A STUDY ON THE IMPACT OF FARM POND UNDER THE WATER RESOURCE DEVELOPMENT PROGRAMME OF AKRSP(I) IN DANG, GUJARAT

Dissertation Submitted to

The IIHMR University, Jaipur

for the partial fulfilment for the award of the degree of

Master of Business Administration (MBA)

in

Development Management

By

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Under the Supervision and Guidance of

Dr. Himadri Sinha

2024

AGA KHAN RURAL SUPPORT PROGRAMME (INDIA)

AKRSPI/DNG/ADM/11/2024 Date: 2nd July 2024

INTERNSHIP CERTIFICATE

This is to certify that **Mr. Kiran Shravan Ambavane** from **IIHMR University, Jaipur** has successfully completed 80 Days of Rural Internship with Aga Khan Rural Support Programme (India) in The Dangs district of Gujarat during 1st April 2024 to 20th June 2024.

The internship undertaken by him was on **"Study on impact of farm pond under water resource development and Regenerative Agriculture in Dang district."**

I hereby certify that the work conducted by him was good to the best of my knowledge.

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DECLARATION

I hereby declare that this dissertation A *Study on Impact of Farm Pond under Water Resource Development Program of AKRSP(I) in Dang, Gujrat* is the bonafide record of my original research work. I declare that it has not been submitted to any other university or institution for the award of any degree or diploma. Information derived from the published or unpublished work of others has been duly acknowledged in the text.

Place: IIHMR University, Jaipur

Date: 5th July 2024

Kiran Ambavane

Name of Student

IIHMR UNIVERSITY

CERTIFICATE FROM FACULTY GUIDE

This is to certify that the dissertation titled *'A Study on Impact of Farm Pond under the Water Resource Development Programme of AKRSP(I) in Dang, Gujrat'* is a record of the research work undertaken by Mr. Kiran Shravan Ambavane in partial fulfilment of the requirements for the award of the degree of MBA Development Management from the IIHMR University, Jaipur under my guidance and supervision and his/her approach to the research study has been sincere, scientific, and analytical.

Faculty Guide: Prof. Himadri Sinha
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Date: 5th July 2024

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ACKNOWLEDGEMENT

I want to express my sincere gratitude to all the people who have helped me along the way to finishing this dissertation. Their persistent support, direction, and contributions helped to mold this work into what it is now.

The organization's esteemed manager, *Mr. Piyush Chaturvedi, Senior Research Manager, Ms. Reema Kachhap, and all the AKRSP (I) team*, deserve my sincere gratitude. Your immense knowledge, endurance, and astute criticism have been crucial in determining the course of this research.

I would like to express my profound gratitude to *Dr. Himadri Sinha and, the Dean of the School of Development Studies at IIHMR University*. Their commitment to promoting an environment of intellectual growth and disseminating knowledge has greatly benefited my academic career.

My sincere gratitude is extended to my family and friends for their unflagging support and inspiration during this quest. They were the pillars of strength that kept me going through the highs and lows of this research trip because they had faith in my talents, were patient with me when I was stressed, and offered encouraging words.

I want to show my gratitude to my seniors, graduates, and colleagues since their varied viewpoints and intellectual contributions have helped me to comprehend more and have forced me to think critically, which has pushed me to polish and improve the quality of this work.

I want to express my sincere gratitude to everyone who was mentioned above as well as the several other people who quietly supported me in the background. No matter how minor or large, your input was crucial to the success of this dissertation.

Place: IIHMR University, Jaipur

Date: 5th July 2024

ACRONYMS

AKRSP(I): *Aga Khan Rural Support Program (India)*

WRDP: *Water Resources Development Program*

FP*: Farm Pond*

SDG*: Sustainable Development Goal*

ICAR: *Indian Council of Agricultural Research*

IWMI: *International Water Management Institute*

NGO: *Non-Governmental Organization*

SWC*: Soil and Water Conservation*

NRM: *Natural Resource Management*

GIS: *Geographic Information System*

PIM: *Participatory Irrigation Management*

M&E: *Monitoring and Evaluation*

EIA*: Environmental Impact Assessment*

SHG: *Self-Help Group*

CSR: *Corporate Social Responsibility*

IWRM*: Integrated Water Resources Management*

ABSTRACT

This study has been done in the Dang district of Gujarat. It examines the changes in agricultural practices and crop productivity of farm ponds, which are highly dependent on rainwater and present challenges to agriculture. This study focuses on the efforts of the Aga Khan Rural Support Program (India) [AKRSP(I)] to improve water availability and agricultural outcomes through farm implementation. Using a cross-sectional observational design, data were collected from 25 farms in two taluks, Ahwa and Waghai, and analyzed using descriptive statistics and visualization. It showed that Keyset ponds significantly increase water availability in fields, allowing farmers to diversify crops and increase productivity. Especially during Rabi season. As for the results generated after the intervention, the study recorded improvements in the yield of crops ranging from 7%. 17% to 21. 28% in different crops. Besides, the construction of plantations has expanded the area for the growth of irrigable crops, minimized the reliance on monsoon rain, and enhanced versatility in agricultural practices. The study points out the significance of farm households in enhancing the dependability of improved income, food security, and the economic well-being of the selected smallholder farmers in the Dang district.

Keywords: ***farm pond, impact, cropping pattern, crop productivity and cropping intensity, crop diversification***

CHAPTER 1
INTRODUCTION

1.1 Introduction

The performance of the agricultural economy continues to be weak despite the existence of multiple initiatives and efforts aimed at the development of the agriculture sector. Its strong reliance on the monsoon season is one of the key causes of its poor economy. Changes in the monsoon can result in both short-term and long-term crop failure. As a result, the seasonal variations in the winds can pose serious risks to the growth of the economy and the welfare of families that depend on the agricultural labor force. The farm's water collection systems need to be improved to improve the situation. In this way, farm ponds can be thought of as low-cost, simple-to-install rainwater harvesting systems that give farmers an extra supply of water in the year. In many developing countries, 70% of the population are farmers. To diversify the risks and challenges associated with maintaining their livelihood and sustaining their family, they thereby participate in a variety of livestock and agriculture-related enterprises. However, they fall under some of the services and support programs designed for bigger, more formalized farmer groups. Most small-scale farmers have limited access to technological inputs and support services, as well as limited control over policy. They feel they are being overpaid for their services and are inadequate providers of food for the country. Small farmers have difficulty finding customers, particularly in rural areas. As a result, their capacity to produce a wider range of goods and larger quantities is limited, making it more difficult for them to take advantage of the expanding market for agricultural products. The lack of post-harvest facilities for perishable goods, like fish, and limited market connections increase all these problems. Even though increased irrigation coverage has been recognized as a key strategy for improving agricultural productivity, India is still lagging, and rain-fed agriculture continues to be dependent upon monsoon changes. Strong reliance on groundwater for

irrigation has raised concerns about the sustainability of the resource over the long run in addition to causing depletion and quality loss. Within this context, small irrigation harvesting systems, like farm ponds, have been viewed as an effective way to help increase local water supply and improve the area's agricultural environment. Farm ponds have several benefits that might support small farmers in their efforts for growth. They store water, can be used to raise fish and other farm products like plants and crops, can be integrated with other farms, and can enhance and change the nutritional needs of farming families. Important and additional agricultural ponds can help with both income and employment.

1.2 Background of Dang

A tribal population that makes up 94% of the district, the Dang district is controlled by tribes. It includes an in-depth examination of the Dang district, water, irrigation, and tribal paper tribal. The Dang district's administrative center is located at Ahwa. There are three blocks in the Dang district: Ahwa, Waghai, and Subir. There are 311 villages in Dang district. The Dang has a total population of 2,28,291 and an area of 1764 km². Of these, 2, 16,073 are tribal, making up approximately 94.6% of the entire population, according to the Census of 2011. From 2001 to 2011, there was a 21.44% increase in population and a 768.8% increase in literacy.

Bhil, Konkana, Varli, Kotwalia, Kathodi, and Gamit are the most numerous tribes. The Bhil (4 chiefs and 10 Naiks) controlled the Dang before the arrival of British authority. There were 7426 Bhil, 6517 Konkani, 2491 Varli, and 302 Gamit counted in the first census conducted in 1872. While the other tribes migrated to the Dang in search of their means of livelihood, the Bhil have traditionally lived in the Dang. Although the tribes in Dang speak the native language, Dangi, they are literate in a variety of languages. Dangi is a language mix that includes Hindi, Marathi, and Gujarati. Of the approximately 94.65% of individuals who identify as tribal, 85% make their living from agriculture. Of that, 74% are

classified as BPL. This essay explores the different irrigation techniques used in the Dang area and tries to estimate their economic impact on indigenous communities.

1.3 Concept of Farm Pond

Agricultural ponds are small tanks or reservoirs designed to store water needed for rivers. By acquiring the best farm ponds it is possible to water plants, cattle fish, and more functions. “This is so because water is one of the most valuable natural resources on which our ecosystems and agriculture base their existence.” This paper focuses on agricultural reservoirs as significant in the management of soil and water used for many purposes in the exploitation to meet the needs of agriculture. Mainly used in agriculture, flood control, recreation, drinking water, fishing, animal drinking, fire prevention, etc. used for other purposes. Agricultural pools contribute to agriculture, employment, high income, etc. It has a positive effect. The soil it provides can be used in agriculture and the embankments in the fields can be strengthened. Farm ponds help increase soil moisture. These drainage structures also help store excess rainfall, thus preventing floods. Farm ponds dilute soil contaminants. Pond farming is a type of agriculture where two or more crops are grown together on the ground, which is more profitable and suitable for all large farmers [2]. An agricultural pond is a large pond, usually square or rectangular, dug into the ground that collects rainwater and stores it for future use. It has an inlet that controls the flow and an outlet that drains excess water. There is a small dam around the lake, which prevents erosion of the lake shore. Size and depth depend on the availability of land, type of soil, water needs of farmers, cost of digging, and availability of land to be excavated. Water from farm ponds is sent to the fields manually or by both methods. Depending on the size of the land used by farmers, farm ponds vary between 15×15×3 m3, 20×20×3 m3, 25×25×3 m3, and 30×30×3 m3 [3].

1.4 The Farm In areas that collect rain, ponds can be constructed for three different methods of irrigation as seen below.

• During the growth season, providing crops with the water they need.

• Meeting essential irrigation (CEI) needs for water throughout crucial phases of crop growth.

• Complete the water requirements in the cropping system approach (irrigation during the essential Kharif crop times in addition to the water requirements of rabbi vegetables).

1.5 Purpose of the Research

The purpose of this research is to evaluate the efforts of the Aga Khan Rural Support Program (India) [AKRSP(I)] on agricultural practices and crop productivity in the Dang district of Gujarat. The study aims to provide insights into how farm ponds can improve water availability, diversify crops, and increase farmers' economic outcomes.

1.6 The problem being investigated

Dang district in Gujarat faces significant agricultural challenges despite receiving about 2,000 mm of annual rainfall. Highly hilly areas and rocky terrains, such that rainwater does not percolate into the soil and runoff through rocky terrain, and inadequate water management infrastructures lead to water scarcity during critical agricultural periods. Farmers rely on monsoon-dependent crops, limiting their ability to diversify and increase productivity. This research explores how farms can reduce these problems by improving water management and crop productivity.

1.7 Context and importance of the problem

According to the month of October 2016 water survey was conducted. As a sample, representatives of about 17 villages are asking some questions related to water. Mainly drinking water, irrigation water, source of water, and distance from the source of water. Out of 17 villages, only 4 villages get water throughout the year, while the remaining villages face acute problems in March, April, and May. As per 2008 records in Dang district several RWSS (Regional Water Supply Schemes), IWSS (Individual Water Supply Schemes), open wells, and hand pumps are used. About 58%, 35%, and 6% of the population are using hand pumps, RWSS. Their lack of water harvesting structures.

Agriculture in Dang District is heavily dependent on the monsoon, thus exposing it to environmental change and water scarcity. The region's mountainous terrain and poor water management add to the problem, limiting farmers to low-yielding, monsoon-dependent crops. And 95% of farmers still practice old-fashioned agriculture to increase agricultural resilience, improve food security, and support sustainable livelihoods in this vulnerable region. Addressing water scarcity is critical.

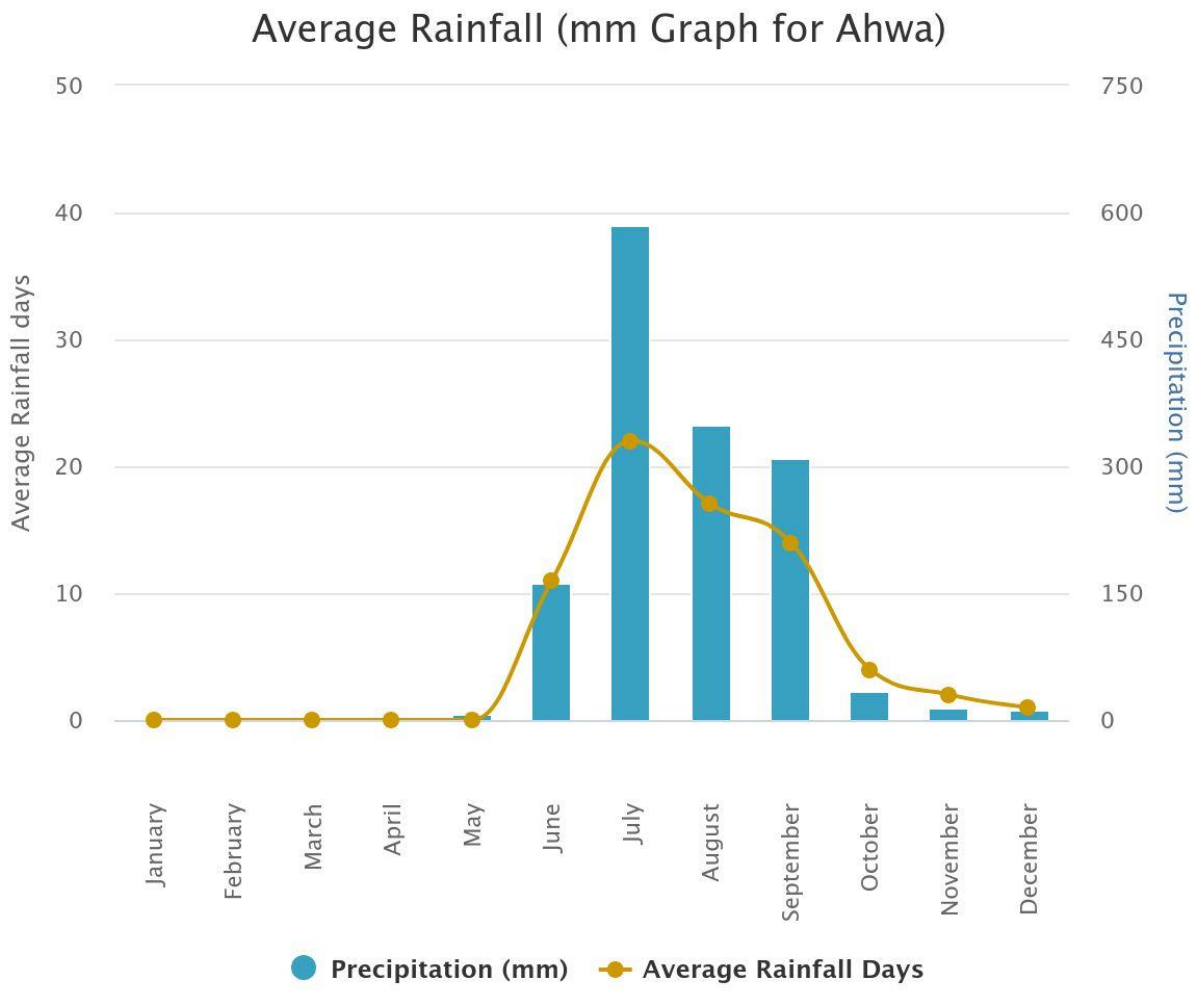

Figure 1 : average rain falls.

https://www.worldweatheronline.com/ahwa-weather-averages/gujarat/in.aspx

1.8 Objectives of this study

- To assess the farm pond for irrigation support for the agriculture activities in Dang district.
- To compare the crop pattern, diversification, and productivity before and after the farm pond activities

CHAPTER 2
LITERATURE REVIEW

The farm pond plays the main role in increasing water availability for irrigation, especially Rabi and summer during this critical stage of crop growth. farm ponds significantly improve water use efficiency by capturing and storing rainwater, which can save during these two seasons This ensures the water supply, and these farm ponds reduce the independence on erratic rainfall and increase the resilience of agriculture activity. *(Jha, 2020*) The farm pond plays the main role in increasing water availability for irrigation, especially Rabi and summer during this critical stage of crop growth. farm ponds significantly improve water use efficiency by capturing and storing rainwater, which can save during these two seasons This ensures the water supply, and these farm ponds reduce the independence on erratic rainfall and increase the resilience of agriculture activity. *(Jha, 2020*)

Farm ponds play a very crucial role in enhancing the extent of use of water through changes in management practices among the farmers. According to *Arya et al., (2019)*, such ponds proved to be lifesaving in providing water during periods of drought and thus served as water supply for irrigation. The farmers can avail water for irrigation from the farm ponds when the natural monsoon water is unpredictable and, thus, there is a stabilization of agricultural yields *(Sharma et al., 2020*). In addition, farm ponds have a positive effect in replenishing the groundwater, making an input to the sustainability of water in the local region *(Shankar and. Shivakumar, 2005).*

From farm pond construction This increase in income is direct since crops can be grown for two seasons instead of just one, therefore allowing more crops to be sold. The decrease in migration has had a positive effect on the health of beneficiaries because now they have a sufficient supply of water and food, they can improve their houses and live with less suffering *(Pauline & Chandrasekaran, 2021)*

As reported *by Minakshi Jakhar and RN Sharma (2022)* Since the construction of farm ponds, all the crops including vegetables showed a positive direction change for average productivity, i.e. increase in productivity. The construction of farm ponds led to a remarkable change in the pattern of cropping, more crops were grown per unit area, increased productivity of crops including vegetables, which increased their annual income, and farmers more welling into agriculture. Crop diversification is another significant benefit of the farm pond availability of farm pond allows farmers to experiment with different crops including vegetables and horticulture which are more water incentives but yield higher returns. *Chandrasekaran et al. (2012)* observed that farm ponds in Karnataka facilitated the cultivation of diverse crops such as fruits, vegetables, and spices, contributing to increased agricultural biodiversity and farmers' livelihoods.

It is quite common to notice changes in exercises that involve the cultivation and production of crops immediately after the introduction of farm ponds. To water sources farmers with reliable access to water are more likely to shift from rain-fed crops which can be significantly limited by water deficiency to high-value crops which commonly require more water. This change not only diversifies the crops being grown but also enhances the cash income in the farm as the new crops grown are orientated towards the market. In the case of a similar study done in the semi-arid parts of India, the constructed farm ponds contributed to the annual diversification of crops as farmers could also expand their production into fruits, vegetables, as well as other commercial crops apart from staples like paddy and wheat *(Dinesh Kumar Nayak, 2016*)

Farm ponds are closely reachable to the productive values of crop output. Given that water is essential for crop production, crops are likely to grow in quantity and quality with the provision of assured irrigation, as noted in some understudies by *Singh, Singh, and Rani (2016).* It helps prevent crop failure during certain months of the year, which is a result of proper irrigation when plants are growing, hence

better crop health and yield., *Joshi et al. (2018*) carried out a study in Gujarat and established that farms that had ponds felt a productivity boost of between 20- 30 percent compared to the farms that did not have water sources. Secondly, through the development of farm pond structures, it is possible to have multiple cropping each year, thus enhancing cropping intensity and overall production of crops in this area *(Rathore et al., 1996)*

Apart from the agrarian/utilitarian values they inculcate, the social and economic prospects of farms are also significant. Women are getting involved in agriculture due to the increase in water storage from farms. This increase in agricultural production productivity, fish farming, and diversification improves household economic income, food security, and overall quality of life *(Sahu et al., 2020*). Also, they have been useful in examining climate variability; Farmers can get water from ponds during dry periods or any type of weather uncertainty *(Kumaran et al., 2020).*

CHAPTER 3
METHODOLOGY

3.1 Methodology

A study was conducted to assess the crop diversity and farm ponds for irrigation on farmers' lives in the Dang area. Field data for the study was collected from two talukas of the district, Ahwa, and Waghai, where farm plots are used for crop cultivation and fish farming. 25 farm ponds were selected for a detailed field survey. To test the results, 25 farm ponds were taken as "treatment groups". Farmers were selected from the villages where farms were constructed. Farm ponds were selected in 10 villages of 2 taluks using a random sampling procedure.

Simple random sampling was used to identify subsequent farm ponds. The main objective of this study was to assess the farm pond for irrigation support for the agriculture activities of farms on crop cultivation and income which shape the social status of the adopters.

Primary data was collected through the survey method using a questionnaire. A pre-designed semi-structured interview schedule was used to interview participants from each village after visiting their farm pond site. Interviews add to their business. Articles, presentations, and relevant data from AKRSP(I) organizations were referenced in the study. Relevant quantitative and qualitative tools have been used for analysis.

3.2 Duration of Study

The study was conducted for a period of 90 days, but as per the organization's need, the study was conducted for 45 days, and along with that we worked on regenerative agriculture for 40 days.

3.3 Type of Study: This study was an observational study and cross-sectional study study.

3.4 Sample Size: 25 Farm Ponds,

3.5 Sample Techniques: simple random sample

3.6 Data Analysis Tools: Microsoft Excel, Kobo data collection**,** SPSS,

CHAPTER 4
ANALYSIS OF FINDINGS

In the present study water management under AKRSP(I) An observational cross-sectional study design was used to assess the impact of the (Farm Ponds) program on beneficiaries and farmland and cropping practices. A survey of 25 farm ponds was conducted in this study. Data collected were analyzed using Microsoft Excel to generate descriptive statistics and visualizations. has been done, which has facilitated the explanation of the impact of the farm pond. In this study, based on an analysis of my study objectives and research questions, the entire analysis process of this research has been done, and here are their primary and secondary categories. It is divided into two categories.

Primary categories: Research question

- What is the effect of farm ponds on the agriculture practices of farmers and the crop productivity in the Dang district of Gujarat?

Second category:

To assess the farm pond for irrigation support for the agriculture activities in Dang district.

- To compare the crop pattern, diversification, and productivity before and after the farm pond activities.

  In this research these two categories provide valuable insights to make the appropriate suggestions and where the suggestions are more sustainable.

4.1 General Profile of the Respondents

a. Age of respondent: As shown in Figure (4.1), in the farms we have currently selected, from the visits and interviews with the farmers in those farms, 54.17% are women while 45.83% are men. In terms of quality, this indicates that women's participation is increasing. As there is no water for twelve months, some farmers leave their village and go to other places for their livelihood or go to other places in the city and try to make a living from it. Due to this, the participation of men is less in this place and the participation of women is more. Make a living.

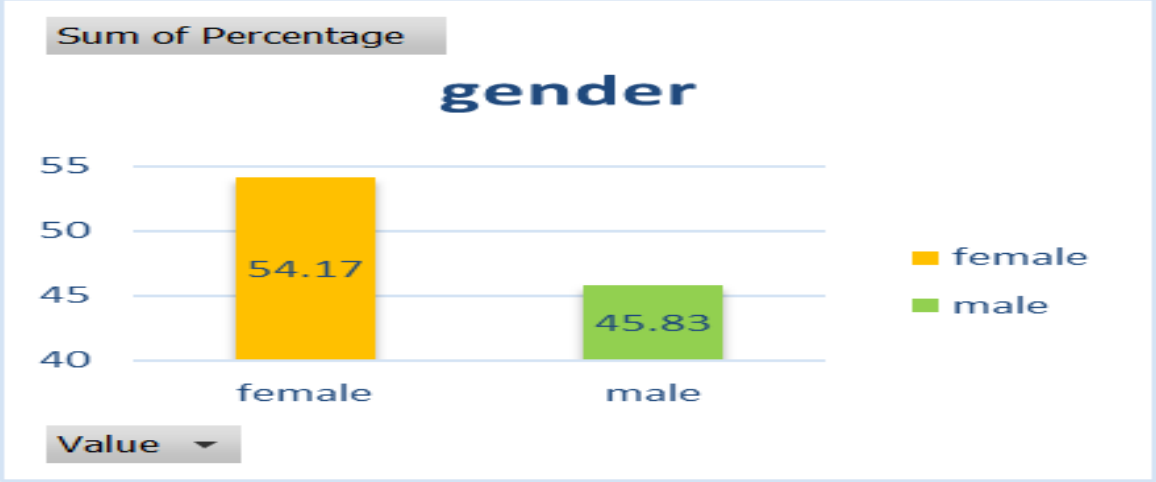

Figure 4.1 Age group of respondents

4.2 Water Harvesting Structures for Irrigation

a. Respondents who had water harvesting structures before the project: It was found that nearly 54% of the respondents had water harvesting structures before the initiation of the current project (Table 4.1). Respondents had water harvesting structures before the project the data presented in shows that the majority (33.3%) of the farmers have no sources of irrigation, while (54.4%) percent of the farmers have rivers and wells for irrigation. But it does not store water throughout the year. Dang district in Gujarat is a full-leafed hilly area, where the normal rainfall is 300 mm, but in this hilly area there is no stability of rainwater, and because the river flow is descending, the river also enters the river. 12 months without water,

respondent	Percentage
yes	54.17
no	33.33

Table 4.1 Water Harvesting Structures for Irrigation.

4.3 Water sources

b. Farmers use water for agriculture from different sources: As shown in Figure (4.2), About 52 % of the farmers use river water for they identified water as the most significant resource used in farming. This high usage of water from the river is suggestive of the fact that water from this source is the most readily available source of water. It does this by implying that the availability and accessibility of water from a river is imperative to agriculture. 18% of the farmers use both rainwater harvesting and wells while 18% of the farmers use either rainwater harvesting or wells. Rainwater outdoes the importance of the rainfall in the region and the input of farmers in ensuring that they collect and use as much rainwater as possible. Therefore, wells also show a dependence on groundwater as the second source of water following rivers, especially during dry seasons or limited availability of river water. Borewells are used by 16 of the total population, this is because Borewells are drilled wells that can be used to access water underground, and hence x from the total population has access to Borewells for their water needs. 12 % of the farmers. This suggests that the extent of dependence on deep groundwater in this area has a moderate level of dependence on deep groundwater extraction. The low number of interventions from this source could be because of the high cost and technicalities in drilling and maintaining borewells.

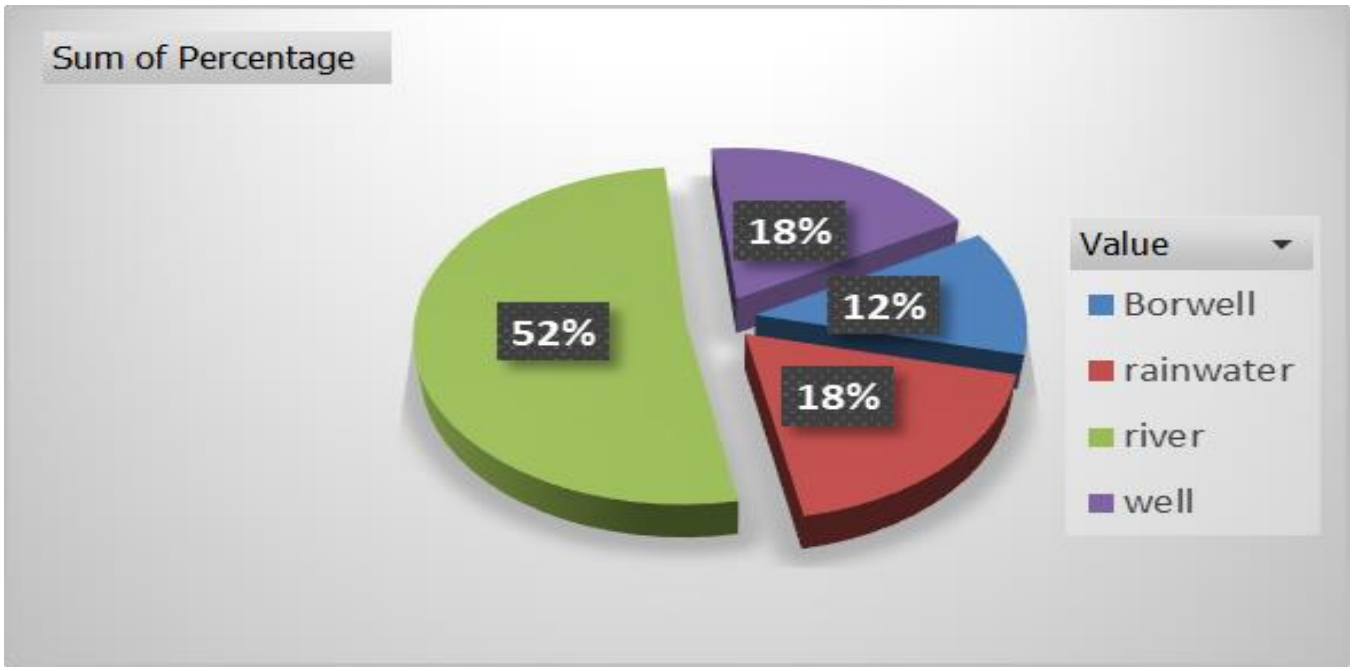

Figure 4.2 water sources available

4.3 Before and after cropping the pattern

c. Before farm pond Cropping Pattern: As per figure (4.3) Through 87.5% of the land under cultivation during the Kharif cropping season, almost all the agricultural area was used for farming before farm ponds were constructed. By comparison, the Rabi cropping season contributed to only 45.83% of the total area, a much lower percentage. This significant difference suggests that farmers' crops were mostly dependent on the monsoon-driven Kharif season, probably because there were not enough supplies of water for irrigation during the Rabi season. The implementation of farm ponds has the potential to mitigate this imbalance by offering a stable supply of water. This will increase the sustainability of Rabi agriculture and promote more equal land usage during both cropping seasons.

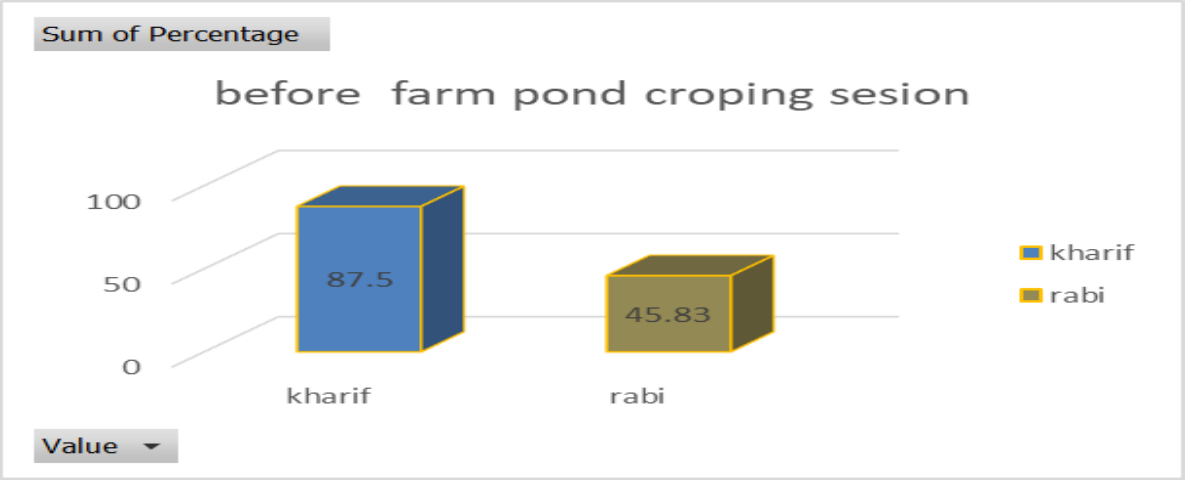

Figure 2.3 Before farm pond Cropping Pattern

d. After farm pond Cropping Pattern: as per (figure 4.4) This has been a noticeable change in the cropping patterns for the Kharif and Rabi seasons, as seen by the bar chart that shows the period following the construction of farm ponds. The percentage of the land under cultivation during the Kharif season dropped to 33.33%, as 87.5% of the land is currently used for Rabi season cultivation. This sudden change indicates that farming activities have been greatly impacted by the construction of farm ponds. The main reason for this change is the increased availability of water during the Rabi season, which was formerly limited by a lack of reliability of irrigation sources. Farmers can now store water during the monsoon and use it for irrigation during the Rabi season because of the construction of farm ponds. They are therefore less reliant on the monsoon rains. And can cultivate their crops more effectively throughout the year.

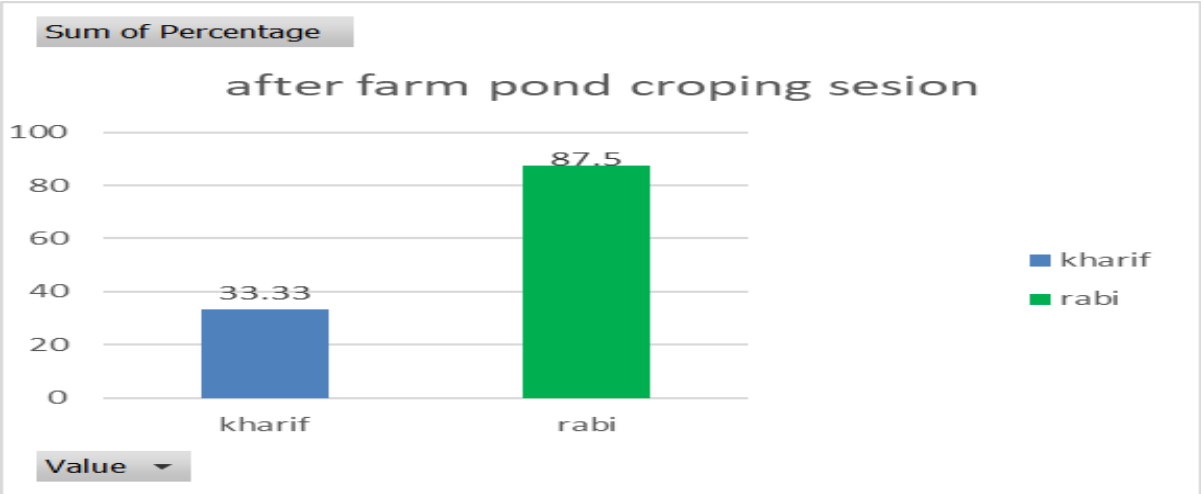

Figure 4.4. After Farm Pond cropping Pattern

4.4 Water storage capacity (In Ltr)

e. The beneficiaries of the average water storage capacity of a farm pond: Table (4.2) shows a wide variation in water storage capacity which can range from a minimum of 126,000 liters to over 3.2 million liters. These large variations reflect differences in pond size and style, which may be due to differences in the size of the specific fields they serve, water needs, investment in available ponds, and many other factors. All added up and averaged, the figure comes to 1,513,279. The region has the potential to support agricultural production by providing water that can increase production and reduce the need for different types of activities.

	Minimum	Maximum	Mean	Std. Deviation
Water storage capacity	126000.0	3237646.0	1513279.522	740587.9026

Table No.4. 2 Water storage capacity

4.5 Water availability

f. Water availability throughout the years: *The Figure **(4.5)*** 'Water Availability' from which information regarding the availability of water has been taken, although classified into four different colors. The categories and their corresponding availability levels are as follows: Category 8 in blue, reveals that the water availability level is at 4 units. Yellow representing Category 9 possesses the lowest availability level of water, which is 1 unit. Category 10 illustrated in red has a water availability level of 3 units, categorization as moderately available. Finally, the partially saturated hydrological level of the last Category 12, colored green, has the maximum number of 10 units on the availability scale. Regarding water availability, a dramatic difference can be observed in the quantity within these categories, in which Category 12 has had access to the largest amount of water and on the other hand, Category 9, the smallest.

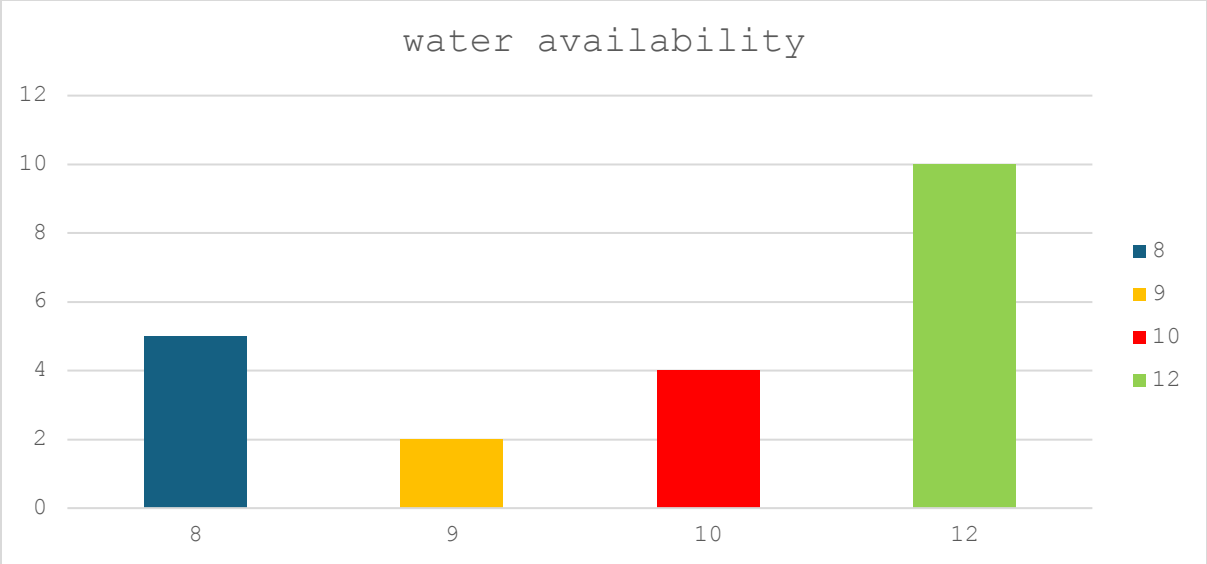

Figure 4.5. Water availability throughout the years

4.6 farm pond water for agricultural activities

g. Farmers use farm pond water for different agricultural activities: In this pie chart figure (4.5) shows the proper use of farm water. Agriculture accounts for the largest share of water, followed by fisheries at 40%, Stoeckel et al. 2009 highlight the fact that fish farming is popular among farmers. Crops and vegetables require the most resources with a share of 33% for agricultural activities, especially for fish rearing in ponds. Overall, plantations are the second largest consumers, using only 25% of the water, proving the need for ponds that support orchard farming and tree planting. Finally, the remaining 2 percent is considered for various agricultural needs, Fig. 4.5, Therefore, agricultural ponds are useful as a multi-purpose water supply source for supplying water for various agricultural activities. Overall, the table shows that regardless of the type, agricultural ponds can be designed to meet a wide variety of needs.

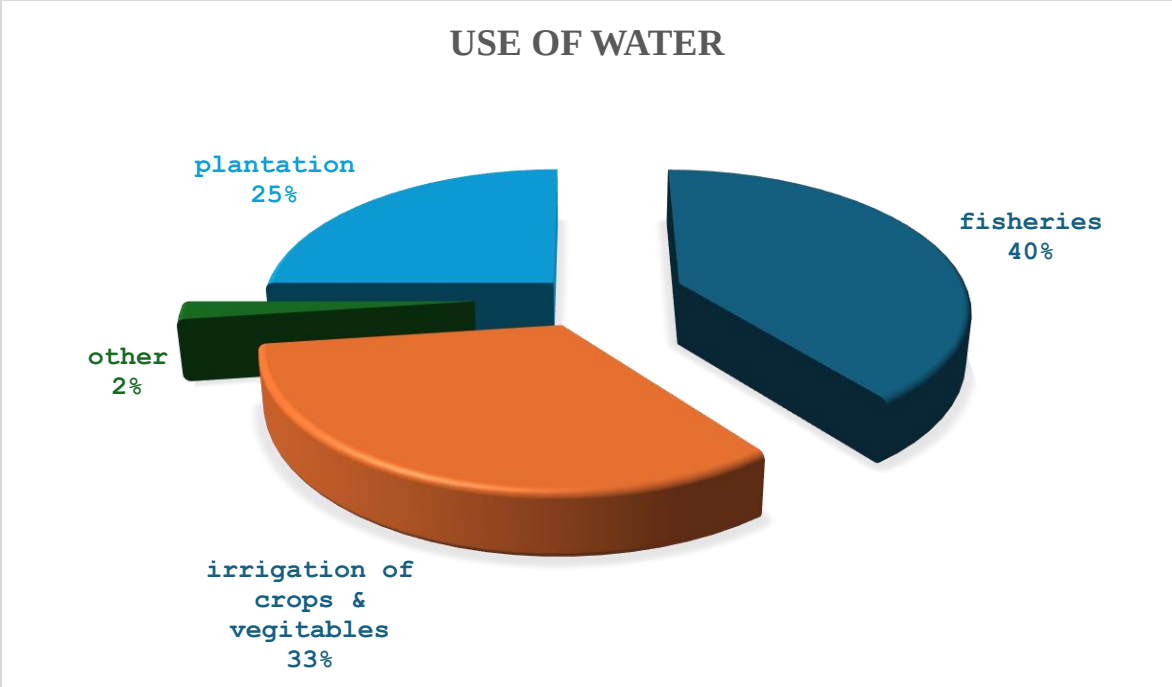

Figure 4.5: Use of farm pond water for agricultural activities

4.7 Crop Diversifying

Activities such as the latest construction of irrigation structures like farms have helped to address issues on yield crop production and diversity during Kharif and Rabi. Relative numbers provided in the data also demonstrate the overall substantial rise in productivity of all cultures having a variation from 7. 17% to 21. 28%. These changes imply that improved water availability can transform agriculture whereby a farmer is likely to move to other production of crops or tend to produce more within a given land area. This farming diversification results in the development of cropland risk-sharing rain and crop-dependent farming systems. Altogether, water resource interventions hold the fundamentals of enhancing the sustainability and productivity of agricultural activities with a focus on improved sustainability.

4.8 **Crop productivity**

h. After farm pond construction crop productivity: as per table (4.3) Data comparing crop productivity before and after the implementation of the intervention showed significant improvement in various crops in both the Kharif and Rabi seasons. Before the farm pond intervention, Bhat, nagli, varai, and udid crops showed low productivity. However, after the interventions, productivity increased significantly: Paddy increased by 11.72%, Nagali by 7.17%, Varai by 16.64% and Udid by 17.52%. These improvements indicate that measures implemented such as improved irrigation techniques or better crop management practices have increased production during the kharif season.

Similarly, during the Rabi season, the productivity of crops such as chickpeas, groundnuts, chilies, brinjal, okra, and kale also improved. For example, chickpeas grew significantly by 21.28%, while okra grew by 11.40% and kale by 17.20%. This increase suggests that the intervention was successful in

adapting agricultural practices during the dry season, possibly through enhanced water.

No of farm ponds=25

S. No.	Crops	Productivity Before (Q/kg)	Productivity After (Q/kg)	Percent Change
Kharif 1	Bhat	26.43	32.11	16.64%
2	Nagali	10.86	12.12	7.17%
	Varai	13.78	16.03	11.72%
4	Udid	8.89	10.88	17.52%
Rabbi 5	Chana	38.93	48.21	21.28%
6	vatana	12.44	14.59	14.90%
7	Ground Nut	46.24	50.77	7.54%
8	Chili	13.87	16.53	16.71%
9	Brinjal	50.06	58.1	13.68%
10	Bhindi	242.51	275.83	11.40%
11	Karle	70.57	84.47	17.23%

Table No. 4.3 crop productivity

4.9 Expansion of irrigated area

If yes, total landholding (size acre)	irrigated land (acre)	% increase in Irrigated land

i. Total % land irrigation through a farm pond: Table (4.4) shows the changes in landholding sizes and irrigation levels for various plots of land. The table presents the total landholding size in acres, the amount of irrigated land before and after a certain period, and the percentage increase in irrigated land. Notably, the irrigated land increased significantly in most cases, with many plots showing over 50% improvement in irrigation. For instance, several plots such as those with initial irrigated areas of 1 acre expanded to 2 acres, reflecting a 50% increase. There are instances of even higher increases, such as an increase from 1 to 1.5 acres representing a 66.67% increase, and from 0.5 to 2 acres representing a 25% increase. The highest percentage increases were observed in cases where irrigation levels doubled, notably from 1 to 2 acres and from 1.5 to 3 acres. Overall, the total landholding covered is 60.8 acres, with the irrigated land increasing from 20.5 acres to 40.8 acres, indicating a substantial improvement in irrigation practices. The usefulness of irrigation improvements and their crucial role in raising agricultural productivity are highlighted by this data.

	Before	after	
2	1	2	50.00%
2	1	1.5	66.67%
2.5	0.5	1.5	33.33%
3	1	1.5	66.67%
3	1	2	50.00%
0	0	0	0%
2.5	0.5	1.3	38.46%
3	1	2	50.00%
5	1.5	3	50.00%
2.5	0.5	1.5	33.33%
3	1.5	2	75.00%
2.4	1	1	100.00%
3	1	1.5	66.67%
2.4	0.5	2	25.00%
2	1	1	100.00%
3	1.5	3	50.00%
2	1	2	50.00%
3	1.5	2	75.00%
3	1	3	33.33%
2	0	1	0%
2	0	1	0%
2.5	0.5	2	25.00%
3	1	1.5	66.67%
2	1	1.5	66.67%
60.8	20.5	40.8	

Table No 4.4: Expansion of irrigated area

Total Landholding Size:

Total Landholding = ∑ Total Landholding Size (acres)= 60.8 acres

Total Irrigated Land Before:

Total Irrigated Land Before = ∑ Before Total Irrigated Land 20.5 acres.

Total Irrigated Land After:

Total Irrigated Land After=After Total Irrigated Land=40.8 acres

Percentage Increase= (Before /After−Before) ×100

Summary table:

Metric	Value
Total Landholding (acres)	60.8 acres
Total Irrigated Land Before (acres)	20.5 acres
Total Irrigated Land After (acres)	40.8 acres

4.1.1 Cropping pattern

Farms have played an important role in increasing water availability during Kharif and Rabi seasons which increases crop yield and diversity. The data shows a substantial increase in productivity: in the kharif season, it includes Bhat 11. 72%, nagli 7. 17%, udad 16. 64%, and did 17. 52%, while gram in the rabi season includes gram 21. 28%, aeration 7. 54%, groundnut 14. 90%, chili 16. 71%, brinjal 13. 68. Such improvements point to the fact that some states have succeeded in achieving better water management as translated into cropping systems and crop yields. . . Also making agriculture more sustainable. This diversification helps reduce risk and dependence on any one crop, thus promoting sustainable development in agriculture. Thus, water storage facilities are very important to enhance crop production and ensure adequate agricultural production throughout the year.

CHAPTER 5
RESULT AND DISCUSSION

5.1 Introduction

The present study evaluated the impact of constructed farms on improving agricultural conditions and social and economic factors related to agriculture in the Dang district of Gujarat. 25 farms were sampled. The experiment yielded positive results in terms of crop yield increase and showed an increase in rice yield of about 16%. 64% and Udid and Karle production increased by 17. 52% and 21%. This increase was due to the availability of water from farms during those dry periods, particularly in the Midwest. Farms generate income for farmers and secure their income by producing high-value crops from traditional crops or produce. From a socio-economic perspective, farm ponds can empower communities, increase women's participation in agriculture, and increase food security among households. Impact studies indicated that farm ponds contributed not only to agricultural livelihoods but also to overall socio-economic growth in the rural context. In conclusion, the study shows that farm pond development can act as a catalyst for change and improvement in the quality of life of people living in semi-arid landscapes like Dang, Gujarat. After looking at various areas of improvement such as an increase in crop production, an increase in income reliability, and social and economic welfare of the people, it is worth noting the importance of water management in strengthening the quality of life of the people of the country. rural areas. Governments and other stakeholders should ensure that investments are sustainable and that relevant policies are in place to support the structure of agricultural ponds and sustain them, as well as to increase resilience to climate change and promote sustainable agriculture in water-scarce environments.

CHAPTER 6
CONCLUSION

The study indicates that the region's agricultural practices have been greatly improved by water management measures, especially the construction of farm ponds. More water is now available and can be stored because of these efforts, which has improved farming's sustainability and productivity. A more equitable use of land during the Kharif and Rabi seasons has been made possible by the transition from reliance on the monsoon to a sustainable year-round water supply, increasing crop yields and agricultural diversity. The fact that farm pond water is used for plantations, grain crops, and fisheries highlights how useful it is for a variety of agricultural activities. The effective use of these measures is demonstrated by the growth of irrigated land and the appreciable increases in agricultural output. Sustaining these improvements and enhancing farmers' livelihoods requires ongoing investment in water harvesting and irrigation infrastructure.

CHAPTER 7
RECOMMENDATIONS

1) It has been reported to be suitable for safe and long-lasting irrigation of fields. As a solution to this, it is suggested to construct the maximum number of farms in the Gujarat Dang district region as well as in drought-prone areas.
2) Farmers are to be encouraged by the district, taluka administration, or agricultural departments to avail themselves of the benefits of the farm pond scheme and how water conservation will change their lives.
3) It is important to interact with the farmers who have benefited from the farm pond program in the past so that they may inspire other farmers to build farm ponds and inspire a lot of confidence in them by providing real-world examples of successful farmers.
4) It is necessary to better understand farm ponds' potential contributions, including when they are beneficial and when they are not beneficial. To use pond water effectively for farming and addressing residential needs, it is important to fully comprehend the variety of uses for which it is employed. The advantages of having water could be greater than the advantages of just having fish.
5) The creation of more farm ponds has the potential to boost economic development in rural regions by boosting agricultural output, supplying high-quality food, increasing household income, and enhancing food security.
6) Training should be given in efficient water management and crop diversification techniques to maximize the benefits of farms.
7) Encouraging the integration of farms with other water conservation practices such as rainwater harvesting and borewells is essential to create a robust and resilient water management system.

Chapter 8
Case Study: Impact of Farm Pond Construction on Indrabhai Pawar

Inderbhai Pawar from village Temrungharta Borkhal Gram Panchayat in the Ahwa Taluka of Dang district is a 55-year-old man who is a farmer and who supports his family of 6. Because there are no reliable water sources, he was only able to cultivate one acre out of the three acres before 2016. The farmer's crops mostly depended on monsoon rains for rice, finger millet, small millet, and black gram which drastically affected his agriculture yield and income. As you saw, because of depending on seasonal rains, it became a real challenge for Inderbhai to give his family food and other necessities just during the entire year. The Inderbhai's difficulties were known to the Aga Khan Rural Support Program (India) [AKRSP(I)] since 2016, it assisted with the funds and training for the construction of farm ponds on his agricultural land. The conceived objective was to design a viable strategy for an inadequate supply of water and enhance the parcel by explaining to Inderbhai the pros of the farm ponds and certain cons if there were any. From this project, Inderbhai was able to practically boost his farming capacity to a high level hence enhancing his living status. Changes in the construction of the farm pond impacted Inderbhai by altering the practices as well as the economic state of the farmer. He utilized his entire 3 acres handsomely after he ensured his water source and was able to plant both rabbis as well as Kharif crops. He went on to grow paddy, little millet, and finger millet along with black gram during the Kharif phase by making use of a continuous water supply and minimizing the reliance on monsoon water. During the rabi season, through the diversification into tomato, brinjal, okra, and Karla, its revenues were found to have expanded significantly in the hands of Inderbhai. These high-value crops provided them with an income of more than INR 25,000 throughout the season and boosted their income level. Thanks to the farm

pond, Inderbhai also started fish farming; the farm was, thus, another source of revenue. This fish farming was generating almost INR 40,000 annually thereby supplementing the income of his family. With this extra income, savings, and investments in the family needs and farm implements improved. Moreover, the existence of a farm pond led to better practices of water supply and demand or what may be referred to as the sustainable use of water. Inderbhai collected water during the rainy seasons to use in the dry seasons so that his crops and fish would have sufficient water to survive. Thus, other farmers in Borkhal Gram Panchayat were prompted to consider the possibility of introducing similar measures to improve the efficiency and revenues from their farms with the help of the principles of sustainable use of water.

CHAPTER 9
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CHAPTER 10
QUESTIONNAIRE

Location Information's

Village:	GP
Clustered	Block: Ahwa
District: Dang	Date

Respondent Information:

Respondent Name: _____

Sex of the Respondent: a) male b) female

1) **Age of the Respondent:**
2) **Caste group:** a) SC b) ST c) PVTG
3) **Marital Status:** a) married b) unmarried.
4) **Total family members**
5) **Occupation** a) Primary b) Secondary
6) **Challenges before Farm Pond (Descriptive)**
   A)
   B)
   C)

Farm Pond Details:

7) **Size of the Farm Pond (hectares or square meters) y**
8) **Source of Water for Farm Pond:** a) rainwater, b) stream, c) canal
9) **Water storage capacity:**

1o) **Year of Farm Pond Construction**

11) **What was the primary purpose of constructing the farm pond**?

a) Irrigation of crops & vegetables

b) Plantation

b) fisheries

c) other

ADDITIONAL FARMERS

- several farmers connected with one farm pond. (1 2 3)
- What is the purpose of the farmers?
- Total covered area through farm pond for irrigation.

Details of fisheries:

types of fisheries: a) b) c) d)

total seeds quantity

how long does it take to grow?

Weight of fish

At the end of that quantity

Marketplace:

Total income

The expense of that:

seed	Feed	Labor	Trasport

Totals lose:

Net income

Details of the source of irrigation

12) **Do You have any water resources for irrigation before the farm pond:** a) Yes b) No

13) (if yes) Source of Irrigation Before Farm Pond (select all that apply):

a. River
b. Canal
c. Well
d. Borewell
e. Other (specify)

Before Farm Pond status of Irrigation Source:

14) **Did you have agricultural land?** a) Yes b) No

15) If yes, total landholding size (hectares or guna):

16) **Total cultivable land and before-farm pond?** a) Yes b) No

Season	**Irrigated area Before FP(Guntha/Hectare/Acre)**	**Non- Irrigated area Before FP(Guntha/Hectare/Acre)**
Kharif		
Rabi		
Summer		

Before the farm pond, Cropping season (Kharif/Rabi/Summer)

17) Crop Details and Productivity Before the Farm Pond.

Crop (Kharif)	Productivity (Quintal/ Acre)	Expenditure during the Kharif Season	Crop (Rabi)	Productivity (Quintal /Acre)	Expenditure during Rabi Season	Crop (Summer)	Productivity (Quintal/ Acre	Expenditure during the Summer Season	TOTAL INCOME
Total									

18) Consumption and sale of crops details before farm pond.

	Consumption (Quintals/Kg)	Sale (Yes/No), how much	If Yes) Total Income
Kharif Crops			
Rabi crops			
Summer crops			

19) **Government schemes for irrigation before farm ponds**. a) Yes b) No

20) **If yes, specify**.

After farm pond

21) **Total cultivable land and after-farm pond?** A) Yes b) No

Season	Irrigated area after FP(Guntha/Hectare/Acre)	Non- Irrigated area after FP(Guntha/Hectare/Acre)
Kharif		
Rabi		
Summer		

22) **After the farm pond, Cropping season (Kharif/Rabi/Summer**)

23) **Crop Details and Productivity after farm pond**.

Crop (Kharif)	Productivity (Quintal/Acre)	Expenditure during the Kharif Season	Crop (Rabi)	Productivity (Quintal/Acre)	Expenditure during Rabi Season	Crop (Summer)	Productivity (Quintal/Acre	Expenditure during the Summer Season	TOTAL INCOME
Total									

24) After farm pond, Consumption, Sale and Income Details

	Consumption (Quintals/Kg)	Sale (Yes/No), how much	If Yes) Total Income
Kharif Crops			
Rabi crops			
Summer crops			

25) What irrigation methods do you use with the farm pond water? (select all that apply)

Type of Irrigation	Before FP	After FP
Flood Irrigation		
Micro Irrigation		
Sprinkler		
Others		

26) **Availability of water in farm pond (No. of months) for irrigation**:

27) How satisfied are you with the farm pond's contribution to cultivating crops/vegetables/plantations?

28) To what extent has the farm pond increased your family's income from agriculture?

a. No increase at all
b. Minimal increase
c. Small increase
d. Moderate increase
e. Significant increase