational mentor Dr. Deepa Gavali, Acting Director, GES for advising and managing her busy schedule to facilitate my online training.

I would like to express my sincere thanks to my esteemed IIHMR University, Jaipur for providing me with an opportunity and platform to further improve my skills and gain much-needed experience through summer work-from-home internships.

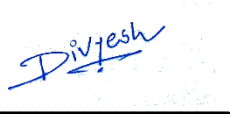
The Placement Committee In-charge, Anshul Goyal, IIHMR University, and the entire Placement Committee for their tireless and hard work.

And I also offer my special thanks to Dr. Rahul Ghai, Dean-SDS, IIHMR University for giving me this opportunity to work with this organization.

My sincere thanks also go to my institutional mentor, Shyama Chattopadhyay, Assistant Professor, IIHMR University, for his always available on-call availability to dispel my doubts and always guide me on the right path.

I am deeply touched by the constant support from my fellow interns and colleagues, whom I was able to complete and report on my research project due to their constant encouragement and understanding. I am grateful for your honest feedback and criticism where necessary to enable better performance. You were also instrumental in providing new and insightful ideas related to the project.

Signature



Divyesh Markana (0078)

TABLE OF CONTENT

INDEX

SECTION-1

About the Organization

SECTION-2

Haripar-Village Study Segment Report

ACRONYMS & KEYWORDS

GDP= Gross Domestic Product

MT= Million Tons

TDS= *Total Dissolved Solids*

BOD= *Biochemical Oxygen Demand*

COD= *Chemical Oxygen Demand*

NPK= Nitrogen, Phosphorus, and Potassium

Mg= Magnesium

Ca= Calcium

C= Carbon

H= Hydrogen

O= Oxygen

PH= Power of Hydrogen

EC= Electrical Conductivity

SCs= Scheduled Castes

STs= Schedule Tribes

T= Transmissivity

PVC= Polyvinyl chloride

K= Hydraulic conductivity

Kg= Kilogram

Ha= Hectare

LIST OF FIGURES

LIST OF TABLES

SECTION-1

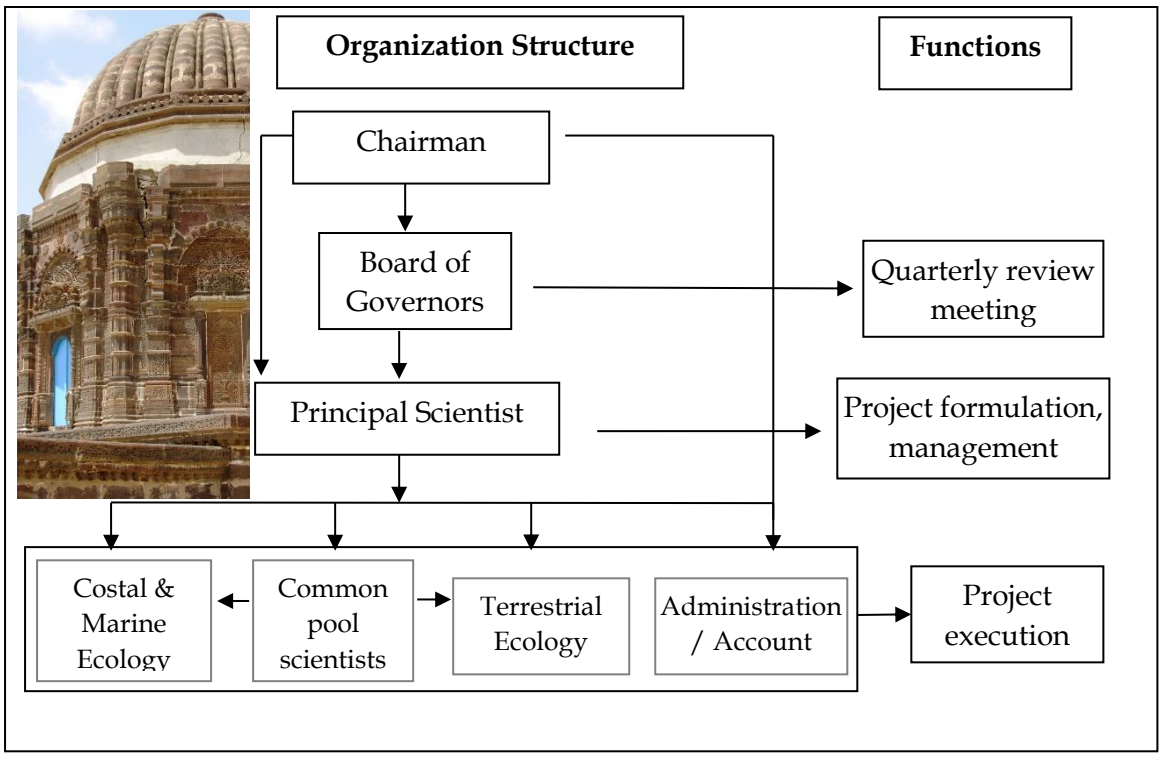
CHAPTER-1

ABOUT THE ORGANISATION

Gujarat Ecology Society is a Research-based NGO registered in January 1995 as Society and Trust. It is in Vadodara, Gujarat. The Society is governed by a governing body, and it is headed by Chairman. The Society is recognized as Scientific and Industrial Research Organization by the Ministry of Science and Technology, GOI, and is a member of IUCN – The World Conservation Union. The Society is also registered under Foreign Contribution (Regulation) Act, 1976.

Mission: "To pursue, promote and disseminate knowledge, information and processes that enable conservation, restoration and development of natural resources of Gujarat having regard to their ecological sustainability"

Organizational Structure:



Major Thrust Areas:

Gujarat Ecology Society has wide experience of 20 years in marine, intertidal and coastal surveys, and monitoring of the environment. And this is the major thrust area in which this is works.

- Biodiversity Conservation
- Coastal and Marine Ecology
- Dynamic Systems

- Restoration ecology

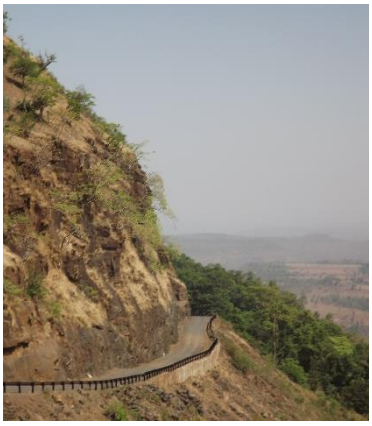
Profile of the Organization: The creation of a multidisciplinary ecological database is considered as one of the main components of all programs of GES. This Society has on its rolls, a team of highly qualified and experienced professionals/scientists, on subjects like,

- Environmental Sciences
- Economics
- Marine Sciences
- Wildlife science
- Statistics
- Botany
- Zoology
- Geology
- Hydrogeology
- Aquatic sciences
- Microbiology

Not just that being a research organization having a past 20 years' experience in this area. It is also doing research work for some the industries such as Hindalco Industries Ltd., Dahej, Gujarat Mineral Development Corporation, Indian Oil Corporation Ltd, Reliance Industries Ltd, and many more. It is also collaborating with some of the Indian agencies as well as overseas agencies. This is the list of agencies,

Indian Agencies

- Bombay Natural History Society
- Department of Ocean Development, Chennai
- Department of Science and Technology New Delhi
- State Forest Department, Gujarat
- Gujarat Institute of Development and Research
- Gujarat Ecology Commission
- Gujarat Maritime Board
- Ministry of Environment, Forest & Climate change, New Delhi
- United Way of Baroda
- IUCN-MFF (Mangroves for Future)
- Gujarat Biodiversity Board (GBB), Gandhinagar



Overseas agencies

- Cambridge University, U.K.
- Global Environment Facility (GEF)
- International Ocean Institute
- Royal Society for Protection of Birds (RSPB), UK
- PADI Foundation, USA.
- World Bank

Research Area: This organization is researching two main areas.

1. The analytical capability of GES
2. Conservation biology

In the Analytical capability of gas, they research Air Environment, Water Environment, Soil/Sediments Environment, Microbiological parameters, Geology, Plankton, Benthos, Fishery, Marine Algae, and Terrestrial Ecology. They are also doing impact studies on Air and Water pollutions. In Conservation biology, they run an awareness program among the students on wetland conservation and climate change. And many more things.

SECTION-2

CHAPTER-1

INTRODUCTION

In India, two-thirds of the population and 70% of the labour force reside in rural areas, generating 46% of national income. Although the process of urbanization is accelerating, it is predicted that by 2050, more than half of India's population will live in rural areas. Agriculture is a crucial sector of Indian economy because it contributes to 17% of GDP and provides employment opportunities for more than 60% of the population.

Over the past few decades, Indian agriculture has registered spectacular growth. The cereal production has increased from 51 MT in 1950-51 to 291.95 MT throughout 2019-20 but it is not enough. Recently, the United Nations State of Food Security and Nutrition in world report 2019 stated that climate change is already having a negative effect on global agriculture, and it is driving up the number of hungry around the world. Recent studies also indicate that India's grain production is vulnerable to climate change.

In the context of India, rural development is becoming more relevant. Most of the people residing in rural areas earn a living in agriculture and related sectors (60.41% of the total labour force) and impoverishment principally persists here. At the time of independence, around 83% of the Indian population lived in rural areas. Accordingly, from the very beginning, the focus of our planning was to understand the socio-economic changes, trends, and pattern. Strategically, our next focus of our planning was to understand the economic growth, productivity of agricultural crops and impact of industry on village.

The present work was undertaken to understand the socio-economic changes taking place in small village and the factors governing such changes.

1.1 Objective

- To understand the changing agriculture pattern.
- To understand the socio-economic trends and patterns in relation to industrialisation.
- To understand the drivers of change through interactions.

1.2 Justification

In India, very few micro-level studies are carried out. In addition, scholars from many different disciplines have adopted different methods to enrich the heritage of Indian rural research. The problem in the Indian context is not so much the scarcity of data at the micro level, but the research interest in generalizing village experiences in different parts of the country.

1.3 Keywords

Socio-Economic Profile, Physical, Economic Resources, Agriculture, Productivity, Industry, Climate Change.

CHAPTER-2

REVIEW OF LITERATURE

Ajay, Pritee, and Surabhi (2015) also highlight that Climate change due to global warming has a significant impact on India's agricultural productivity. But not only climatic fluctuations, but any annual change in climatic conditions such as precipitation patterns, temperature, and wind direction can cause significant fluctuations in agricultural production. The main effects would be a reduction in food security, an increase in the frequency of floods and droughts, leading to loss of income and employment of agricultural laborers. The weather phenomenon has a direct impact on the volatility of food grains. Food prices will decrease with the falling agricultural productivity of the population due to high food prices and worsen poverty. According to a study, India's GDP could fall by 6.2% and agricultural production could fall by 24% by 2080 due to anthropogenic climate change.

Karan and Manoj (2020) also observed and analysed that Climate change is already affecting the temperature, precipitation, and hydrological cycles of the earth, with constant changes in the frequency and intensity of rainfall, heatwaves, and other extreme events that will affect agricultural production. The most important aspect of climate change is that the average temperature of the earth's surface is slowly but steadily increasing due to the emission of greenhouse gases such as CO2 and methane. The productivity of crops decreases, only slightly by 2020, but by 10-40% by 2100 due to temperature increases and fluctuations in precipitation. For example, a recent study says that every 1 ° C increase in temperature reduces wheat production by 45 million tons.

Mariken, Anders, and Christian (2011) also indicate that Pollination is a crucial stage in the production of most flowering plants and pollinators are essential for transferring genes within and other plants. A rapidly increasing human population will reduce the number of natural habitats through increasing demand for food-producing areas, urbanization, and other land-use practices, putting pressure on the ecosystem service delivered by pollinators. On other hand, the demand for pollination in agricultural production will increase to sustain food production. But the most important effects of climate change are on plat-pollinator interactions. They also found that the timing of both plant flowering and pollinator activity is strongly affected by temperature. Both react differently and this mismatch affects plants by reducing insect visitation, while pollinators' experience reduces food availability, and the loss of pollination creates reduce in crop production.

Aizem, Garibaldi, Cunningham, and Klein (2009) say that the productivity of many crops depended on the presence of pollinating insects, pollinator decline reduces the global agricultural production. They also determined that the cultivation of pollinator-dependent crops has been expanding faster than non-dependent crops, so the demand for pollination service is rising at the same time pollinator diversity is declining. This trend decreased the crop yield, productivity. Result says that total agricultural production in the absence of pollination is decreased by 3-8%. This scenario calls on the dependence of agriculture on pollinators.

Alexandra, Bernard, James, Ingolf, Saul, Claire and Teja (2007) observed that honeybees *(Apis mellifera)* are the most economically valuable pollinators worldwide. Yields of some fruit, seed, and nut crops are decreased by more than 90% without this pollinator. When wild bees are not visiting agricultural fields, honeybee hives are the only solution for farmers to ensure crop pollination. Compared with wild bees, honeybees are cheap, convenient, and versatile, but for some crops, they are not most effective. But the honeybee colonies are also declining in some parts of the world due to improper use of pesticides and herbicides. Using novel primary data from 200 countries they found that fruit, vegetable, and seed production from 87 of the leading global food crops is dependent upon pollination, rest 28 crops do not. But 60% of global production comes from crops have do not depend on pollination, 35% from crops that depend on pollinators and 5% are unevaluated.

Surabhi, Sanjay, and Gaurav (2009) highlighted that in India, availability of agricultural inputs and poor access to agriculture-related information are the major constraints on the growth of agricultural productivity. But mobile phones help reduce the information asymmetry that exists in the agricultural sector and improve farm productivity and profitability. Farmer's revenue is increase because increase in access to information on price and reduce spoilage including crop infection. The information received from mobile phone play a complementary role to extension activities and better impact then other one-way information source.

Harte (2003) have indicated that presence of higher TDS in the groundwater is not suitable for irrigation. Higher TDS affects the crops productivity and ground water pollution is different from the surface water pollution.

Chhonkar, Datta, Joshi, and Pathank (2000) also analyze that liquid waste is generated from oil and textile industries is discharged on land or into watercourses and These effluents high BOD, COD, Na, and TDS. it also effluents major primary, secondary plant nutrients such as NPK, S, Mg, Ca, C, H, O, as well as micronutrients and heavy metals. That waste is causing deflocculation of soil particles, increase in soil PH, Sodicity, and EC of soil. For a long time, it affects soil health.

CHAPTER-3

RESEARCH METHODOLOGY

The data was collected on demography, physical feature, the socio-economic profile of the village, water availability, agriculture, and agro-climate. Both qualitative and quantitative data are collected. The qualitative data are on the quality of drinking water, housing pattern (*Kuccha or Pucca house*), and food habits which was obtained from the village through a household survey. The quantitative data were on population, landholding, literacy rate, sex ratio, etc. was obtained from secondary sources.

3.1 Source of Data

The source of information and data would be primary and secondary.

1. Quantitative Methods will be used for the data collection. First-hand Information will be collected through interviews with the relevant persons through the fieldwork.
2. And some of the secondary information will be also gathered through research papers, journals, textbooks, publications, Gram Panchayat Office, Sarpanch, etc.

3.2 Universe of Study

The universe of study is the farmer people of Haripar village of Jamnagar, Gujarat.

3.3 Study Period

The study covers a period of twenty years from 2000 to 2020.

3.4 Sample Design

The design of this research paper is explanatory and descriptive. And for the questionnaire survey, systematic sampling was done, and 100 households were selected randomly. The effort behind this survey was to collect real-time information regarding occupation, land, crops grown, present source of income, purchase of grocery items, availability of drinking water, and civic amenities.

3.5 Data Analysis

The collected data has been analysed by using Microsoft Excel. Tables, graphs, bar charts, averages, percentages, percentages growth, etc. were used to depict the analysed data.

3.6 Limitation of Data Collected

- Most people were hesitant to reveal their income and assets details.
- They are not clear about the present value of their asset.
- In the Gram Panchayat Office, there is no official record of how many agricultural laborers are available in the village.

CHAPTER-4

SOCIO-ECONOMIC PROFILE OF VILLAGE

4.1 Introduction about Village

The name of Gram Panchayat from Haripar village is HARIPAR. The subdistrict in Lalpur. The name of the subdistrict headquarters is LALPUR, and it is 12 km away from the village Haripar. the name of the main district of the village is Jamnagar and the distance from the village is around 26 km. The nearest town to Haripar village is Jamnagar, and the distance from the nearest town is 26 km.

In Haripar village, the population of children aged 0 to 6 years is 296, which is 11.84% of the total village population. The average gender ratio of Haripar village is 979, which is higher than the Gujarat state average of 919 in the year 2011.

The village has a population of 2,501 according to 2011 census data, where the male population is 1,264 and the female population is 1,237. The area of the village of Haripar is 2892.69 hectares. The population density in Haripar is 1 person per hectare. The total number of households in the village is 525.

Fig. 4.1 Geographic Location of Haripar

There are two primary schools and one secondary school in the village, and it is fully functional. As we know that a primary health sub-center is the first point of contact between the primary health system and the community, as per the population norms, PHS is set up for every 5,000 inhabitants in flat areas, which is available in the village, having one male and one female health worker.

Haripar village has a lower literacy rate compared to Gujarat. In 2011, the literacy rate in Haripar village was 70.61% 78.03% compared to Gujarat. In Haripar, the male literacy rate is 78.13%, while the female literacy rate was 63.10%.

Schedule Caste (SC) accounts for 11.56% while Schedule Tribe (ST) accounted for 0.04% of the total population in Haripar City.

In the village of Haripar, 1,202 people were involved in work activities. 89.85% of employees describe their job. as the main occupation (employment or income of more than 6 months), while 10.15% had a marginal job that secures their livelihood for less than 6 months. Of 1,202 workers who were employed in the main occupation, 580 were cultivators (owners or co-owners) while 252 were agricultural workers.

Table 4.1 Haripar Working Population

	Total	**Male**	**Female**
Total Workers	1202	808	394
Main Workers	1080	759	321
Main Workers Cultivators	580	438	142
Agriculture Labourer	252	103	149
Household Industries	0	0	0
Other Workers	248	218	30
Marginal Workers	122	49	73
Non-Working Persons	1299	456	843

(Source: Census 2011)

According to the constitution of India and the Panchyati Raaj law, the village of Haripar is administered by a Sarpanch (village chief) who is elected as the representative of the village.

CHAPTER-5

PHYSICAL FEATURE

Haripar village is in Lalpur block in Jamnagar district of Gujarat state. It is 26 km towards the south of district headquarters Jamnagar and the Coordinate of the village is 22.2847° N, 70.0146° E. The total area of the village is 2892.69 hectares (Census 2011). The population density of the village is 1 person per hectare which is low compared to 308 person/Ha for State of Gujarat (Census 2011).

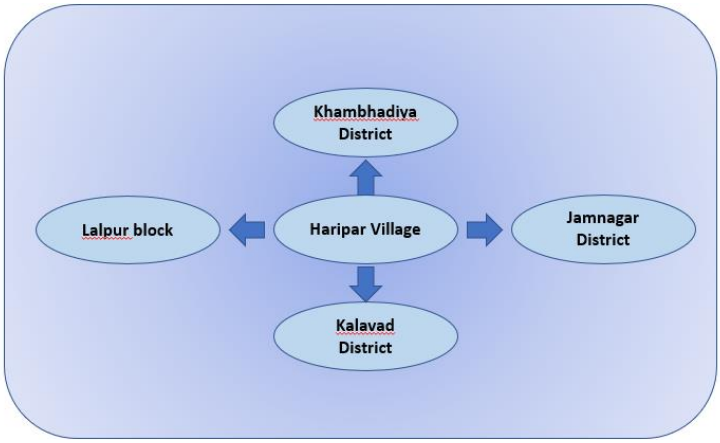


Fig. 5.1 Location of Haripar Village

5.1 Physiography

Haripar village comes under the Jamnagar North-West Coastal Plain regions. This region is generally flat, but it is fringed with a line of wind-blown sandhills. The slope of the region is towards the north. And there is no forest in this region.

5.2 Drainage

This village is devoid of any large perennial rivers. There are 2 minor rivers in the village, one is small and another one is large. The flow of each river is east to west. None of them have any large tributaries, both are dry channels till the advent of the monsoon.

5.3 Land and Land use Pattern

The total land in the village was 2892.7 ha as per 2010-11(census 2011). The land classification according to the different uses for the rural areas of the district is based on the information compiled from the village directory.

Table 5.1 Land Classification of Haripar Village Area (In hectares)

Sr No.	Classification	Area as per 2001	Area as per 2011	% Of Change
1	Forests	0	0	0
2	Not available for Cultivation	713.4	210.8	-70%
3	Cultivable Waste Land	234	162.3	-31%
4	Total Irrigated Land	319	1158.5	+263%
5	Total Un-Irrigated Land	1626.3	1361.1	-16%
	Total Land	2892.7	2892.7	0

(Source: Village Directory, 2001 & 2011)

The above table shows the land classification of Haripar village area. The total land of the village is around 2892.7 ha. The village has no forest land. The dynamics of the land use pattern shows increase in area under cultivation from 2001 to 2011, an increase of 263% indicates improvement of irrigation schemes. This is promoting farmers to undertake cultivation as is evident from decline in area under non agriculture.

5.4 Climate

The Climate of Haripar village is generally pleasant. The summer season extends from March to June, with day temperature reaching about 41° C. The monsoon starts from July to September and the winter sets in during October and extend till February. The relative humidity ranges from 80-85% during the south-west monsoon and about 60-75% rest of the year.

5.4.1 Temperature

This village is a small part of the Saurashtra region, and this region falls under the semi-arid tropic Agro climatic region. This region is characterized by a high incidence of solar radiation, high temperatures, and very variable rainfall.

There is only one metrological station, which is situated the Jamnagar district.

Table 5.2 Year-wise Maximum and Minimum Temperature

Sr. No	Year	Temperature (in °C)	
		Maximum	Minimum
1	2000	31.7	16.5
2	2002	32.4	16.7
3	2004	37.6	13.7
4	2006	36.7	12
5	2008	38	10.4
6	2010	38.6	12.6
7	2012	38	10
8	2014	38	8
9	2016	38.5	13.2
10	2018	39	12.7
11	2020	40.8	10.2

Source: (1) Statistical Abstract of Gujarat-2019, Directorate of Economics and Statistics,

(2) Statistical Abstract of Gujarat-2012, Directorate of Economics and Statistics,

(3) Statistical Abstract of Gujarat-2007, Directorate of Economics and Statistics,

(4) Statistical Abstract of Gujarat-2005, Directorate of Economics and Statistics,

The table above shows the annual maximum and minimum temperatures of Haripar village for the years 2001 to 2020. There is increase in maximum temperatures in last 20 years. Further, the night temperatures have reduced and this anomaly in temperature pattern is linked with climate change. The larger difference between the day and night temperature is indicative of arid system and impact of industrialisation of the area. The expansion of the Reliance plant and loss of green cover have attributed to high day temperatures.

5.4.2 Rainfall

Most of the time, rainfall comes from the South-West monsoon and there is no post-monsoon or negligible rainfall in this region. The period from June to mid-September is the monsoon (called wet season) and from October to May there are usually dry conditions. About 90-95% rainfall is obtained during the southwest monsoon season and July receives the highest rainfall.

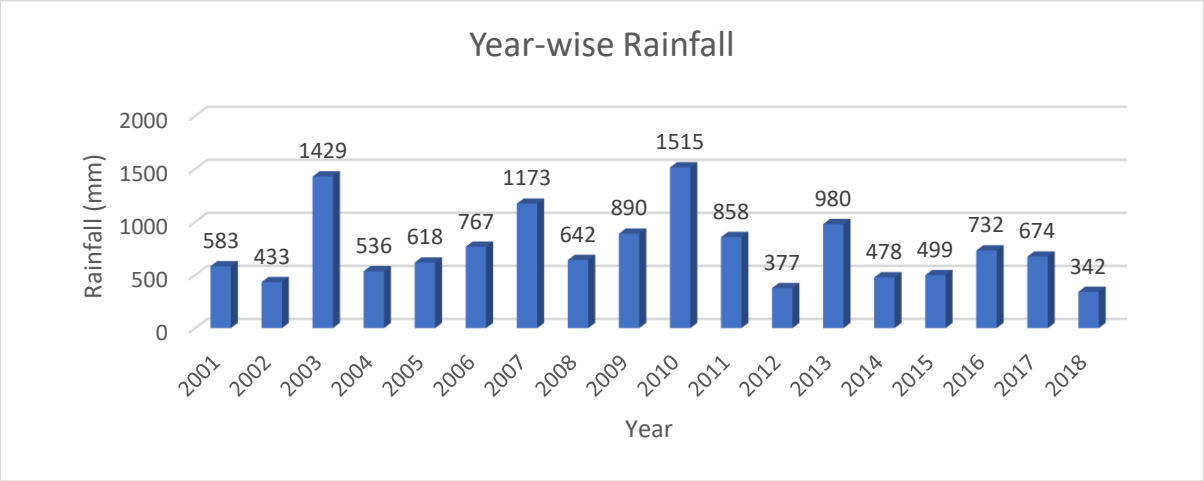


Fig. 5.2 Year-wise Rainfall

Source: (1) Socio-Economic Review, -2011-12, Directorate of Economics and Statistics,

(2) Comprehensive-District Agriculture Plan of Kheda, Directorate of Agriculture,

(3) Statistical Abstract of Gujarat-2019, Directorate of Economics and Statistics.

The above graph shows the precipitation from 2001 to 2018. It was found that the precipitation in 2010 was the highest, which was 1515 mm. The average rainfall from 2001 to 2018 was 751 mm. The rainfall pattern is irregular, however a decline in rainfall is reported in the last 5 years. This correlates with the temperature anomaly observed and points towards shift in climate from semi-arid to arid.

5.5 Irrigation

The main purpose of irrigation is to be able to grow crops and maintain landscapes. In Haripar there are only three main sources of water viz., River, Open wells, and Borewells. Submersible motors and pumps help to extract the water from water source to field and that is operated by electric power. These devices are more economical and easier to handle in the long run, but the initial capital expenditure of motor and pump is high.

CHAPTER-6

SOCIO-ECONOMIC PROFILE OF VILLAGE

The socio-economic profile of the village is present here using the census data.

6.1 Population

- Haripar has a total population of 2501 as per 2011 census data, where the male population is 1,264 and the female population is 1,237.
- The rate of population growth in Haripar village is 4.16% as observed from the 2001 census and 2011 census data.

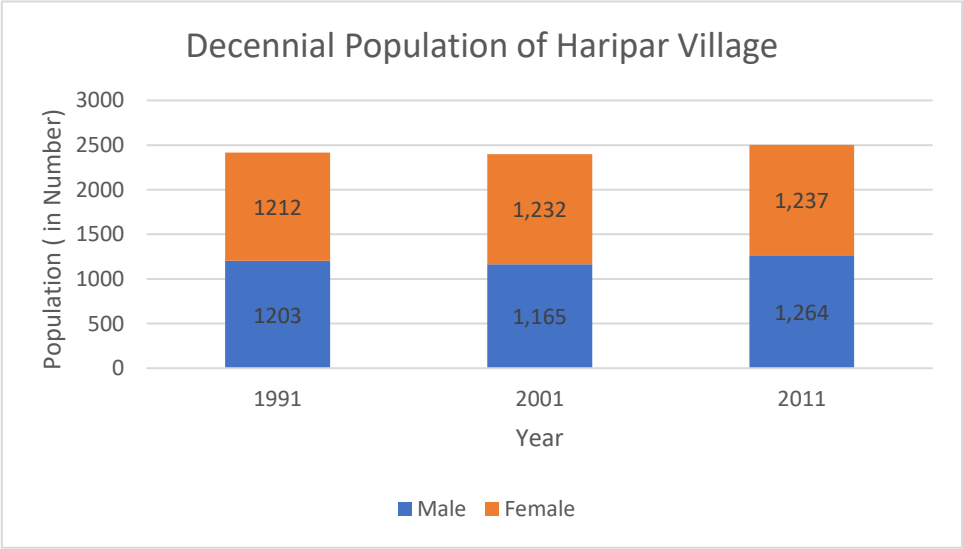


Fig. 6.1 Decennial Population of Haripar Village

6.2 Change in Household

- As per Census 2001 there were 424 total households in the village which increased to 525 in 2011. with a growth of 19.24%.

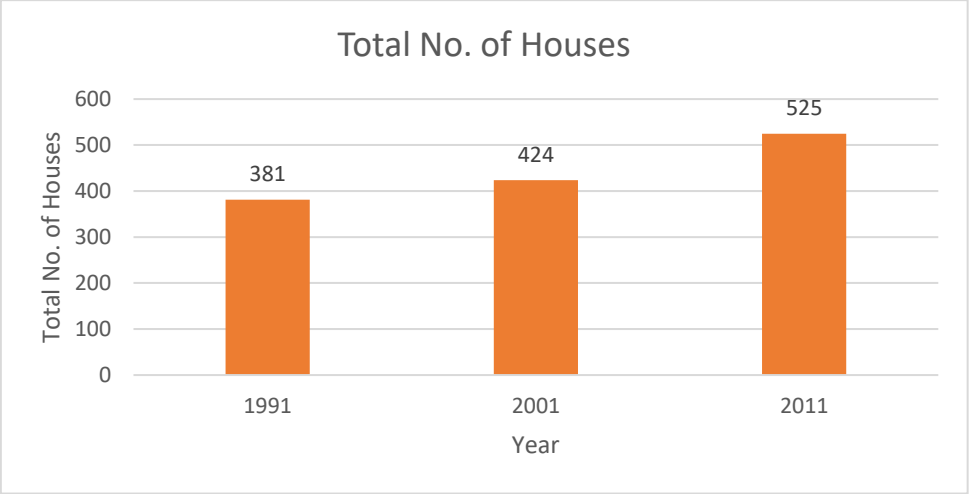


Fig. 6.2 Total No. of Houses

6.3 Literacy rate

- As per 2011 census, the literacy rate of the state is around 78.03%, whereas literacy rate of Haripar villages was 71%.
- The male literacy rate is 78% which is higher than the female literacy rate of 63% in 2011.
- In 2001, the village literacy rate was around 41% but increased in 2011 largely due to education policy implemented by the State.

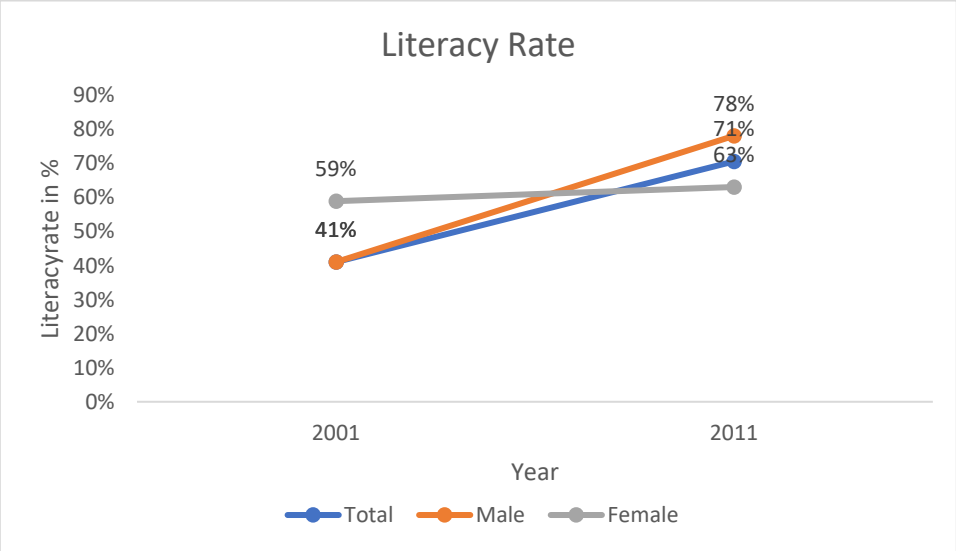


Fig. 6.3 Literacy Rate

6.4 Child Sex Ratio (0-6 Years)

- According to census 2011 (National level), the child sex ratio in the age group of 0-6 years has reached 919 from 927 in 2011.
- In Gujarat, the child sex ratio was 883 in 2001 but in 2011 it is increased to 890.
- In case of Haripar village decline in sex ratio over the last three decades was observed.

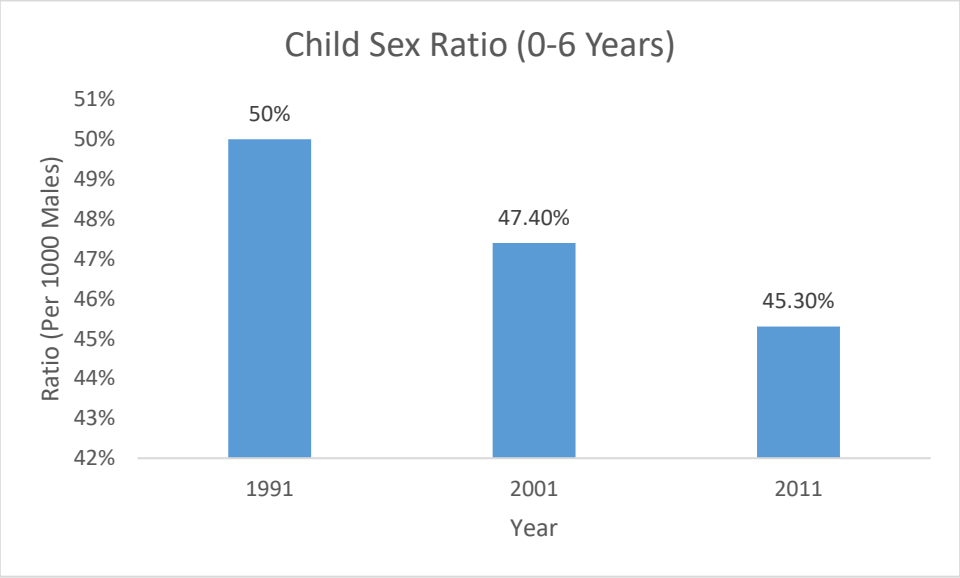


Fig. 6.4 Child Sex Ratio (0-6 Years)

6.5 Scheduled Castes and Scheduled Tribes Population

- As per 2011census, the total population of SCs and STs in the Haripar village is 290.
- in, 2011 the total population of SCs is more compared to 2001. And there is 19.04 % growth in 10 years.
- But in the female SC population is lesser than the male SC population in 2001 as well as 2011.

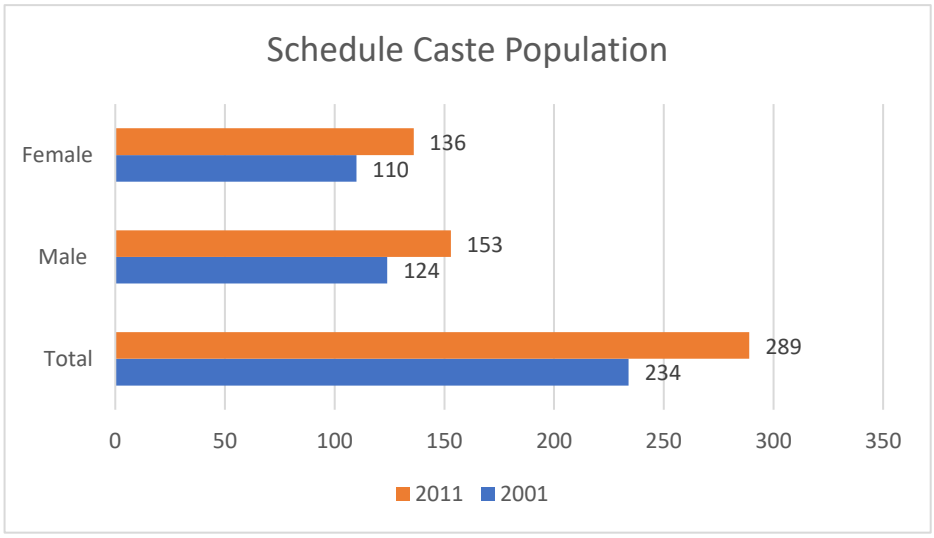


Fig. 6.5 Schedule Caste Population

- The population of Schedule Tribe is decreased by 75% in 2011 as compared to 2001. This indicates migration of ST community to other places. Further, the ST population has ever reached double figure in the village, so this trend is insignificant, and the village never had ST community.
- In, 2001 the total population of Schedule Tribe is 4 but in 2011 it is only 1 and that is male-only.

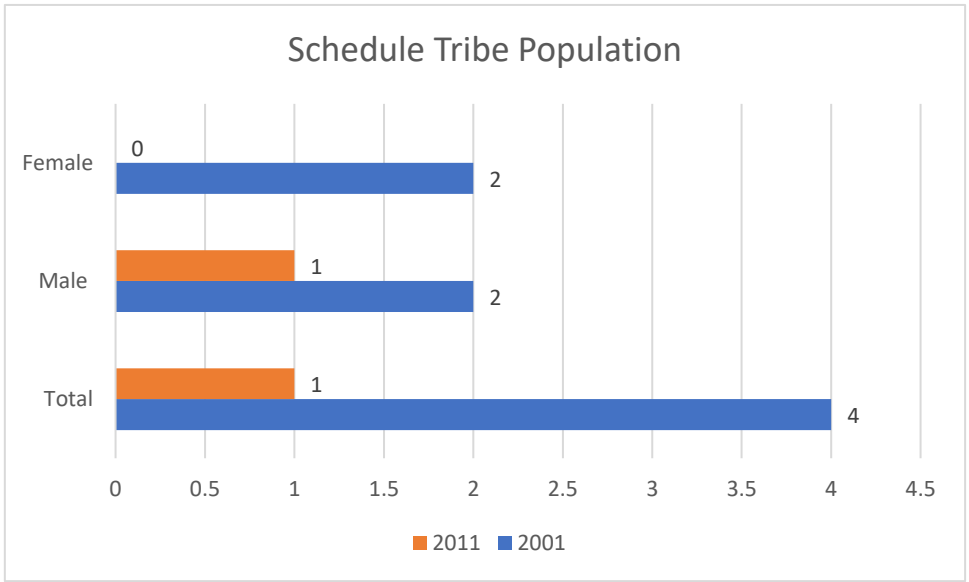


Fig. 6.6 Schedule Tribe Population

6.6 Workers

- As per Census 2011, the total workers comprised of 1,080 (34.7%) main workers, 122 (3.9%) marginal Workers, 360 (11.6%) Agricultural Workers, and 1,299 (41.7%) non-Workers.
- Among males 31.8% were main workers, 2.1% were marginal workers, 8.8% were agricultural workers, 4.3% were agricultural laborers and 19.2% are non-workers.
- While females 16.6% were main workers, 3.8% were marginal workers, 7.8% agricultural workers, 7.7% were agricultural laborers and 43.7% are non-workers.
- It is observed that non-workers largely were dominated by the females who preferred to stay at home.

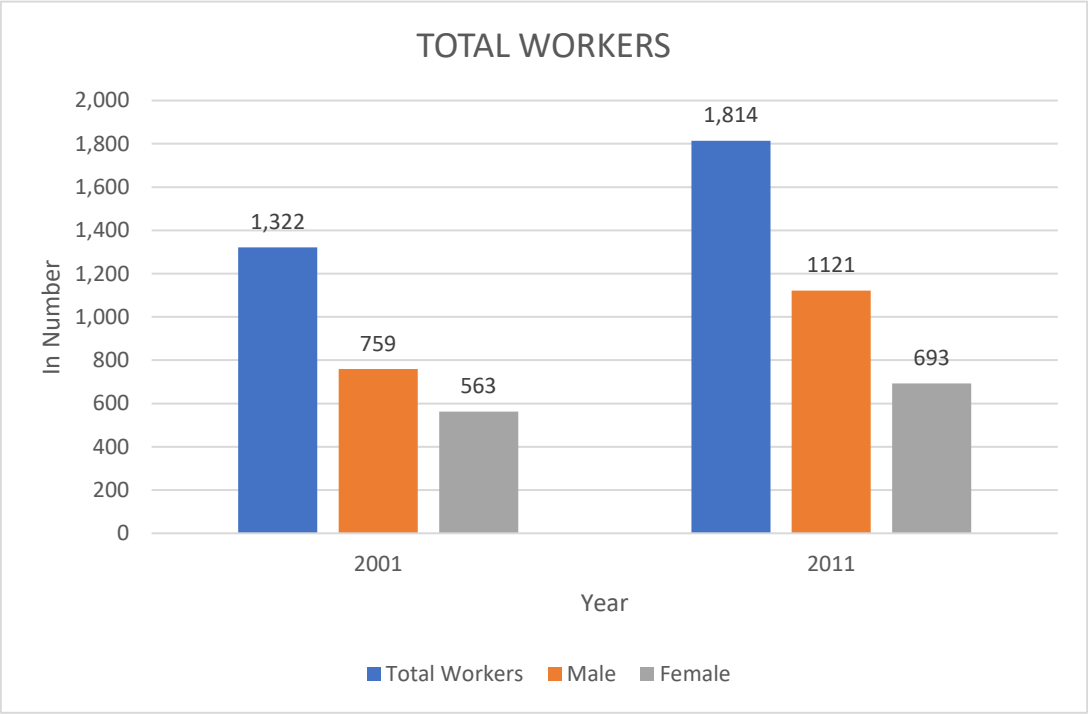


Fig. 6.7 Total Workers (Population Census 2001 & 2011)

CHAPTER-7

WATER AVAILABILITY

In Haripar village the major source of water is underground water. And it is drawn with the help of the tube-wells. Groundwater is defined as the water present in a zone of saturation below the ground. The other nearby source of water is a river, and it is a peninsula.

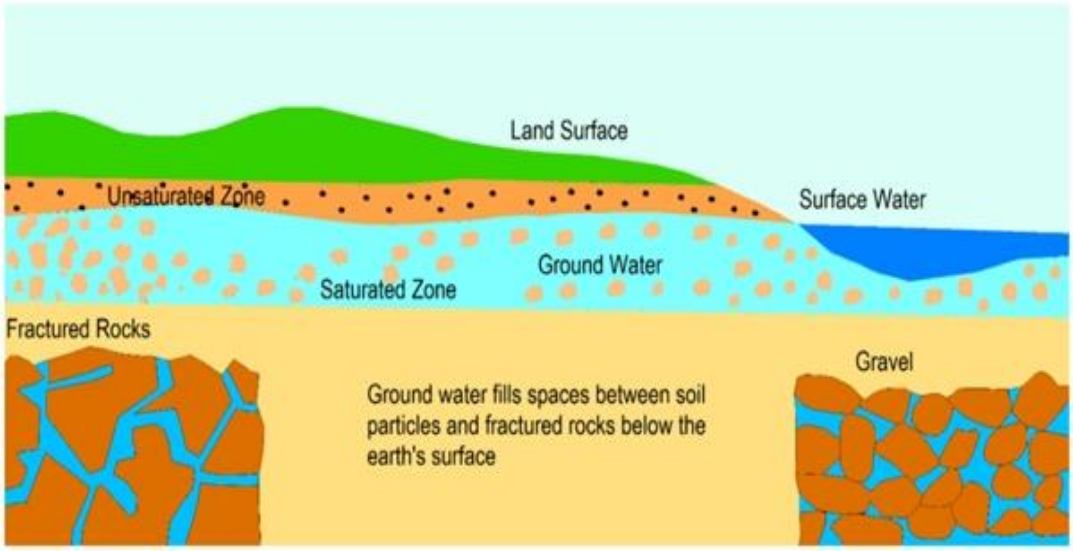


Fig. 7.1 Groundwater zone

7.1 Aquifer

The zone of saturation is technically called an aquifer. An aquifer is also known as a water-bearing stratum. It consists of a body of saturated rock in which water is easily moving. Aquifers are significantly porous and permeable to supply water to wells, springs, and tube wells. Wells and tube wells are some of the most important sources of fresh water on earth. There are three types of aquifers present below the zone of saturation.

1. Unconfined aquifer
2. Confined aquifer
3. Semi-confined or Leaky aquifer

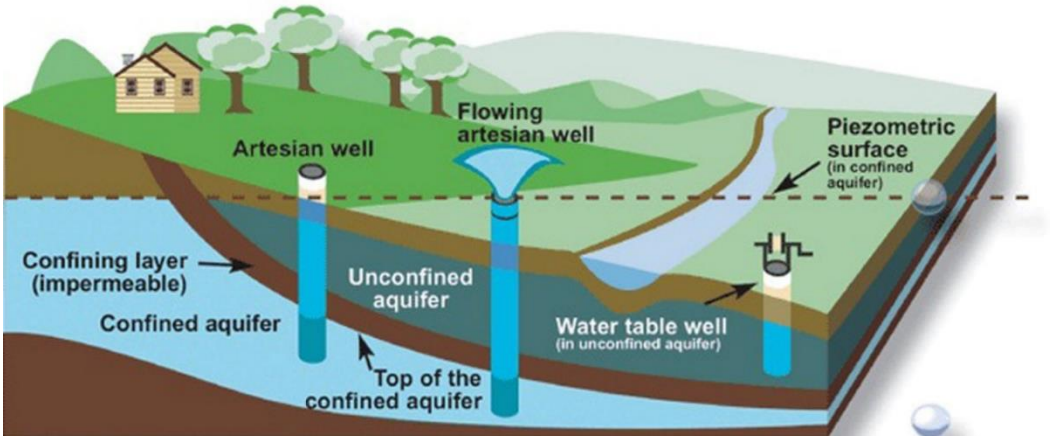


Fig. 7.2 Types of aquifers

Each aquifer has its properties such as specific yield, specific retention, porosity, hydraulic conductivity, transmissivity (T), and storability.

In Haripar, village groundwater is present in the confined aquifer and leaky aquifer. And properties of both aquifers are given below.

1. Confined aquifer:
    - It is also known as an artesian pressure aquifer.
    - It is lies between the two impervious layers.
    - In this aquifer hydrostatic pressure is more than atmospheric pressure.
    - And the water level is more than the water table.
2. Semi-confined aquifer:
    - It is bounded between two semi-impervious layers.
    - Due to this semi-impervious layer, there will be the possibility of leakage, that is why it is also known as a leaky aquifer.
    - Due to low hydraulic conductivity one aquifer generating an unconfined aquifer and Which is known as a parch aquifer.

7.2 Tube-wells

These types of wells are done with drilling machines, designed for the extraction of water with the help of a submersible pump. A casing of plastic pipe (PVC) is used to line the borehole and it prevents the rock and soil from collapsing into it. And the end part of the casing has a suitable opening to allow water into the borehole from the aquifer. An initial investment of bore, motor and the pump are high, but it is more economical in long run. In Haripar village, there are 30-35 tube-wells are present in the village but for irrigation, it is around 320-350. And the average depth is between 300-800 feet. And it is the only source of dry season water, that is why there is a high number of tube-wells. To understand the pattern of groundwater we categorized tube wells into zone-wise.

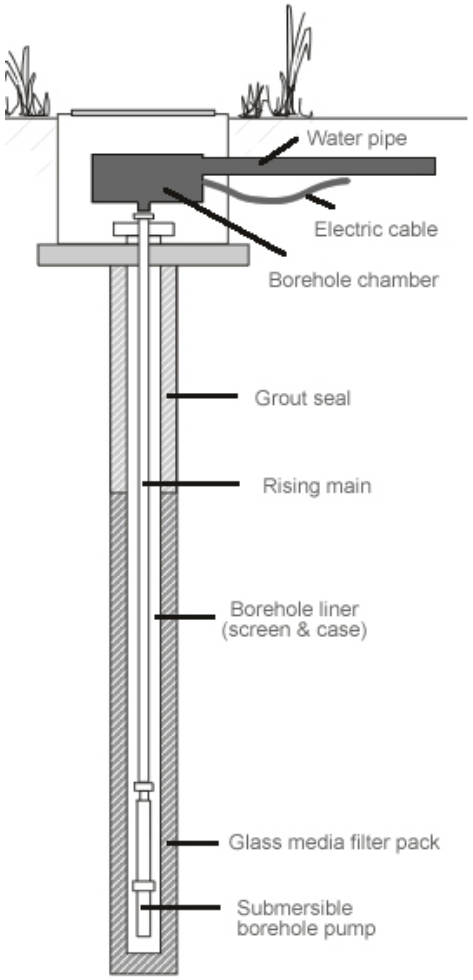


Fig. 7.3 A Tube-well

7.2.1 Zone I: East

This zone has a high number of tube wells is around 126 because there is no other source of visible water. The average depth of tube wells in this zone is from 300-1000 feet. And water table is found at 600 feet and 900-920 feet. In this zone quality of water good but no fertile land.

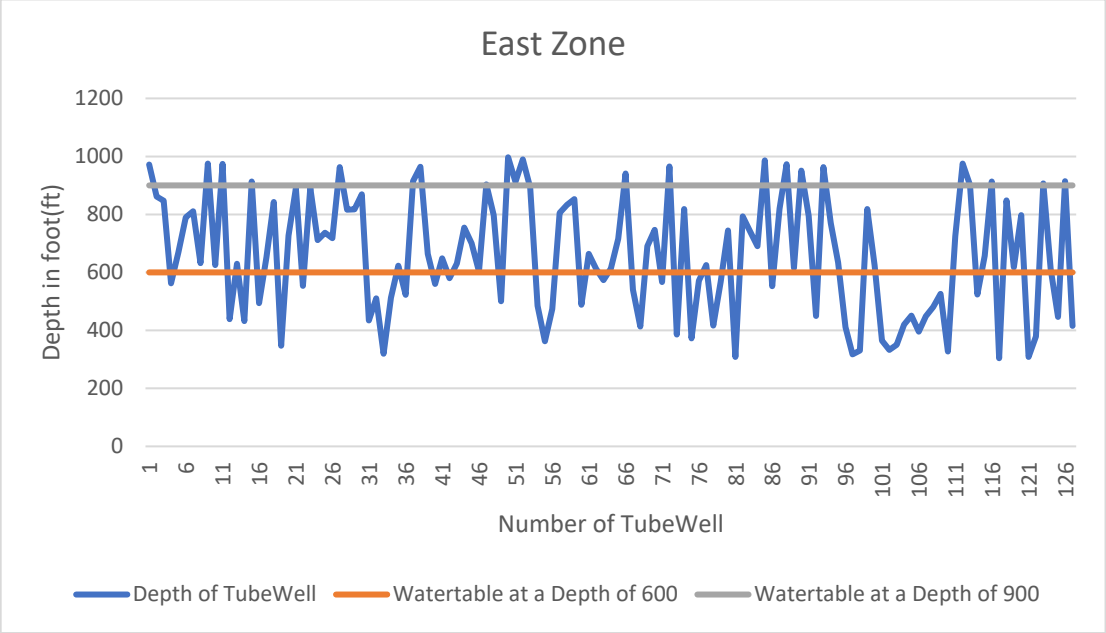


Fig. 7.4 Number of Tube-wells in East Zone

7.2.2 Zone II: West

This zone has around 80 tube wells. An average range of depth is 300-700 feet. In this zone peninsula river is nearby, that is why in this zone tube-wells are shallow. And water table of this zone is at 90, 215, 650 feet.

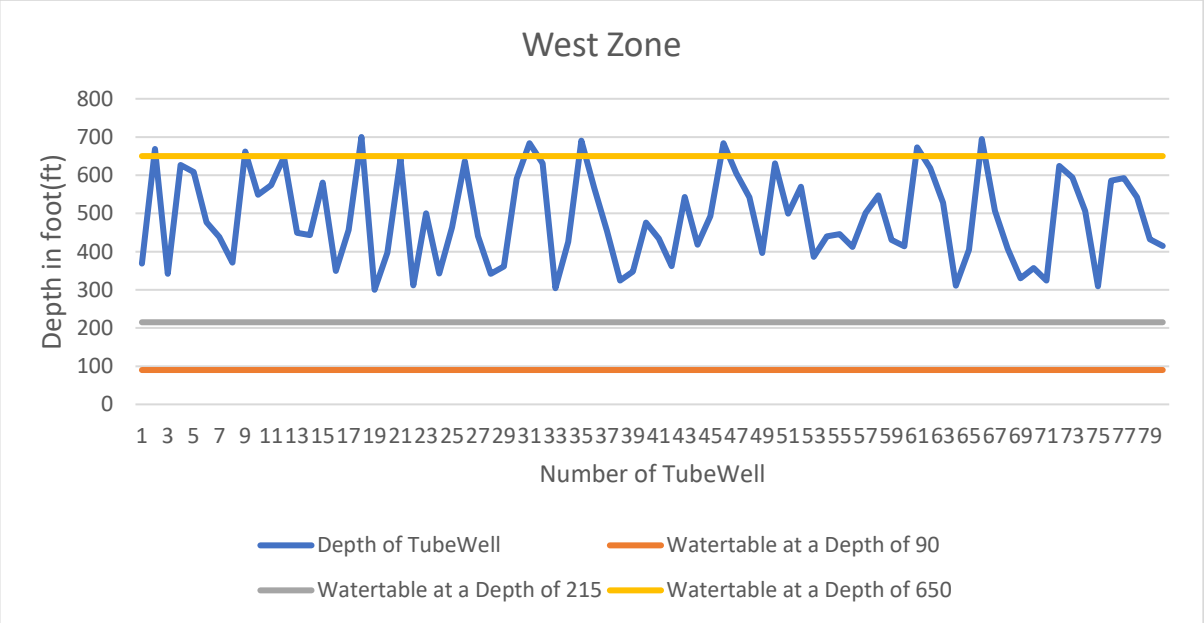


Fig. 7.5 Number of Tube-wells in West Zone

7.2.3 Zone III: North

This zone has around 30-35 tube wells. In this zone it the only source of water. An average range of depth is 300 to 950 feet. The water table is found at a depth of 425 and 325 feet. In the summer season, most of the tube wells are empty in this zone.

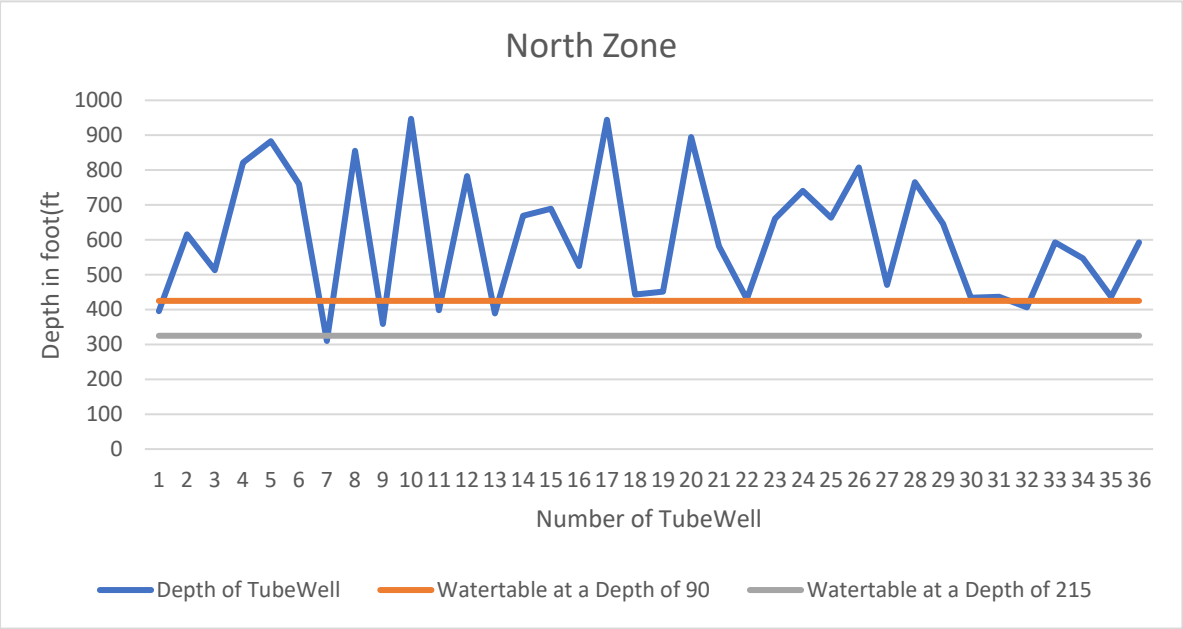


Fig. 7.6 Number of Tube-wells in North Zone

7.2.4 Zone IV: South

This zone has around 95 tube wells. An average range of depth is 200 to 900 feet. The water level is found at a depth of 250, 475, and 850 feet.

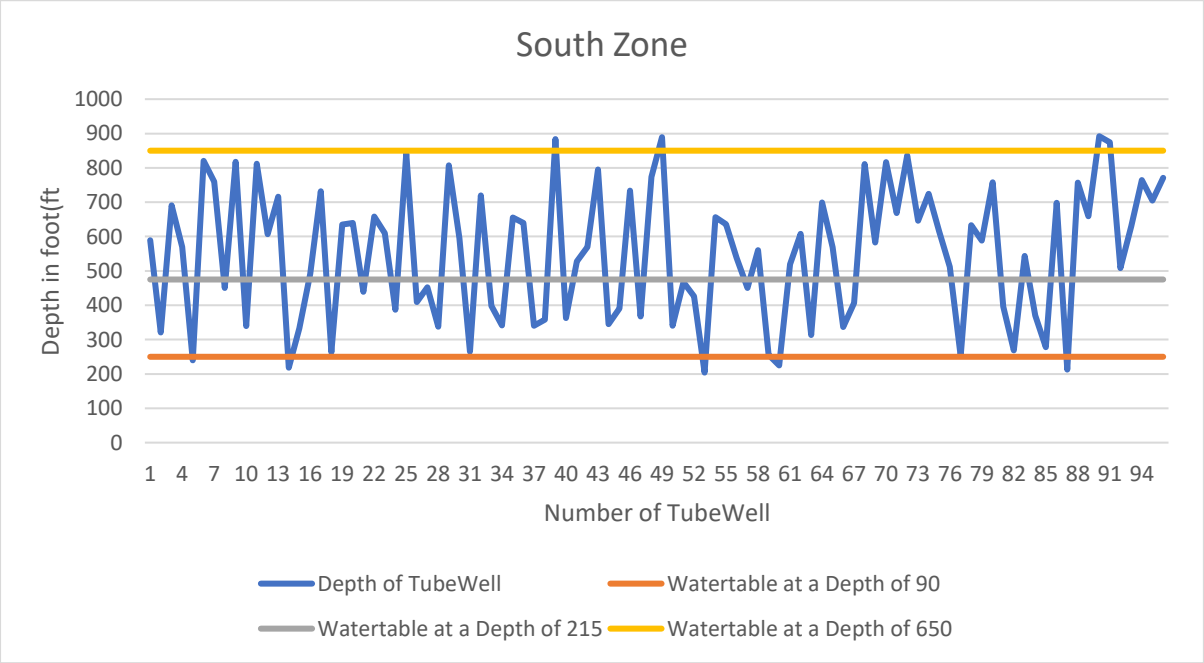


Fig. 7.7 Number of Tube-wells in South Zone

7.3 Properties of Aquifer

From above graphs we can say that aquifers are natural systems, it is invisible and as a result, they have a high degree of variability. This variability makes accurately describing the properties of aquifers. It is difficult to measure because we cannot be able to see what is going on underground. That is why it is important to recognize some of the parameters that classify aquifers.

1. **Specific yield**: The volume of water drains from the aquifer due to the influence of gravity.
2. **Specific retention**: due to molecular attraction of water present in the aquifer that is known as specific retention.
3. **Porosity**: it is the ratio of the volume of voids to the total volume.
4. **Hydraulic conductivity**: the rate at which water transmits throw the aquifer per unit time.
5. **Storability**: it is defined as the water store in an aquifer.
6. **Transmissivity (T)**: the rate at which water transmits throw the aquifer per unit time per unit width of an aquifer. Unit of transmissivity is Sec./cm or Minute/Meter. And it is calculated by,

$$\mathbf{T=bk}$$

Where b=depth,

k= Hydraulic conductivity.

CHAPTER-8

ECONOMIC RESOURCES

Economic resources are an important substance for the working people of the village. The main economic resource is in the village is agriculture and industries.

8.1 Agriculture

Agriculture is an important source of livelihood for the majority of the Haripar village. As per census 2001, 6.8% of the total working population was engaged in agriculture, but in census 2011, it is 24.5%.

Table 8.1 Number of Persons Working as Agricultural Laborers and Workers

Sr. No.	Sector	2001	2011
1	Agricultural Workers	151	360
2	Agricultural labours	12	252
	Total	163	612

Source: Census 2001 & 2011

Currently, in the village, approximately 900 agricultural laborers are working *(Haripar Gram-panchayat).* Most of the laborers have a *pucca* house built on the farm. They come from Utter-Pradesh, Bihar, and Madhya-Pradesh. They consume wheat, millet, rice, vegetable, and meat. And some of them work on daily wages on a range of Rs 180-275.

8.1.1 Soil and Cropping Pattern

Soil found in the village is classified as alluvial, medium black, and light brown. The light brown soil is found in the east and north zone. The medium black soil is found in the south zone. And the alluvial soil is found in the west zone which is called "*kali*" as it is found on the riverbank side. The land of the village is mostly plain and productive is ideal for crops like groundnut, cotton, sesame, sugarcane, millet, and wheat. This medium black soil has medium fertility and low water holding capacity.

8.1.2 Average Yield per Hectare

Data for the average yield per hectare for the year 2000 to 2020 (5-year intervals) concerning different crops in the village is given in the following table.

Table 8.2 Average Yield per Hectare in kg/ha

Sr No.	Name of crop	2020	2015	2010	2005	2000
1	Groundnut	126	105	96	63	51
2	Wheat	285	255	225	195	165
3	Gram	150	126	114	90	66
4	Cotton	81	156	135	126	120
5	Sesame	60	45	-	-	-

(Source: Haripar Gram panchayat)

The above table shows that the average yield per hector for groundnut, wheat, gram, and sesame is increasing in each 5-year interval. Here one point is noticed that the average yield per Ha for the crop of cotton is decreasing. The main reason behind this is the pollination process. Due to climate changes, the timing of both plant flowering and pollinator activity is strongly affected by temperature. The difference in the timings of the pollinators and flowering reduces the pollination which is important for cross-pollinated crops thereby affecting crop productivity (*Mariken Kjohl, 2009).*

8.1.3 Fertilizer

It is a natural or artificial substance that contains chemical elements that help to improve the growth and productiveness of plants. In the village, most of the people use modern chemical fertilizers. Such as nitrogen, Phosphorus, Potassium, Calcium, magnesium and sulphur, and Micronutrient fertilizers.

Table 8.3 fertilizer use in kg/ha

Sr No.	Year	Kg/Ha	Total in Ton
1	2000-01	90	103.5
2	2005-06	120	138
3	2010-11	150	172.5
4	2015-16	180	207
5	2020-21	240	276

Source: From 2 Agro Product Distributers

The above table shows that the usage of fertilizer is raised each year.

8.1.4 Fertilizer vs Productivity

The main function of fertilizer application is to improve crop productivity and therefore a relation between the crop productivity and fertilizer usage for all the crops was done.

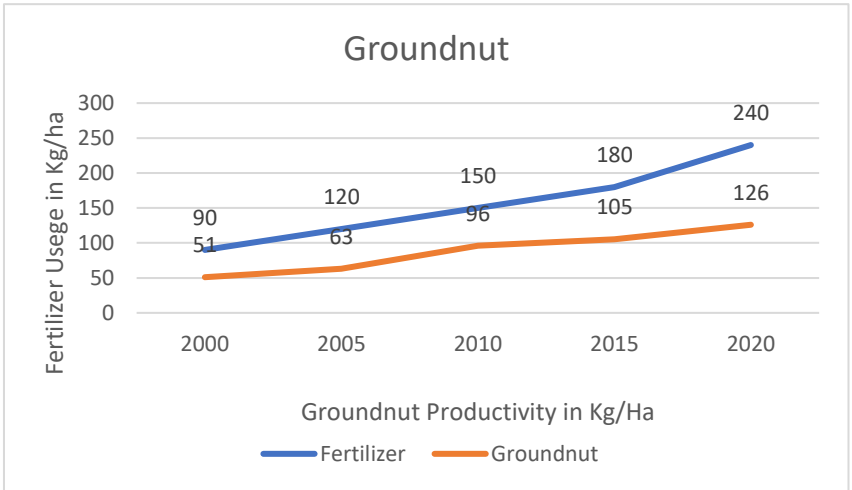


Fig. 8.1 Fertilizer vs Productivity: Groundnut

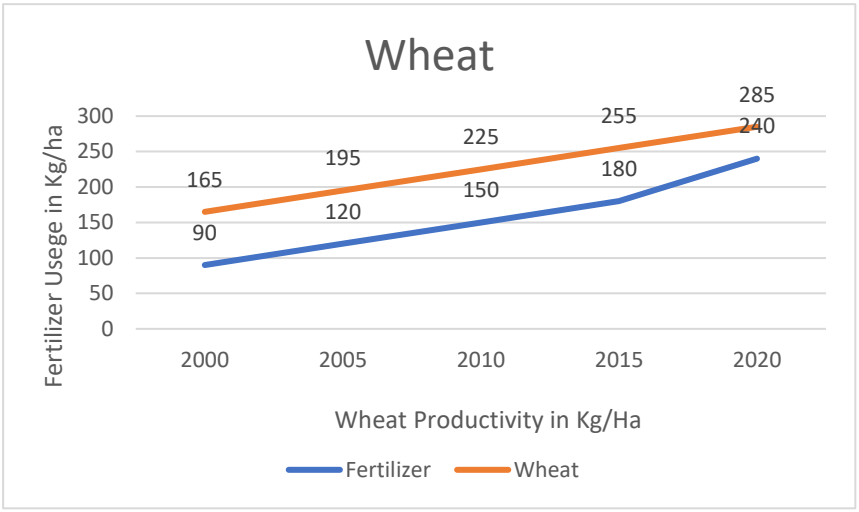


Fig. 8.2 Fertilizer vs Productivity: Wheat

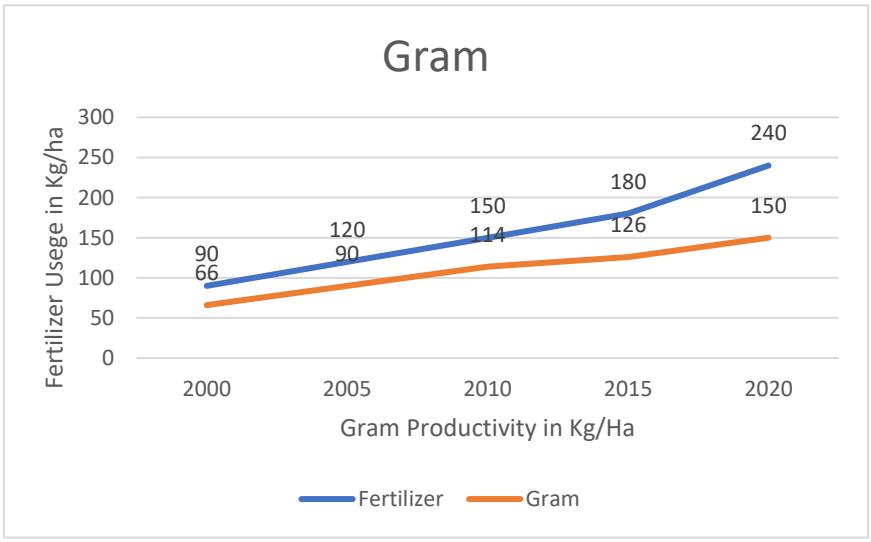


Fig. 8.3 Fertilizer vs Productivity: Gram

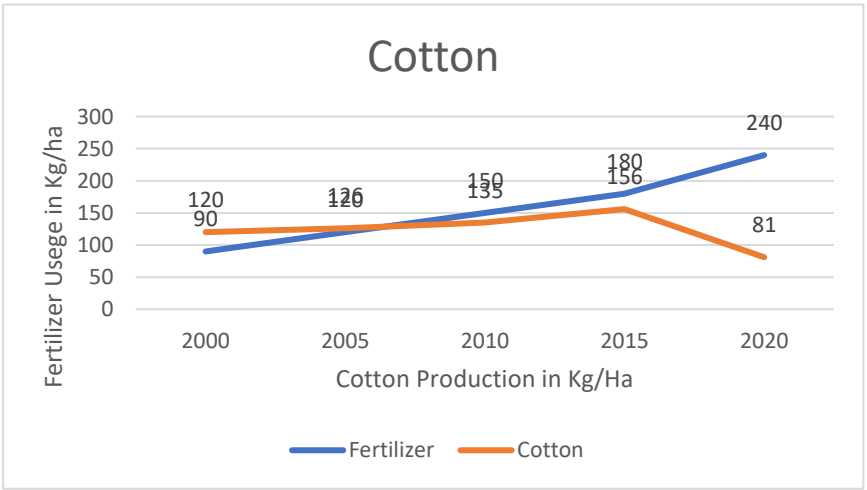


Fig. 8.4 Fertilizer vs Productivity: Cotton

The above graphs show that the productivity of groundnut, wheat, gram is increasing due to an increase in fertilizer usage. But the productivity of cotton is decreasing with an increase in fertilizer usage. Therefore, it is important to undertake crop rotation to maintain the fertility of the soil.

8.2 Industry

Before one decade, the economy of the village is dependent on agriculture. But now the people are going into industry as a daily worker. Some of them go in Reliance and the rest of goes in the brass industry situated in Jamnagar. The absence of farmers or laborers holding knowledge and experience of farming skills is resulting in alteration in the agriculture practices and affecting the productivity.

CHAPTER-9

ANALYSIS OF SOCIO-ECONOMIC SURVEY

9.1 Civic Amenity

Times are changing and in this modern time, 72% of the respondents have a toilet facility in their house. And rest 28% of respondents do not have access to a toilet facility in their house. To achieve 100% toilet facility in the village the government schemes launched must be relooked and the reasons worked out. Health awareness camps need to be taken up more frequently till the village achieves 100 % toilet facility within their houses. It is a sign of poverty and failure of the government in spreading health awareness related to sanitation.

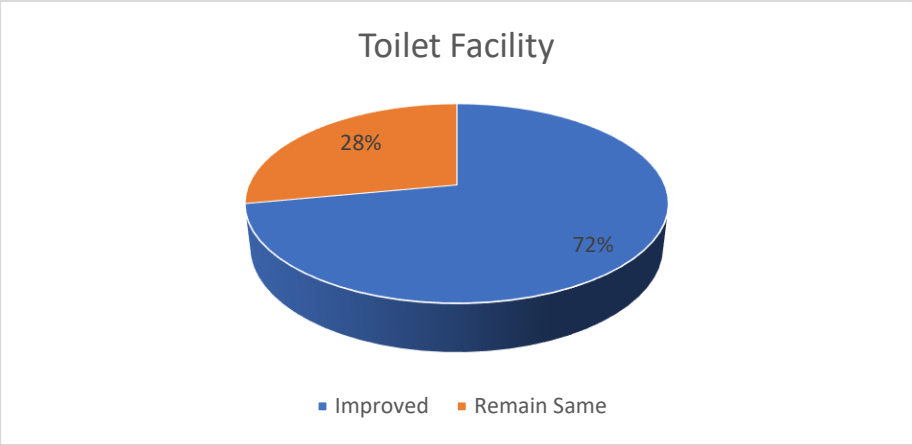


Fig. 9.1 Civic Amenity

9.2 Occupation

Almost 99% of the respondent belong to the farmer community and the primary source of income is farming. But some of the respondents have a secondary source of income such as income from brass industries, grocery shops, jobs, brokers, etc.

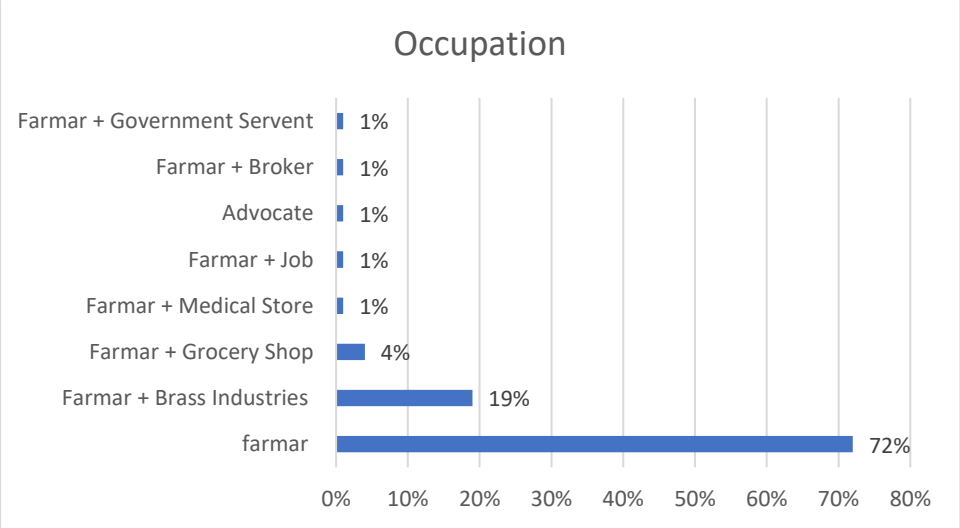


Fig. 9.2 Occupation

9.3 Classification of Farmers based on land Holding

The landholding records show that 2% of the respondents are marginal, 8% are small, 48% were semi-medium, 39% were medium and only 3% were large farmers. Most of the farmers belong to the semi-medium category.

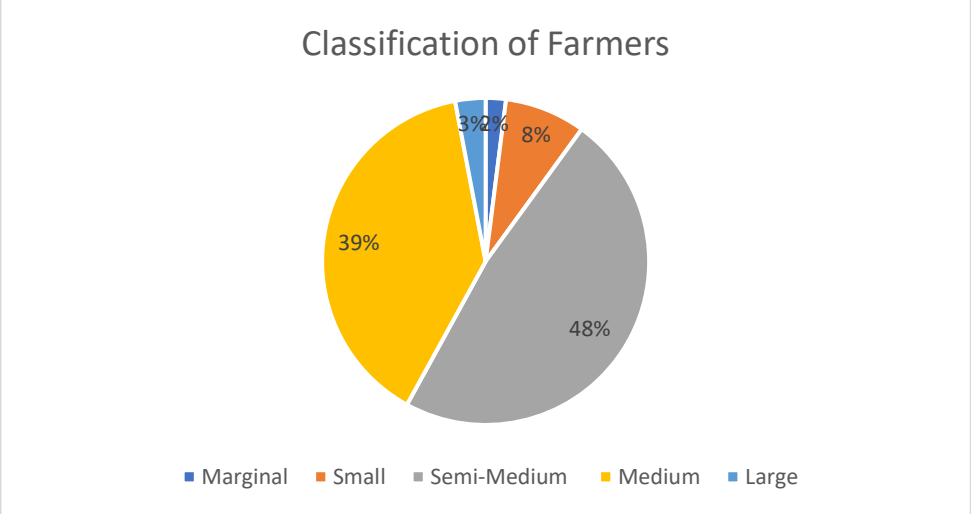


Fig. 9.3 Farmer Classification based on landholding

9.4 Cropping Season

- 19% of the respondents undertake farming for all three seasons, while 75% take two seasons crops because of water availability.
- Only 4% of the respondents relied on rainfed agriculture and these represented the small farmers.

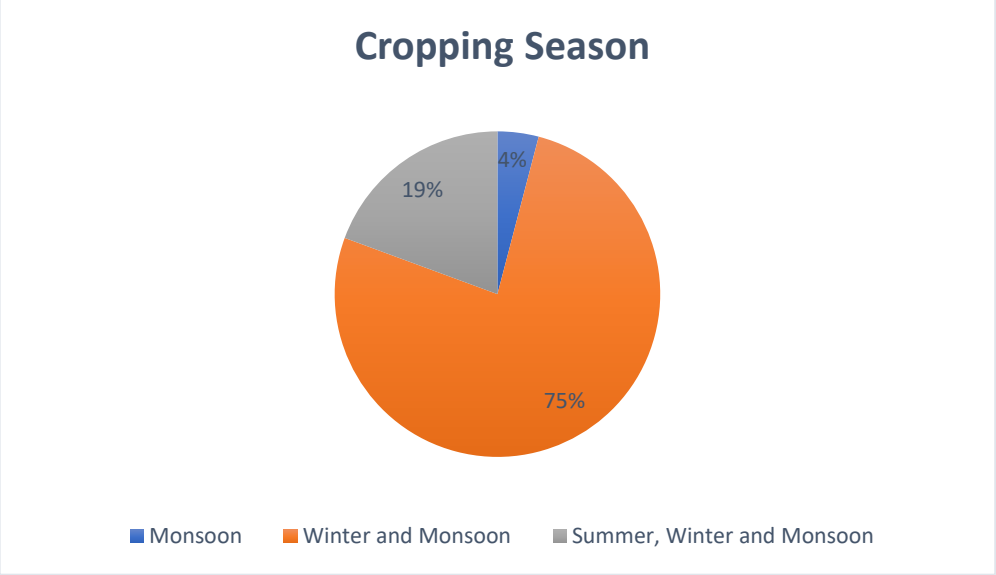


Fig. 9.4 Cropping Season

9.5 Labor for Farming

About 61% of the respondent say that they are laborers available for farming and 39% of the respondent have the problem of laborers. Those with the problem of laborers pay extra wages or call laborers from a nearby village. For small farmers, whose land is not more than 1 ha they undertake cultivation on their own. But they face problems during the harvest time when there is always a shortage of laborers.

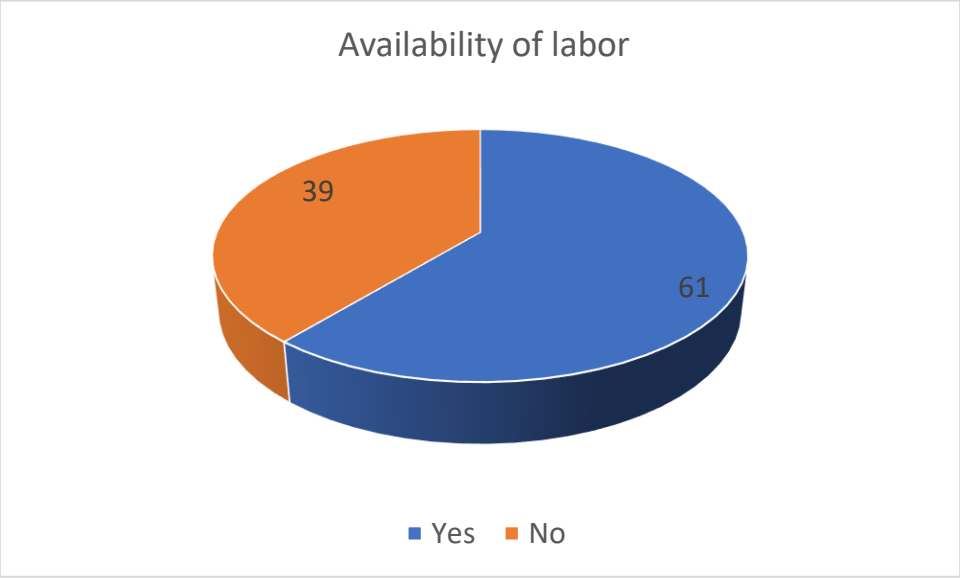


Fig. 9.5 Availability of labor

9.6 Purchase of Grocery items

purchase of grocery items	%
<50,000	5
50,000-1,00,000	17
1,00,000-1,30,000	17
1,30,000-1,60,000	21
1,60,000-1,90,000	19
>1,90,000	21

Table 9.1 Purchase of grocery items

The annual expenses towards the purchase of groceries differed. Maximum respondents spent around Rs 1,30,000- 1,60,000 and >1,90,000. The data reveals that there is a good number of spending towards the purchase of grocery items. One observation is that perhaps there is a shift in the agriculture pattern from food crops to cash crops which is forcing the farmers to purchase grocery items from the market.

CHAPTER-10

SUMMARY

- The Haripar village lacks 100% household toilet facility and most of the people have left education due to poverty
- The results of government schemes such as WASH is not visible.
- In the village, most of the farmers belong to the semi-medium and medium categories of landholding category.
- Almost 99% of the respondent belong to the farmer community and the primary source of income is farming.
- Productivity of crops such as groundnut, wheat, and gram has increased due to an increase in fertilizer usage, but the same is not true with cotton, where a decline is reported.
- There is crunch of farm laborers in the village due to availability of job in the nearby industries. The absence of farmers or labor holding knowledge and experience of farming skills is resulting in alteration in the agriculture practices and affecting the crop productivity.
- With the advent of smart phones and communication skills there is need to create awareness among the farmers on the recent agriculture changes and schemes by the government to bring in more productivity in the sector.

CHAPTER-11

CONCLUSION

Sustainable development of India's rural economy is vital for growth. However, finance is the biggest problem for development of rural economy. People in the rural areas area always in crisis as they are the ones who must face the brunt of the climate change issues whether it is drought or floods. Further, the issues get complicated with low land holdings and most of the farmers belong to the semi-medium category forcing them to borrow money in case of crop failures. It is here that they fall into vicious cycle and land up in hands of land sharks. The schemes formulated by government seldom reach the needy farmers and throws light on government failure to protect the small marginal farmers.

CHAPTER-12

REFERENCES

Savoor, R., 1998. Pollinator management: An eco-friendly green revolution eludes India. *Current Science*, 74(2).

Williams, I., 2002. Insect Pollination and Crop Production: A European Perspective. *Pollinating Bees*.

Maria Klein, A., Vaissière, B. and Cane, J., 2007. Importance of pollinators in changing landscapes for world crops. *Proceedings of the Royal Society B: Biological Sciences*, 274(1608).

Aizen, M., Garibaldi, L., Cunningham, S. and Klein, A., 2009. How much does agriculture depend on pollinators? Lessons from long-term trends in crop production. *Annals of Botany*, 103(9).

Aizen, M., Garibaldi, L., Cunningham, S. and Klein, A., 2009. How much does agriculture depend on pollinators? Lessons from long-term trends in crop production. *Annals of Botany*, 103(9).

HARTER, T., 2003. Groundwater Quality and Groundwater Pollution. *University of California*, 8084.

Thakur, M., 2012. Bees as Pollinators-Biodiversity and Conservation. *International Research Journal of Agricultural Science and Soil Science*, 2(1).

Kumar, A., Sharma, P. and Joshi, S., 2015. Effects of Climatic Factors on Agricultural Productivity in India: A State-wise Panel Data Analysis. 3(1).

Meena, A. and Meena, R., 2020. Climate Change and Its Impact on Agricultural Productivity in India: A Review. *Environment and Ecology*, 38(1).

Kumar, R. and Gautam, H., 2014. Climate Change and its Impact on Agricultural Productivity in India. *Climatol Weather Forecasting*, 2(1).

kjohl, M., Nielsen, A. and Stenseth, N., 2011. Potential Effects of Climate Change on Crop Pollination. *CEES*.

Chhabra, K. and Kumar, M., 2020. Agricultural Production with Changing Climatic Scenario. *Agriculture & Environment*, 1(2).

Singh, S. and Nayak, S., 2014. Climate Change and Agriculture Production in India. *EUROPEAN ACADEMIC RESEARCH*, 2(6).

Sayara, T., Hamdan, Y. and Basheer-Salimia, R., 2016. Impact of Air Pollution from Quarrying and Stone Cutting Industries on Agriculture and Plant Biodiversity. *Resources and Environment*, 6(6).

Chhonkar, P., Datta, S., Joshi, H. and Pathak, H., 2000. Impact of Industrial Effluents on Soil Health and Agriculture-Indian Experience. *Journal of Scientific & Industrial Research*, 59.

Skjærseth, J. and Skodvin, T., 2001. Climate Change and the Oil Industry: Common Problems, Different Strategies. *Global Environmental Politics*, 1(4).

Indian Council for Research on International Economic Relations (ICRIER), 2010. Socio-Economic Impact of Mobile Phones on Indian Agriculture. 246.

Moura, T., Vale, C., Helena, M. and Spyrides, C., 2020. Subsistence Agriculture Productivity and Climate Extreme Events. *Atmosphere*, 11(1287).

Dhaliwal, S., Naresh, R., Mandal, A., Singh, R. and Dhaliwal, M., 2019. Dynamics and transformations of micronutrients in agricultural soils as influenced by organic matter build-up: A review. *Environmental and Sustainability Indicators*, 1(2).

Swindale L.D., Virmani S.M., Sivakumar M.V.K. (1981) Climatic Variability and Crop Yields in the Semi-Arid Tropics. In: Bach W., Pankrath J., Schneider S.H. (eds) Food-Climate Interactions. Springer, Dordrecht.

2011. *District Census Handbook Jamnagar*. 25th ed. Directorate of Census Operations, Gujarat.

2001. *District Census Handbook Jamnagar*. 25th ed. Directorate of Census Operations, Gujarat.

ANNEXURE