PROGRESS AND UPTAKE OF SUSTAINABLE AGRICULTURAL PRACTICES

Under

Paramparagat Krishi Vikas Yojana (PKVY),

Including

Bharatiya Prakritik Krishi Paddhati (BPKP)

Project Coordinator

Prof. Ranjan Kumar Ghosh

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Mr. Ankit Saha

Ms. Akansha Agarwal

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CENTER FOR MANAGEMENT IN AGRICULTURE (CMA)

INDIAN INSTITUTE OF MANAGEMENT AHMEDABAD (IIMA)

VASTRAPUR, AHMEDABAD – 380015

Supported by

MINISTRY OF AGRICULTURE AND FARMERS WELFARE

GOVERNMENT OF INDIA

MARCH 2023

FINAL REPORT

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Needless to say, all the errors and omissions are solely my own. The analysis and views presented are personal and do not represent the position of supporting institutions IIM Ahmedabad or the Ministry of Agriculture & Farmers Welfare.

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EXECUTIVE SUMMARY

This study assesses the progress under an incentive based land clustering system in India that aims to subsidize investments for conversion of land to suit chemical free sustainable cultivation – called the Paramaparagat Krishi Vikas Yojana (PKVY). Under this program, farmers are required to form groups of minimum fifty members and achieve a cluster of fifty acres or more. The steps include following all the processes for a participatory guarantee scheme (PGS) certification which is a voluntary guideline to ensure chemical free farming. As part of the scheme, the central government provides financial support of Rs. 20,000 per acre of the land they contribute to participate in the clustering. In fact, a farmer committing to a group has to dedicate all of his or her land owned or leased for this program. Additionally, farmers receive financial support for conducting knowledge and skill development activities such as meetings, exposure visits, leadership training and training on farm management practices; certification and quality control activities such as online registrations for PGS, soil sample collection and testing, process documentations, field inspections and residue analysis; land conversion and production support such as organic seeds, new cropping systems, biological nitrogen harvest planting, botanical extracts production, liquid bio-fertilizers and bio-pesticides, phosphate rich manure and vermicomposting; and, machinery inputs such as implements, power tillers and threshers from customer hiring centers.

The scheme also incentivizes value chain participation by these farmer groups by supporting their activities for packaging, branding, labelling and selling to end consumers at high prices. PKVY is a sub-component of the soil health management scheme under National Mission of Sustainable Agriculture (NMSA). PKVY also aims at empowering farmers through institutional development through a cluster approach not only in farm practice management, input production, quality assurance but also in value addition and direct marketing through innovative means. The scheme was launched in 2015 by the Government of India and was launched under Participatory Guarantee Scheme (PGS) Certification.

As per the revised guidelines of PKVY in 2018, all forms of natural farming have been included under the scope of this scheme. Hence we also include adoption of practices under the Bharatiya Prakritik Krishi Paddhati (BPKP) which is more akin to natural farming as defined differently from organic farming. During the course of the study we realized that many states have some state-sponsored schemes that have the same objectives as PKVY. In these places the regional Directorates of Agriculture have made attempts to converge them. Hence, we have also included any useful information from those wherever available.

The implementation of this research study was coordinated by Center for Management in Agriculture (CMA) with the support of four Agro-Economic Research centers namely Gujarat, Bihar, Himachal Pradesh, and Karnataka. The study involved primary data collection in combination with certain focus group discussions and individual stakeholder interviews. This entailed direct communication with the farmers using a survey instrument which included direct and open questions to relevant cluster members. The questionnaire was used as a tool in order to understand the farmers' level of awareness regarding sustainable agricultural practices and also to understand the factors that persuade or dissuade farmers from entering under PKVY.

For every state, a total of 150 farmers were sampled across two districts including 100 samples for treatment farmers and 50 samples for control farmers. In total, the survey contained samples from 4 states, 9 districts, 20 talukas and 67 villages. Best attempts were made to average out on an equal number of C1, C2 and C3 level of farmers. About 47.5% of the respondents accounted for C2 level of farmers, 30.25% accounted for C1 level of farmers and 22.25% accounted for C3 level of farmers.

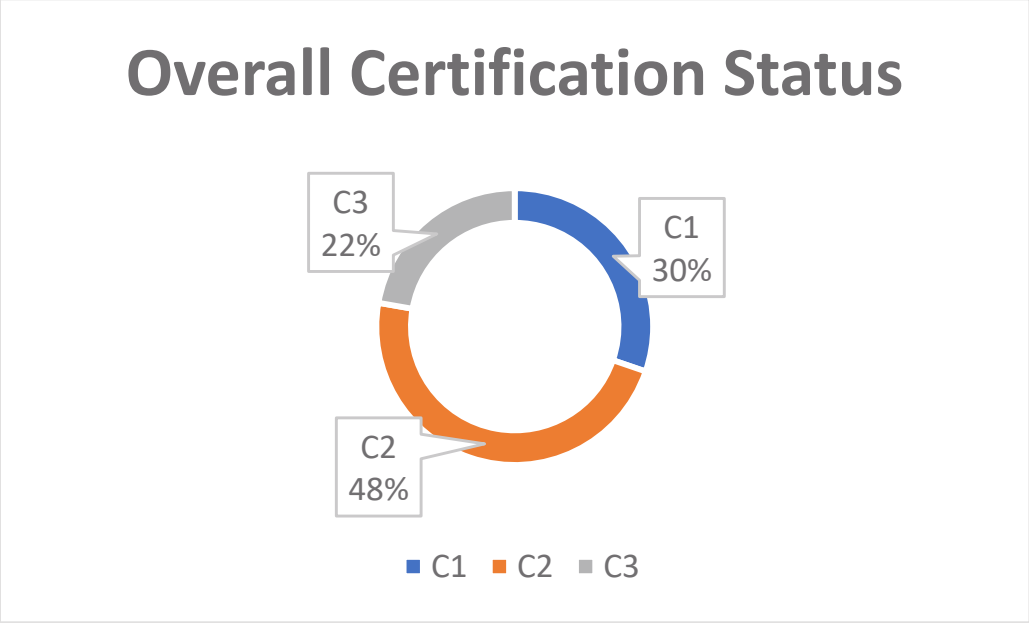

Figure: Overall certification status across four states

Organic farming has been found to have more productivity in rainfed areas when compared to conventional farming. Looking at the irrigation status in the table below, we can see Himachal Pradesh has the least area under irrigation (57.73%) followed by Gujarat (68.73%). Karnataka has 83.1% area under irrigation, while in Bihar, all the land is irrigated.

Table E.1: Irrigation status across select states

Irrigation status	Bihar	Gujarat	Himachal Pradesh	Karnataka	Overall
Average irrigated area (acres)	2.2	2.93	1.03	3.07	2.31
Operated area under irrigation (%)	100	68.73	57.73	83.10	77.39

Source: Own Compilation

The primary motivation of the scheme was to enable cluster farmers to pool their land together, so that a substantive portion of their farm could be used for sustainable practices. The table below sheds light on the status of land devoted to sustainable practices. Taking the average of four states, farmers have used 46.06% of their landholding for sustainable practices. Karnataka farmers lead with about 67.78% area of landholding being used for sustainable practices, while Bihar has the least area under sustainable farming, about 28.7%. In Himachal Pradesh and Gujarat, the average net operated land under sustainable farming is 34.96% and 52.79% respectively.

Table E.2: Area under sustainable farming

Status	Bihar	Gujarat	Himachal Pradesh	Karnataka	Overall
Average area devoted to sustainable farming (acres)	0.61	0.57	0.85	2.13	1.04
Operated area under sustainable farming (%)	28.70	34.96	52.79	67.78	46.06

Source: Own Compilation

We found that the main motivation for farmers to initiate sustainable agriculture practices were low cultivation costs due to low input costs, good financial assistance, good personal health, and better soil health conditions. Respondents in Gujarat and Himachal Pradesh mentioned reduced costs, good soil health, and health related benefits as the major drivers for adoption of sustainable practices. On the other hand, in Bihar, farmers were motivated by government subsidies and peer influence, followed by good soil health. Farmers in Karnataka reported soil health and other health related benefits as the major drivers for adoption of sustainable farming; peer influence and subsidy came next.

Despite the benefits there are certain barriers which discourage farmers to continue practicing sustainable agriculture practices. These are lack of incentives, improper price discovery and unavailability of proper marketing channels for the sale of the organically or naturally produced crops. Farmers across the four states reported lack of market linkages and appropriate prices as the biggest challenge for continuing organic or natural farming.

Considering the challenges, many farmers tend to discontinue sustainable agricultural practices. As is evident from the table below, 55.25% of the respondent farmers have continued with organic farming, whereas 44.75% have discontinued. In Himachal Pradesh, 96% are continuing sustainable farming, followed by Karnataka at 64%. In Gujarat, 51% of the farmers continue with sustainable farming, while in Bihar, majority of the farmers have discontinued, with only 10% willing to pursue sustainable practices.

Table E.3: Continuation of sustainable farming

Continuing with sustainable farming	Bihar	Gujarat	Himachal Pradesh	Karnataka	Total
No	90%	49%	4%	36%	179 44.75%
Yes	10%	51%	96%	64%	221 55.25%
Total	**100%**	**100%**	**100%**	**100%**	**400**

Source: Own Compilation

Analyzing our data, we conclude that sustainable farming practices are necessary to improve health, soil fertility and make agriculture long term and sustainable. However, farmers are willing to continue with sustainable practices in the future subject to the availability of proper marketing channels and price discovery mechanisms. Looking at production costs, we don't find much difference between sustainable practices and their conventional counterparts; although these practices tend to have delayed returns to investment. Thus, with proper planning and implementation, it might be possible to move from conventional towards a more sustainable crop production system.

CHAPTER

1

INTRODUCTION

1.1. Overview of PKVY

Paramparagat Krishi Vikas Yojana (PKVY) is a sub-component of Soil Health Management Scheme under National Mission of Sustainable Agriculture (NMSA). It aims at development of models of sustainable practices, without the use of agrochemicals, through a mix of traditional wisdom and modern science to ensure long term soil fertility, resource conservation, with a view to also help in climate change adaptation and mitigation[1]. PKVY aims at empowering farmers by institutional development through a cluster approach. It aims at better farm practice management, organic or natural inputs, quality assurance and value addition through direct marketing. The scheme was launched in 2015 by the central Government of India (GOI) and was launched under the Participatory Guarantee Scheme (PGS) certification. Currently, the funding pattern under PKVY is 60:40 by the central and state governments respectively.

The main objectives of the scheme are – to reduce the use of chemical fertilizers for growing crops; encourage farmers for adopting eco-friendly, technically-endowed and economical way of farming; make use of natural resources for agriculture; maintain the fertility of the soil; reduce cost of agriculture to farmers through sustainable integrated organic farming systems; and encourage farmer entrepreneurship through direct market linkages. The idea has been to mobilize the farmers and pool their lands to form clusters with 50 acres of land to be converted for organic farming. Every cluster would comprise of 50 or more farmers, and in a span of 3 years, 10,000 clusters are planned to be formed covering 5 lakh acres under organic farming (A. A. Reddy 2017).

After the formation of a cluster, farmers pledge to PGS and a cluster-head or lead resourceful person (LRP) is identified from the cluster. Members are provided training on organic and natural farming. Soil sample is collected and tested whereas the conversion into organic methods, inputs used, and cropping pattern followed are documented for PGS certification. The farmers do not have to bear the expenditure on certification. The expected outcomes are promotion of commercial organic production through certified organic farming; improve the health of soil, farmer, and the consumers; and raise farmers' income and create potential market for traders. A total of Rs. 500 lakhs have been allotted per

Awareness of PKVY scheme in Mandya district, Karnataka

[1] https://www.pib.gov.in/PressReleseDetailm.aspx?PRID=1695627

1000 ha cluster for implementation, certification, and value addition and marketing[2]. When implemented in 2015-16, PKVY was allocated Rs. 300 crores in the budget. A total of Rs. 88.58 crores were allotted to states for PKVY by Ministry of Agriculture and Farmers Welfare in the budget year 2021-22[3].

Bharatiya Prakritik Krishi Paddhati (BPKP)

BPKP is a sub-component under PKVY. It aims at the promotion of national indigenous practices and focuses on on-farm biomass recycling with major stress on biomass mulching, use of cow dung-urine formulations, and exclusion of all synthetic chemical inputs either directly or indirectly. This centrally sponsored scheme (CSS) aims to improve farmers' profitability, availability of quality food and restoration of soil fertility and farmland ecosystem as well as generate employment and contribute to rural development.[4] Under BPKP, financial assistance of Rs 12,200/ha for 3 years is provided for cluster formation, capacity building and continuous handholding by trained personnel, certification and residue analysis.[5]

Natural farming systems, which involve the usage of inputs available in the farm, support quality agricultural commodities, improve the livelihood of farmers, and posit a socio-economic sustainable farming practice[6]. The BPKP programme has been adopted in State of Andhra Pradesh, Karnataka, Himachal Pradesh, Gujarat, Uttar Pradesh, and Kerala. Several studies have reported the effectiveness of natural farming- BPKP in terms of increase in production, sustainability, saving of water use, improvement in soil health and farmland ecosystem. It is considered as a cost-effective farming practices with scope for raising employment and rural development.[7]

Zero Budget Natural Farming (ZBNF)

Zero Budget Natural Farming (ZBNF) means practicing agriculture without the use of any fertilizers and pesticides or any other external materials. The main concept of zero budget is to cultivate crops with zero cost of production. ZBNF guides the farmers towards sustainable farming practices, thus, helps in retaining soil fertility, ensure chemical free agriculture, and ensure low cost of production to enhance farmers' income[8]. The concept was promoted by agriculturist and Padma Shri Subhash Palekar in the mid-1990s in Karnataka.

Drums being provided for production of organic inputs under ZBNF

[2] https://agricoop.nic.in/sites/default/files/Final%20PKVY%20revised%20guideline.%20.pdf

[3] https://www.indiabudget.gov.in/doc/eb/sbe1.pdf

[4] https://naturalfarming.niti.gov.in/bharatiya-prakritik-krishi-paddhati-bpkp/

[5] https://www.pib.gov.in/PressReleasePage.aspx?PRID=1737751

[6] https://naturalfarming.niti.gov.in/national-level-consultation-on-bpkp-natural-farming/

[7] https://niti.gov.in/natural-farming-niti-initiative

[8] https://pib.gov.in/FactsheetDetails.aspx?Id=148598

Prakritik Kheti Khushal Kisan Yojana (PK3Y)

The Himachal Pradesh (HP) government wants to promote natural farming practices across the state and has allocated a sum for implementing HP Prakritik Kheti Khushal Kisan Yojana (PK3Y). Around 9.61 lakh farmer households will be covered under natural farming in a phased manner in the state. As of date 1.71 lakh farmers have opted for natural farming in the state covering 9464 hectares, and by 2022-23, an additional area of 20000 hectares is expected to be covered. Assistance and subsidy are being provided for various purposes like cattle sheds, cattle purchase and transport. Farmers would be provided training and necessary equipment as well. There is a budget provision for Rs. 17 crores for the financial year 2022-23 under this scheme[9].

Jaivik Corridor Yojana (JCY)

The main objective of JCY scheme is to promote organic farming, minimize environmental and water pollution, produce chemical free vegetables, save health of the soil, conserve micro-organism available in the soil. Through these, it is expected that it will reduce farmers' cost of cultivation and fetch higher prices resulting in an increase in their incomes. JCY was launched in 2019-20 for three years till 2021-22 with an allocated budget of Rs. 155.18 crores. Under the scheme, cultivation of organic vegetables is being promoted in selected districts during the 1st year. In subsequent years the scheme expects to cover other crops as well.

The Bihar State Seed Organic Certification Agency (BSSOCA) is the licensed certifying agency. It was accredited by APEDA, Government of India in January, 2020. BSSOCA provides a free-of-cost certification facility to organic farmers. Under the JCY, the state government provides assistance of Rs. 11,500/acre for 3 years and up to 2.5 acres of organic farming.

Given this background we selected four states of Himachal Pradesh, Karnataka, Gujarat and Bihar in order to:

- Understand the determinants of adoption of PKVY, BPKP and associated state-government schemes
- Understand the underlying characteristics and motivations of current participants in comparison to non-participants.
- Understand the policy implications for further improvement of sustainable agriculture schemes based on insights from the study.

With these objectives in mind, we will briefly look into how agricultural policies were designed since independence and what were the reasons which drove to such strategies.

1.2. Policy Background for Sustainable Agriculture

With the liberalization of trade policies in 1991, the focus of agricultural sector policies shifted towards improving the functioning of markets, reducing excessive legislation, and liberalizing agricultural trade. Reforms were introduced in accordance to the World Trade Organization (WTO) agreement to integrate with global trade. Although agricultural productivity increased as a result of the green revolution, problems around the sustainability of agricultural systems started becoming visible.

In the year 2000, the Government of India published the National Agriculture Policy (NAP), which is a comprehensive agricultural policy statement that set out clear objectives and measures for

[9] https://agriculture.hp.gov.in/en/our-scheme/prakritik-kheti-khushhal-kisan-yojna/

all important sub-sectors of agriculture[10]. With the aim to attain a growth rate of more than 4% p.a. over the next two decades, the NAP included components like:

- Efficient use of natural resources, while keeping in mind the conservation of soil, water, and biodiversity.
- Ensuring growth which is widespread across regions and farmers, i.e., growth with equity.
- Growth that is demand driven and caters to domestic market and maximizes benefits from exports of agricultural products.
- Growth that is sustainable technologically, environmentally, and economically.

Keeping all these objectives in mind and adhering to the norms of Sustainable Development Goals (SDGs) as proposed by the United Nations[11], it has become necessary to shift from conventional farming towards sustainable agricultural practices in order to minimize the environmental impact of conventional agriculture practices. PKVY is a step forward in that direction.

The academic literature on sustainable agriculture is full of evidence that such practices protect the environment (Das, Chatterjee, & Pal, 2020; Ramesh et al, 2005). Hole et al. (2005) identify three broad practices that are strongly associated with sustainable agriculture as being beneficial to farmland biodiversity in general, which are: reduced use of chemical pesticides and inorganic fertilizers; sympathetic management of non-crop habitats and field margins; and preservation of mixed farming. Soil in sustainable farming systems have a higher content of organic matter on average compared to those devoted to conventional farming. It can also be concluded that sustainable agriculture contributes positively to agro-biodiversity and natural biodiversity. Sustainable farming systems fare better than conventional farming on the counts of nitrate and phosphorus leaching and greenhouse gas emissions (Mondelaers, Aertsens and Huylenbroeck 2009).

Although there are concerns about lower productivity, in traditional rain-fed agriculture with low external inputs, sustainable agriculture has shown the potential to increase yields. Despite lower crop productivity, farmers adopting sustainable practices earned a higher net profit compared to conventional farmers (Ramesh et al, 2005). This is primarily driven by the availability of premium prices for certified organic produce and a reduction in cost of cultivation. Unavailability of premium prices on the other hand makes adoption of sustainable practices economically unfeasible. In this context, we try to understand the adoption patterns of sustainable agriculture in some selected states of India. The next section elaborates on the study design and methodology adopted.

1.3. Study Design

The implementation of the research study at the state level was coordinated by the four Agro-Economic Research Centers (AERCs) in the states of Gujarat, Bihar, Karnataka and Himachal Pradesh. The study involved primary data collection in combination with focused group and individual stakeholder interviews. The tools included a questionnaire involving direct and open-ended questions to relevant cluster members as part of the scheme. AERCs approached state level nodal agencies/authorities responsible for PKVY. These included Department of Agriculture, Department of Horticulture, block level offices of the state, or any other relevant agency. The objective was to gather information regarding the cluster members and the cluster

[10] http://agricoop.nic.in/agpolicy02.htm, https://www.indiawaterportal.org/articles/ministry-agriculture-announces-national-agricultural-policy-2000
[11] https://sdgs.un.org/topics/food-security-and-nutrition-and-sustainable-agriculture

leaders and the benefits provided to them under the scheme. Also, the district wise progress report for Kharif 2020 and Rabi 2021 were collected in the particular state.

The process involved a direct communication with the farmers in order to understand their level of awareness regarding adoption of sustainable agricultural practices[12], understanding what factors persuade or dissuade farmers from enrolling under PKVY. Sustainable agriculture refers to a bundle of farming practices practiced by framers such as organic farming, natural farming and other traditional methods of farming which aims to meet society's food needs in the present without compromising on the needs of the future generations, primarily through use of chemical-free inputs and sustainable techniques.

The study relied on primary survey questionnaire as the main instrument. A total of 605 farmers across all the 4 states were surveyed based on random sampling. AERCs sampled around 150 farmers across two districts of each state. These districts were categorized based on the cluster's formation and the certification status of the farmers and each district had a sample size of 75. Best attempts were made to sample on an average equal number of C1, C2 and C3 farmers. C1, C2 and C3 refers to the certifications given to the farmers based on their uptake of sustainable farming practices in terms of years under PKVY. C1 farmers refer to the farmers involved in the process of sustainable farming since a year, C2 farmers refer to the farmers involved in the process of sustainable farming in the past two years whereas C3 farmers refer to the farmers involved in the process of sustainable farming in the past three years.

Table 1.1: Sample characteristics – treatment and control samples groups

State	Treatment Samples	Control Samples	Total
Bihar	100	50	150
Gujarat	100	50	150
Himachal Pradesh	100	50	150
Karnataka	100	55	155
Total	**400**	**205**	**605**

Source: Own compilation

In table 1.1, we list the number of sample respondents we collected data for from each state. A total of 150 samples were collected from each state, which comprised of 100 treatments and 50 control. Only Karnataka collected 55 control samples comprising of 155 total samples. This adds the total tally of samples to 605 samples – 400 treatment samples and 205 control samples.

Table 1.2: Sample characteristics – states surveyed

State	Districts	Blocks	Villages
Bihar	3	5	10
Gujarat	2	3	11
Himachal Pradesh	2	2	10
Karnataka	2	10	36
Total	9	20	67

Source: Own compilation

[12]Sustainable agricultural practices or sustainable farming refers to a bundle of farming practices practiced by framers such as organic farming, natural farming and other traditional methods of farming which aims to meet society's food needs in the present without compromising on the needs of the future generations.

Table 1.2, provides insights on where data was collected from. The sample was collected from 4 states, comprising of 9 districts, 20 talukas (blocks), and 67 villages in total. These districts and blocks were decided in consultation with representatives from AERCs in the select states. The villages were selected on the availability of PKVY clusters and to account for different conditions in landscape and demography, which enables to look into various aspects of farmers, which in turn can be responsible for determining their participation in this scheme. While in Bihar, Gujarat and Himachal Pradesh, data was collected from 10 or 11 villages; farmers using sustainable methods were more dispersed in Karnataka, hence, 36 villages were covered in Karnataka alone.

Table 1.3: Sample characteristics – certification status of treatment group

Certification Status	Bihar	Gujarat	Himachal Pradesh	Karnataka	Total
C1	50	21	12	38	121 (30.25%)
C2	50	50	68	22	190 (47.50%)
C3	0	29	20	40	89 (22.25%)
Total	**100**	**100**	**100**	**100**	**400**

Source: Own compilation

The table 1.3 above, lists the certification status of the PKVY farmers from the selected states. Except Bihar, all other states were able to provide differently certified samples which include C1, C2, and C3. On an average, overall, the sample consisted of maximum numbers of C2 farmers, accounting for 47.5% of the sample, followed by 30.25% of C1 farmers, and 22.25% of C3 farmers[13] (figure 1.1). Except for Bihar, where we did not find any C3 farmer in our data collection process, the other three states had representation of all the three categories of certified farmers.

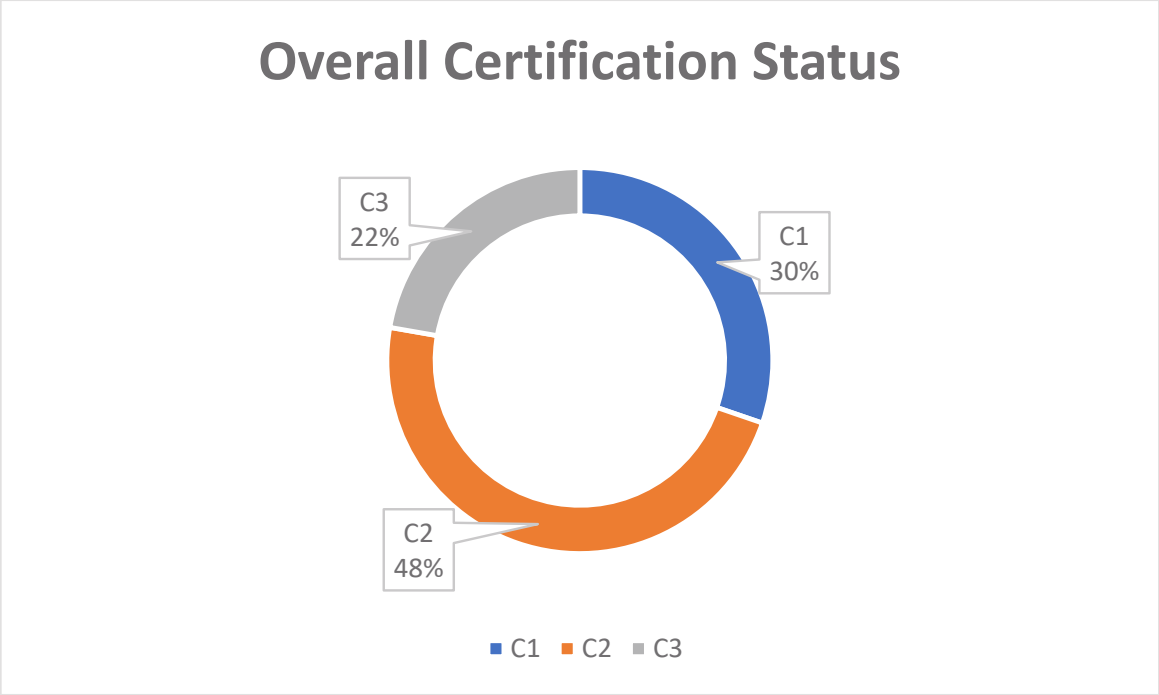

Figure 1.1: Overall certification status from selected states

[13] In Karnataka, some independent farmers were approached, who were pursuing sustainable farming out of self-motivation and were not registered under the scheme. They have been practicing sustainable methods for a long time and hence are considered as C3 farmers in the sample.

1.4. State Wise Analysis

The states covered under the study include Bihar, Gujarat, Himachal Pradesh and Karnataka, all having different cropping patterns and suitability for varied crops. In Bihar, sustainable farming is promoted since 2017-18 under the aegis of Department of Agriculture. The scheme is implemented mainly in the villages situated on the bank of river Ganges and National Highways. The main motivation driving the scheme in the state includes low cultivation costs due to low input costs, good financial assistance and better soil health conditions.

In the state of Gujarat, sustainable farming is promoted since 2017 under the aegis of Department of Agriculture. The main problems encountered while transitioning towards sustainable farming included problem of irrigation, practicing parallel agriculture created an issue. Also, lack of incentives and lack of marketing channel for the sustainable produce were the major barriers in the state. The certification in Gujarat is carried out by the Gujarat Organic Produce Certification Agency (GOPCA) both at the individual and the group levels.

In the state of Himachal Pradesh, the PKVY scheme was initiated in 2015 under the aegis of Department of Agriculture and got shifted to Directorate of Agriculture since 2018. The main motivating factors that were driving the scheme in the state included free inputs and less risks as compared to conventional methods. The main crops grown under the scheme included cauliflower, tomato, wheat, capsicum and apple. The main barriers that demotivated farmers to carry on with the scheme included lack of dedicated marketing channels, lack of licensing and certification agency and lack of patience among farmers. Currently in the state the scheme of PKVY is merged with Prakritik Kheti Khushal Kisan (PK3) scheme.

In the state of Karnataka sustainable farming is promoted since 2015 under aegis of Department of Agriculture which got shifted to Department of Horticulture in the later stage. The main demotivating farmers as encountered in the state while practicing sustainable farming included low incentives for group leaders, problems in timely data flow, problem of finance as well as lack of coordination between the centre and the state in terms of budget flow which is shared in 60:40 ratios. The main crops grown in the state under the scheme are paddy, sugarcane, ragi, vegetables and tomato. The Department of Horticulture promoted the growth of leafy vegetables under the scheme as it consumes less chemicals, can be harvested early and is not prone to pests and disease problems in an extensive manner.

Table 1.4: Overall sample information

State	Nodal Agency		Main crops	Certification agency	
	Phase 1	Phase 2		Phase1	Phase2
Himachal Pradesh	Department of Agriculture	Directorate of Agriculture	Peas, beans, capsicum, tomato, wheat, apple, cauliflower, etc.	Best Recognition NGO	Himachal Pradesh State Seed Certification Agency
Gujarat	Department of Agriculture	Department of Agriculture	Paddy, ragi, wheat, peas, gram, urad, tur, etc.	Gujarat Organic Produce Certification Agency	Gujarat Organic Produce Certification Agency (GOPCA)

State	Nodal Agency		Main crops	Certification agency	
	Phase 1	Phase 2		Phase1	Phase2
Karnataka	Department of Agriculture	Department of Horticulture	Paddy, tomato, ragi, arecanut, sugarcane, coconut, etc.	Aditi Organics	Aditi organics
Bihar	Department of Agriculture	Department of Agriculture	Paddy, cucumber, nenua, lady finger, tomato, maize, wheat, mango, etc.	Bihar State Seed and Organic Certification Agency	Bihar State Seed and Organic Certification agency

CHAPTER

2

GUJARAT

2. Introduction

Being situated on the western coast of India, Gujarat has been considered as one of the most progressive states in India on both the industrial and agricultural fronts. Gujarat Natural Farming and Organic Agricultural University is a unique and diverse educational, research and extension hub for sustainable agriculture established in 2017 by Government of Gujarat.

This chapter describes the socio-economic background of farmers, the status of adoption of PKVY in the state and the certification status of the same. The chapter also covers the information on cropping pattern as well as cost benefit analysis of adopting sustainable agricultural practices over the traditional practices.

2.1. Socio Economic and Farm Level Characteristics

Socio-economic profile of the farmers indicates the information on the average age of famers, educational qualification, caste, gender, occupation, average land holding and income of farmers from various categories.

Table 2.1.1: List of sampled districts based on uptake

State	District	Taluka	Number of Farmers
Gujarat	Ahmedabad	Dholka	50 treatment + 25 control
Gujarat	Dang	Ahwa, Waghai	50 treatment + 25 control
Total			150 (100 - Treatment + 50 - Control)

Source: Own Compilation

Table 2.1.1 presents information related to survey conducted by the study team in different blocks of the state of Gujarat. The coverage of survey at the block level was equal for all the states. The farmers have been classified into two categories as treatment group farmers and control group farmers with a sample of 150 being divided as 100 for treatment group farmers and 50 for control group farmers.

Table 2.1.2: Sample characteristics of treatment farmers

Sample Characteristics of Treatment Farmers		
Average Age of farmers	54 years	
Average HH Size	6 members	
Average HH engaged in Agriculture	2.64 ~ 3 members	
Average Annual HH Income	**Rs. 2,00,610**	
	Ahmedabad	Rs. 3,14,960
	Dang	Rs. 86,259
Average Income from agriculture and allied sources	**Rs. 1,59,970**	
	Ahmedabad	Rs. 2,71,700
	Dang	Rs. 48,240
Average Income from non-agricultural sources	**Rs. 65,548**	
	Ahmedabad	Rs. 86,520
	Dang	Rs. 51,377

Source: Own Compilation

Table 2.1.2 presents the information of sample characteristics of the treatment group farmers. The average age of surveyed farmers in Gujarat is reported as 54 years and the average family size is reported as 6 members out of which 3 members on an average are engaged in agricultural activity in the sampled area. Out of the surveyed population of the treatment group, 94% of the surveyed population was male while 6% were females. The data reported that in the sampled districts, the whole sample from Dang district belonged to the Scheduled Tribes category while from Ahmedabad 39% belong to General category, 10% from other backward classes and 1% belonged to scheduled caste category. The average of the total household income of the household is reported at Rs. 2,00,609.50, under which agriculture and allied activities contribute Rs. 1,59,970 and non-agricultural activities contribute Rs. 65,548 on an average basis.

Out of the total surveyed population 38% were found to have attained secondary education followed by 35% having primary education and only 6% reported having a graduation degree.

Table 2.1.3: Landholding characteristics of surveyed farmers

Landholding Characteristics		
Average Landholding	**2.83 acres**	
	Ahmedabad	3.61 acres
	Dang	2.04 acres
Average Net Operated Land	**3.62 acres**	
	Ahmedabad	5.19 acres
	Dang	2.04 acres
Average Area Irrigated out of Net Operated Land	**2.93 acres**	
Percentage Operated Land Irrigated (average)	**68.73%**	
	Ahmedabad	99.60%
	Dang	37.85%
Average Area dedicated to sustainable farming	**0.57 acres**	
Percentage Operated Land under sustainable farming (average)	**35.96%**	
	Ahmedabad	24.12%
	Dang	45.79%

Source: Own Compilation

Table 2.1.3 presents the information on the landholding characteristics of the treatment group farmers. The average landholding size in the surveyed area is found to be 2.83 acres and the average net operated land is 3.62 acres, of which 68.73% is irrigated. The data reports that on an average a land of 0.57 acres has been dedicated to sustainable agricultural practices, of which 35.96% land is reported to be part of the operated land area.

Table 2.1.4: Secondary occupational structure of the treatment group

Secondary Occupational Structure	
Occupation	**Percent**
Self Employed / Own Business	5%
Livestock / Poultry Rearing / Fishery	62%
Salaried employment	7%
Agricultural Labour	24%
Non-Agricultural Labour	25%
Others	6%

Source: Own Compilation

Table 2.1.4 presents information on the non-agricultural sources of income. The data shows that with agriculture being the primary occupation of the famers, 62% of the farmers reported livestock/poultry rearing/ fishery as the secondary occupation to support their incomes followed by 25% engaged in non-agricultural labour and 24% as agricultural labour.

2.2. Paramparagat Krishi Vikas Yojana Status

The PKVY scheme is under the aegis of Department of Agriculture in Gujarat. The scheme works on the cluster approach in the state with each cluster having maximum 50 members and a total land size of 21 acres.

Table 2.2.1: Incentives for the leader

Incentives Provided		
District	**Cash**	**Kind**
Ahmedabad	0%	74%
Dang	100%	0%

Source: Own Compilation

Every cluster has a leader who is selected mainly on the basis of knowledge about sustainable practices. In Dang, 100% of the farmers claimed that leader gets a cash incentive of Rs. 1000 whereas in the Ahmedabad district 74% of the farmers claimed that the group leader gets an incentive in form of kind in order to incentivize him to encourage farmers to pursue sustainable agriculture practices.

In the state of Gujarat 85% of the surveyed farmers under the sample for treatment group reported that they are aware about the sustainable agricultural practices while 15% reported that they have no awareness regarding the same.

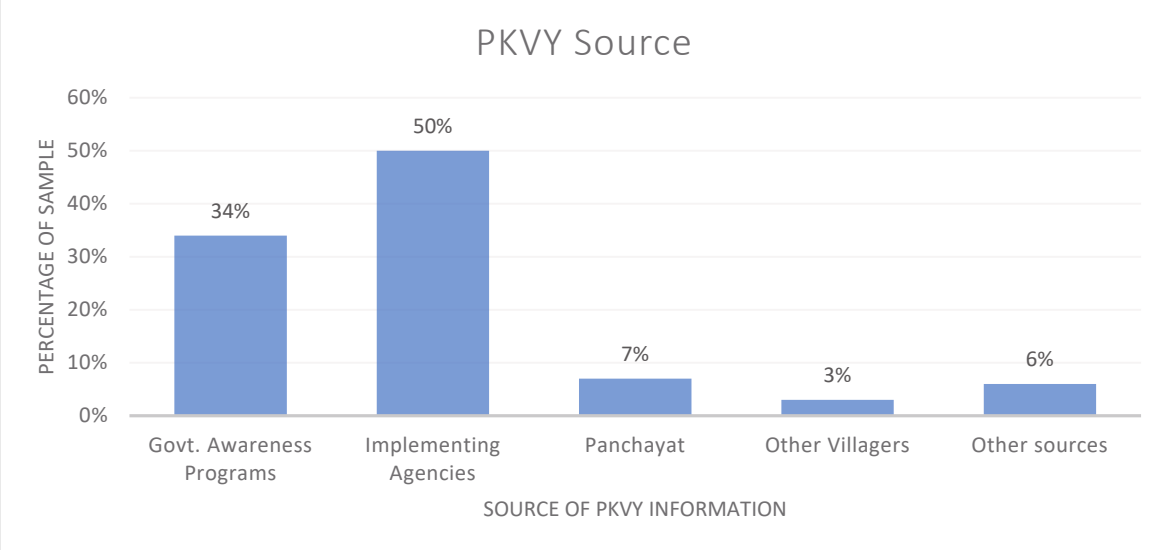

Figure 2.2.1: Sources of Information about Sustainable Agricultural Practices

The figure 2.2.1 represents the source of information for the farmers. The data shows that 50% of the farmers reported that the implementing agencies were the main source of information regarding sustainable agricultural practices for them followed by 34% representing government programmes as the main source of information.

2.2.1. Certification Status

The scheme is supported by the issue of the certificate from the concerned agency. Generally, Gujarat Organic Produce Certification Agency (GOPCA) is responsible as a nodal agency for the issue of certificates under PKVY in Gujarat. The certification process is divided into three phases as C1, C2 and C3. With C1 representing the farmers who have completed one year following sustainable farming, C2 represents the farmers who have completed two years following sustainable farming and C3 represents the farmers who are able to convert their land into a completely organic or natural land without the use of fertilisers for the period of three years.

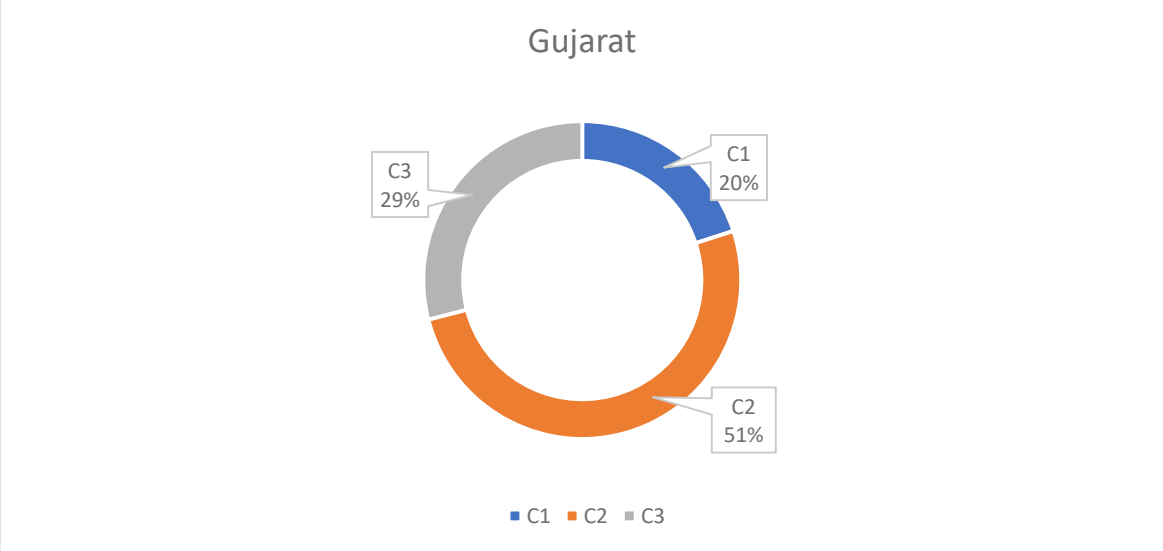

Figure 2.2.2: Certification status of treatment group farmers

Figure 2.2.2 shows the certification status of the surveyed farmers under PKVY in the state of Gujarat. It was reported from the survey that among the three categories, 20% of the farmers belong to the C1 category, 51% of the farmers belong to C2 category and 29% reported belonging to the C3 category. Among the sampled population 42% of the farmers reported that Agricultural Technology Management Agency (ATMA) department under the government sector is the implementing agency in their area for PKVY while 39% reported regional councils as the implementing agency and 15% reported support agencies as the implementing agency.

2.2.2. Drivers for adoption of Sustainable Agricultural Practices

This section will cover the motivating factors as well as the barriers that play a role in the functioning of PKVY in the state of the Gujarat.

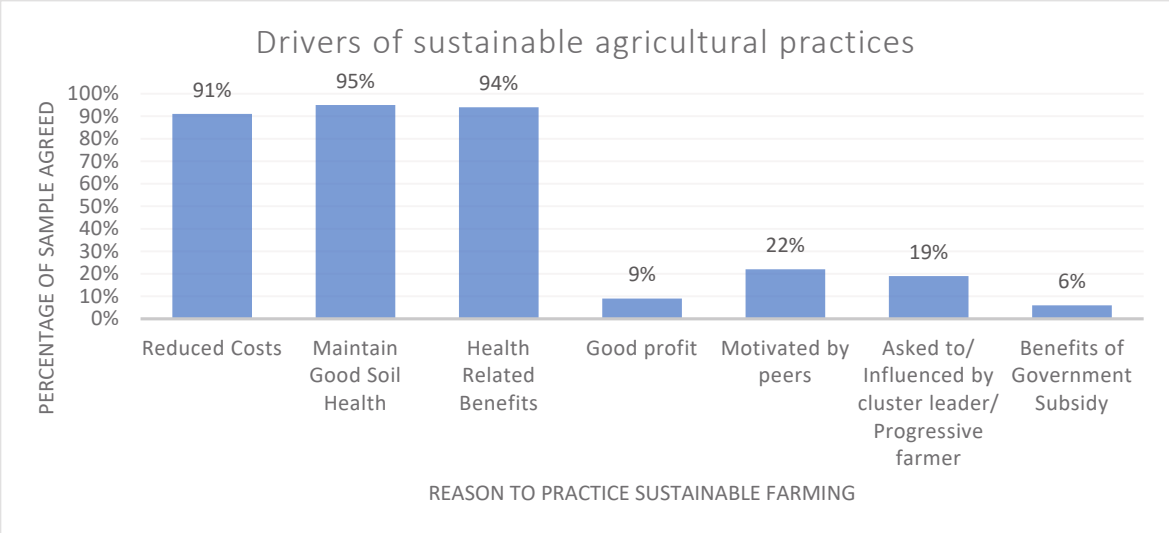

Figure 2.2.3: Motivating factors for adoption of Sustainable Agricultural Practices

The figure 2.2.3 represents the motivating factors for the adoption of sustainable agricultural practices in the state of Gujarat. The main motivating factors for the adoption of sustainable agricultural practices are good soil health, reduced costs and health benefits. Nearly 95% of the surveyed farmers reported soil health as the reason for sustainable agricultural practice

adoption followed by 94% stating health benefits as the reason and 91% reported cost benefits as the main reason for the adoption of these practices. With the famers reporting improved soil health as the reason for adoption, 75% of surveyed farmers reported that soil health tests are conducted whereas 25% reported absence of the soil health tests by any agency. As the certification status shows that there is a reduction in the number of farmers going from C2 to C3 status, this indicates there are some barriers as well.

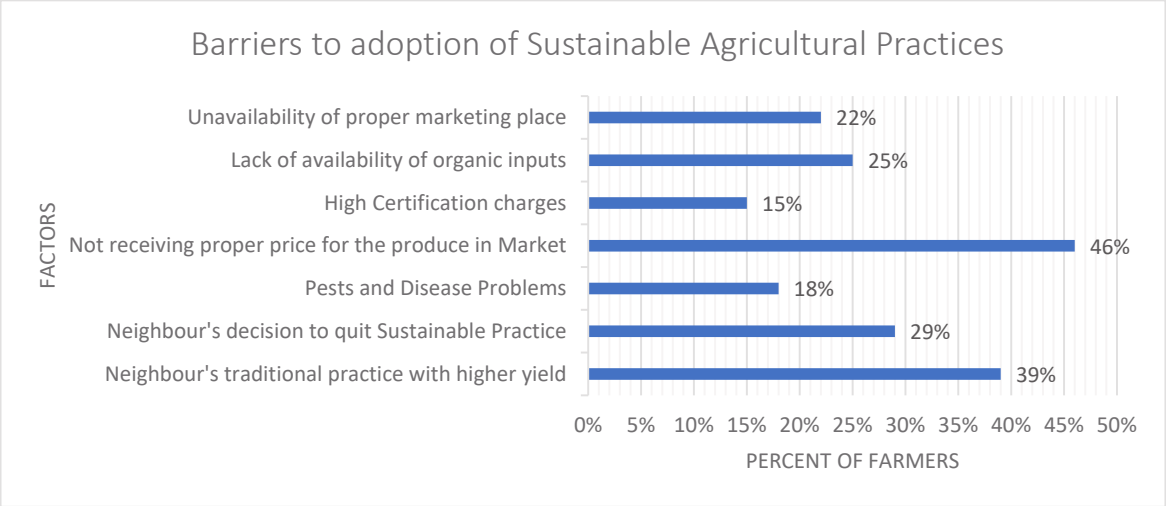

Figure 2.2.4: Barriers to adoption of Sustainable Agricultural Practices

The figure 2.2.4 represents the factors that deterred farmers from continuing with sustainable agricultural practices. The main deterrent is the unavailability of a mechanism for proper price discovery of their sustainable produced crops. The data represents that 46% of the farmers reported no proper price discovery mechanism as the main reason followed by 25% reporting lack of availability of organic inputs and 22% reported unavailability of proper marketing channels.

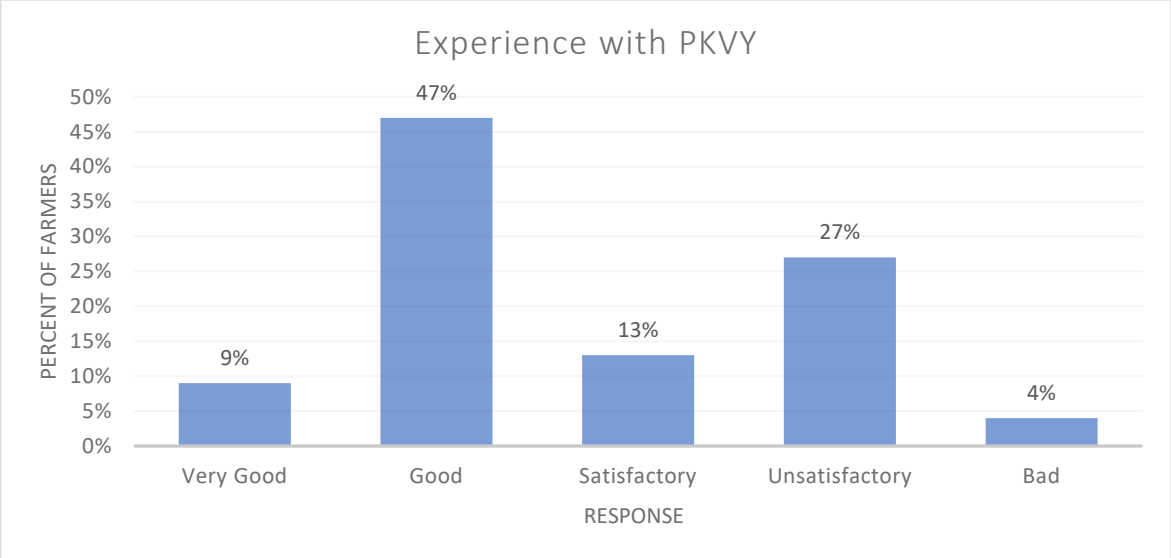

Figure 2.2.5: Experience with Paramparagat Krishi Vikas Yojana (PKVY)

Figure 2.2.5 represents the farmers experience of the scheme of PKVY. A large proportion of 47% of the farmers reported having a good experience under the scheme. The main benefits that the farmers seek from the government side under the scheme as reported included market availability for the sale of their produce.

2.2.3. Challenges under Sustainable Agricultural Practices

Table 2.2.2: Challenges under Sustainable Agricultural Practices

Biggest challenge in following sustainable farming	
Reason	**Percentage of Farmers**
Low Yield	42%
Pests and Disease management	2%
No proper prices	18%
Problem of market linkages	79%
Lack of access to organic inputs	3%
Lack of training and awareness	1%
Lack of continued support	15%

Source: Own Compilation

Table 2.2.2 presents the challenges that farmers face in the adoption of the sustainable agricultural practices. Nearly 79% of the farmers in the treatment group reported problem of market linkages, 42% reported low yield and 18% reported unavailability of proper price discovery. As a result, in the district of Ahmedabad only 2% of the surveyed farmers reported continuing sustainable agricultural practices whereas in the district of Dang 100% reported continuing with the sustainable agricultural practices. This is a reason why Dang has been declared as a chemical-free district. In the district of Ahmedabad as well if farmers are provided with proper market linkages as well as proper price discovery mechanisms then 100% farmers reported it as their wish to continue with the sustainable agricultural practices.

2.3. Cropping Pattern

Given the sample collection from Gujarat, the districts depict different geographic properties from each other. Ahmedabad receives water from Sabarmati River and its canals, so flood irrigation is the popular form of irrigation here, whereas Dang is a hilly area and lacks much water sources and are mostly rain-fed. This influences the cropping pattern in these areas.

Table 2.3.1: Sustainable Agricultural Practices cropping pattern

Cropping Pattern (sustainable farming)		
Ahmedabad		
Kharif	***Rabi***	***Zaid***
Paddy	Wheat	Paddy
Dang		
Kharif	***Rabi***	***Zaid***
Paddy	Gram	Groundnut
Nagli	Vegetables	Moong
Tur	Soyabean	

Source: Own Compilation

Table 2.3.2: Conventional cropping pattern

Cropping Pattern (Conventional)		
Ahmedabad		
Kharif	***Rabi***	***Zaid***
Paddy	Wheat	Paddy
	Oilseed	
Dang		
Kharif	***Rabi***	***Zaid***
Paddy	Wheat	.

Source: Own Compilation

As is evident from the tables 2.3.1 and 2.3.2 above, we can see that paddy and wheat are dominant crops grown during Kharif and Rabi season respectively in Ahmedabad, be it organic or conventional. On the contrary, Dang has more varieties in terms of sustainable produce. In Kharif season, Paddy, Nagli, Tur, Urad, etc. are produced organically; whereas in Rabi season, Grams, Vegetables, Soyabean, etc. are cultivated. Groundnut and Moong comprise of organic produce in the summer (Zaid) season. In terms of conventional or conventional cultivation, Dang has Paddy and Wheat cultivation in the Kharif and Rabi seasons respectively.

2.4. Perception of farmers towards sustainable agricultural practices

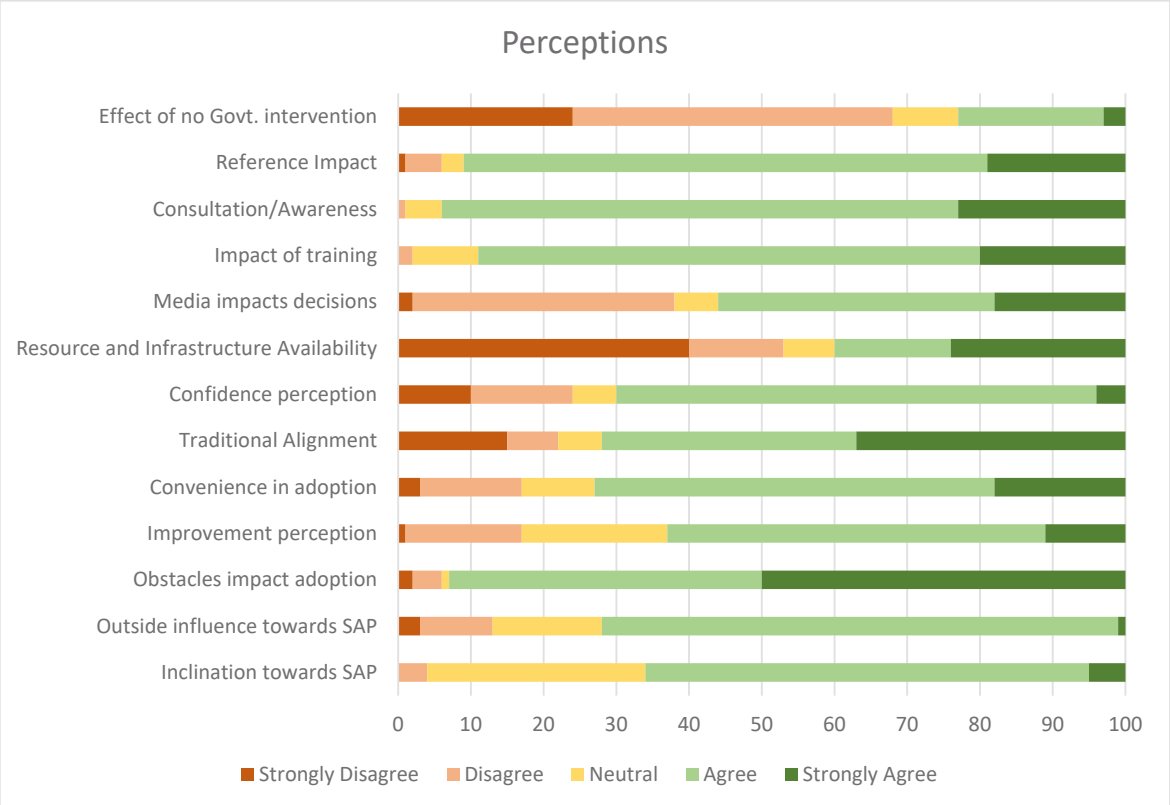

Figure 2.4.1: Perception of farmers towards Sustainable Agricultural Practices

Figure 2.4.1 gives us a qualitative idea on how this scheme and the general idea of sustainable

farming was perceived by the sample. We put forward 13 instances to get the perspectives of the respective farmers. Starting from the bottom in the above figure, farmers were asked how inclined do they feel towards sustainable agricultural practices after evaluating its positive and negative consequences. More than 60% of the farmers agree that they are inclined towards sustainable practices. When asked about how outside sources like reference groups and information channels influence their behaviour and decisions, more than 70% farmers agreed that outside influence matters. When farmers were asked if it is difficult to adopt sustainable agriculture depending on the internal and external obstacles or opportunities such as personal abilities, knowledge, economic resources and infrastructural facilities; more than 90% of the farmers agreed that there are obstacles to adoption of sustainable practices.

More than 60% of the farmers believe that adopting sustainable farming would improve prospects like yield, soil health, income, and health; whereas around 15% of farmers disagree to this point. More than 70% of the farmers believe that it is easy to learn and practice sustainable agriculture. Similarly, around 70% of the farmers agree that sustainable farming fits their traditional values, past experiences and current needs; but 15% of the farmers strongly disagree to this.

Seventy percent of the farmers are confident that they can adopt sustainable practices with the level of skills and knowledge they have, and around 25% of the farmers disagree with this notion. Around 55% of the farmers disagree that they have the necessary resources and technical infrastructure required to adopt sustainable practices, whereas 40% agree that they are endowed with the resources required. When asked how formal media sources like television, radio, newspapers, etc. influence their decisions, around 55% of the farmers were likely to adopt sustainable practices, whereas around 35% of the farmers were unlikely to do so. Around 90% of the farmers agreed that they were more likely to adopt sustainable practices if provided sufficient training, workshops, and exposure visits for the same. Similarly, around 95% farmers were more likely to adopt sustainable practices if provided consultations or influenced by extension workers.

It can be seen that around 90% of the farmers agree that reference groups in terms of closer environment such as friends, neighbours, overall community, etc. influence their behaviour and decisions regarding sustainable practices. It can be seen that continuing sustainable practices without government support and paying for certification and other services is disagreed by around 70% of the sample, implying necessity of government support to push sustainable practices.

2.5. Control Farmers

The data was collected for two set of farmers including the treatment group and the control group of farmers where the control group signifies the group of farmers practicing the traditional methods of farming using fertilizers and pesticides for the purpose of crop production.

2.5.1. Socio Economic Characteristics of the Control Farmers

The socio-economic characteristics of the control farmers represents the age of farmers, educational qualification, gender and caste, among others. The table below represents the socio-economic characteristics of the control farmers.

Table 2.5.1: Sample characteristics of control farmers

Sample Characteristics of Control Farmers		
Average Age of farmers	47.28 ~ 47 years	
Average HH Size	5.96 ~ 6 members	
Average HH engaged in Agriculture	3.22 ~ 3 members	
Average Annual HH Income	**Rs. 1,31,060**	
	Ahmedabad	Rs. 1,85,720
	Dang	Rs. 76,400
Average Income from agriculture and allied sources	**Rs. 1,13,537**	
	Ahmedabad	Rs. 1,77,188
	Dang	Rs. 72,800
Average Income from non-agricultural sources	**Rs. 67,278**	
	Ahmedabad	Rs. 78,643
	Dang	Rs. 27,500

Source: Own Compilation

Among the surveyed farmers 98% are male members whereas only 2% are female members. The average age of the farmers is 47 years whereas the average household size is 6. As can be seen from the table, on an average 50% of members of the household are engaged in agricultural activities. The average household income of the farmers is Rs. 1,31,060. The district wise distribution of the average household income of farmers in Ahmedabad district is reported at Rs. 1,85,720 and in Dang district is reported at Rs. 76,400. The table indicates that the average household income from agricultural activities is reported at Rs. 1,13,537 on an average basis under which the average income from agricultural activities in Ahmedabad district is reported at Rs. 1,77,188 on an average basis whereas in Dang district it is reported at Rs. 72,800. The table indicates that the average household income from non- agricultural activities is reported at Rs. 67,278 under which in Ahmedabad district it is reported at Rs. 78,643 whereas in Dang district it is reported at Rs. 27,500 on an average basis.

Table 2.5.2: Caste profile of the control farmers

Caste Profile	
Caste	**Percentage of Farmers**
General	34%
SC	0%
ST	50%
OBC	16%

Source: Own Compilation

The above table represents the caste profile of the farmers belonging to the control farmers' category. Nearly 50% of the control farmers belong to the ST category followed by 34% of the farmers belonging to the general category and 16% of the farmers belonging to the Other Backward Castes (OBC) category.

Table 2.5.3: Educational qualification status of the control farmers

Educational Qualification Status	
Qualification	**Percent**
Illiterate	10%
Primary Education	42%
Secondary Education	36%
Higher Secondary / Diploma	4%
Graduation	8%

Source: Own Compilation

Table 2.5.3 represents the educational qualification status of the control farmers. Nearly 42% of the control farmers reported to being educated till the primary level whereas 36% had educational qualification till secondary level. Roughly 10% of the farmers reported being illiterate followed by 8% having a graduation degree and 4% educated till higher secondary level.

Table 2.5.4: Landholding characteristics of the control farmers

Landholding Characteristics		
Average Landholding	**2.89 ~ 3 acres**	
	Ahmedabad	3.69 acres
	Dang	2.09 acres
Average Net Operated Land	**3.55 ~ 3.5 acres**	
	Ahmedabad	4.97 acres
	Dang	2.13 acres
Average Area Irrigated out of Net Operated Land	**2.75 acres**	
Percentage Operated Land Irrigated (average)	**60.8%**	
	Ahmedabad	99.2%
	Dang	22.4%

Source: Own Compilation

Table 2.5.4 represents the landholding characteristics of the control farmers. The average landholding of control farmers is reported at 3 acres of which Ahmedabad district's average is reported at 3.7 acres whereas for Dang district it is 2 acres. The average net operated land is 3.5 acres. For Ahmedabad district, the net operated land at 4.97 acres and for Dang it is 2.13 acres. The average area irrigated out of net operated land is reported at 2.75 acres accounting for 60.8% of the operated land. Ahmedabad has higher irrigation rates at 99.2% while Dang has lower percentage of land irrigated at 22.4%.

Table 2.5.5: Secondary occupational structure of control farmers

Secondary Occupational Structure	
Occupation	**Percent**
Self Employed / Own Business	4%
Livestock / Poultry Rearing / Fishery	48%
Salaried employment	8%
Agricultural Labour	44%
Non-Agricultural Labour	8%
Others	4%

Source: Own Compilation

Table 2.5.5 represents data on the secondary occupational structure of the control farmers. Nearly 48% of the farmers reported livestock as their major secondary occupation followed by 44% of the farmers reporting agricultural labour as the major secondary occupation. Approximately 8% of the farmers reported salaried employment as the major secondary occupation after agriculture and 8% were non-agricultural labourers whereas 4% of the farmers reported own business as the revenue generating activity after agriculture. Some farmers are dependent on more than one secondary occupation; hence, the percentage of farmers sums up to more than 100%.

2.5.2. Paramparagat Krishi Vikas Yojana

The control farmers were asked about information related to the PKVY scheme. Table 2.5.6 represents the source of information for the control farmers regarding PKVY.

Table 2.5.6: Sources of Information Regarding PKVY

How do you know about PKVY?	Percent
Govt. Awareness Programs	50%
Implementing Agencies	2%
Panchayat	2%
Other Villagers	12%
Other sources	34%
Total	**100%**

Source: Own Compilation

According to it, 50% of the control farmers surveyed reported to have received the information regarding PKVY through government awareness programmes followed by 12% through their peers whereas 2% received the information through implementing agency and panchayats individually.

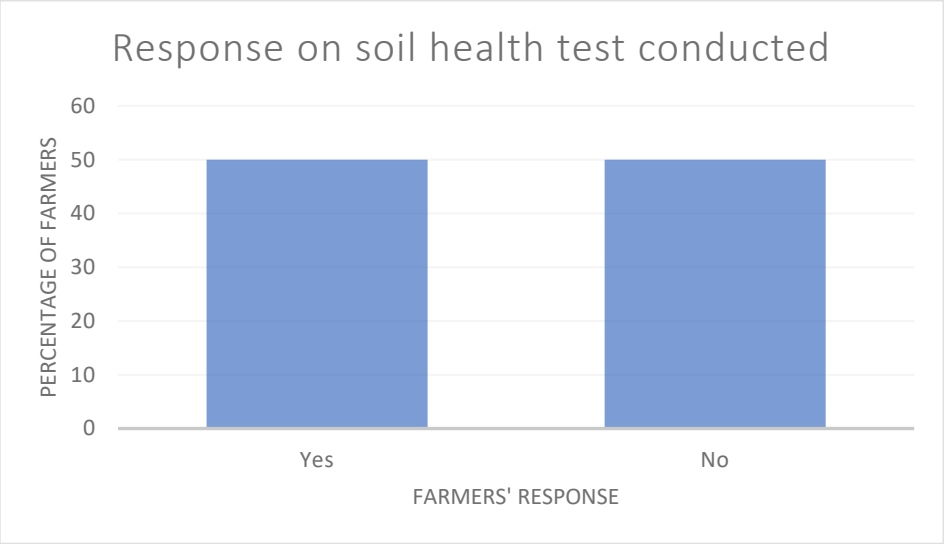

Figure 2.5.1: Response of control farmers on conduct of soil health tests

The above figure represents the response of the control farmers for the conduct of the soil health test. Out of the total farmers surveyed 50% reported positively for the soil health test being conducted while 50% reported negatively on the conduct of the soil health tests.

2.5.3. Cropping Pattern

The cropping pattern of the area is mainly influenced by the type of demography in which the crops are grown.

Table 2.5.7: Cropping pattern

Cropping Pattern (Conventional)		
Ahmedabad		
Kharif	***Rabi***	***Zaid***
Paddy	Wheat	Paddy
Dang		
Kharif	***Rabi***	***Zaid***
Paddy	Gram, Peas	Moong

Table 2.5.7 represents the cropping pattern as reported by the surveyed control farmers. In the Kharif season paddy is reported to be the dominant crop by the control farmers in both Ahmedabad and Dang districts whereas in Rabi season in Ahmedabad wheat is reported to be the dominant crop grown using conventional methods and in Dang, gram and peas are reported to be the dominant crop grown using conventional practices. Also, in Zaid season in Ahmedabad paddy is reported to be the dominant crop whereas in Dang District, Moong is reported to be the dominant crop grown in Zaid season using conventional practices. The data also suggests that in Gujarat as a whole 100% of the farmers reported growing paddy in Kharif season followed by 42% of the farmers reported growing Urad and 40% reported growing Ragi in the Kharif season. In Rabi season among the total 50 farmers surveyed 36% reported growing wheat and 10% reported growing gram and 10% reported growing peas whereas in Zaid season 16% of the farmers reported growing paddy and 4% reported growing moong using conventional practices.

2.5.4. Perception of farmers towards Sustainable Agricultural Practices

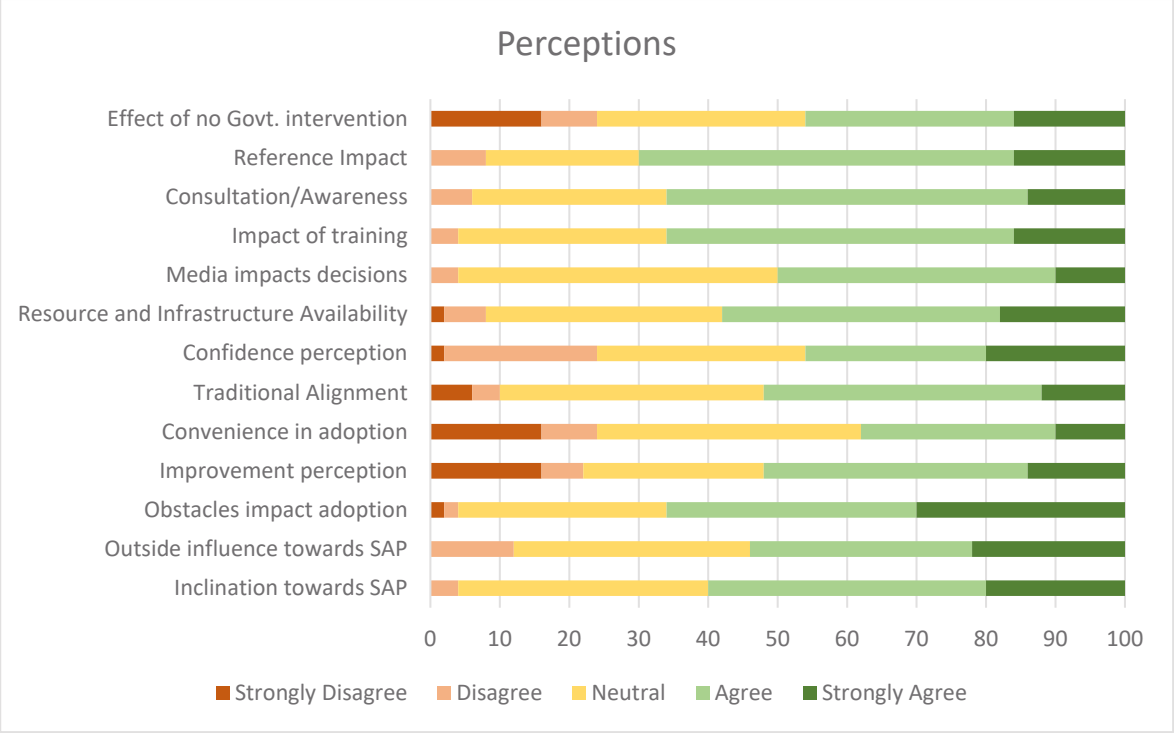

Figure 2.5.2: Perception of farmers towards Sustainable Agricultural Practices

Figure 2.5.2 gives us a qualitative idea on how the general idea of sustainable farming was perceived by the control sample. These instances are like the ones asked to the sustainable farmers. When farmers were asked how inclined do they feel towards sustainable agricultural practices after evaluating its positive and negative consequences, 60% of the farmers agree that they are inclined towards sustainable practices; which is a surprising inference and raises questions as to why are they not pursuing so. When asked about how outside sources like reference groups and information channels influence their behaviour and decisions, more than 50% farmers agree that outside influence matters.

When farmers were asked if it is difficult to adopt sustainable agriculture depending on the internal and external obstacles or opportunities such as personal abilities, knowledge, economic resources and infrastructural facilities; more than 60% of the farmers agree that there are obstacles to adoption of sustainable practices. More than 50% of the farmers believed that adopting sustainable farming would improve prospects like yield, soil health, income, and health, whereas around 20% of farmers also disagree to this point. Around 40% of the farmers believe that it is easy to learn and practice sustainable agriculture. Similarly, around 50% of the farmers agree that sustainable farming fits their traditional values, past experiences, and current needs.

A little less than 50% of the farmers are confident that they can adopt sustainable practices with the level of skills and knowledge they have, and around 25% of the farmers disagree with this notion. Surprisingly, around 60% of the farmers agree that they have the necessary resources and technical infrastructure required to adopt sustainable practices, whereas less than 10% of the sample disagrees that they are endowed with the resources required. When asked how formal media sources like television, radio, newspapers, etc. influence their decisions, around 50% of the farmers were likely to adopt sustainable practices, whereas most of the remaining farmers were indifferent in this case. More than 60% of the farmers agreed that they were more

likely to adopt sustainable practices if provided sufficient training, workshops, and exposure visits for the same. Similarly, around 60% farmers were more likely to adopt them if provided consultations or influenced by extension workers.

It can be seen that around 70% of the farmers agree that reference groups in terms of closer environment such as friends, neighbours, overall community, etc. influence their behaviour and decisions regarding sustainable practices. Continuing sustainable practices without government support and paying for certification and other services is disagreed by around 25% of the sample, while around 45% of the farmers agree to this.

2.6. Cost of Cultivation

This section represents the average input costs and the average additional costs adding up to the total costs per acre as reported by the surveyed farmers in the state of Gujarat. The major crops grown by farmers in Gujarat include paddy, wheat, nagali, gram and groundnut. The cost of inputs for the sustainable farming includes the costs for seeds, Jivamurtha/Bijamurtha, compost, organic fertilizers, farmyard manure, green manure etc. The input costs for the farmers adopting conventional farming include costs for seed, fertilizers, pesticides, urea etc. Additional costs include labour costs, machinery costs and other miscellaneous costs and together with the input costs, we arrive to a total cost.

Table 2.6.1: Average cost of cultivation for sustainable farming

Cost of cultivation for sustainable farming			
Crop	**Average Input Cost (per acre)**	**Average Additional Cost (per acre)**	**Average Total Cost (per acre)**
Paddy	Rs. 6915	Rs. 12298	Rs. 19213
Wheat	Rs. 5195	Rs.6804	Rs. 11999
Nagali	Rs. 1572	Rs. 9333	Rs. 10905
Gram	Rs. 145	Rs. 4128	Rs. 4274
Groundnut	Rs. 750	Rs. 15200	Rs. 15950

Source: Own Compilation

Table 2.6.1 represents the farming costs as reported by the treatment sample i.e. the farmers who have adopted sustainable farming. We can see that, for the production of paddy the average input costs per acre is Rs. 6,915 and the average additional costs per acre is reported by farmers as Rs. 12,298 thus leading to the total costs per acre of Rs. 19,213. For the production of wheat, the input costs incurred per acre is Rs. 5,195 and the additional costs per acre incurred on the production of wheat is Rs. 6,804. Thus, the total costs per acre amount to Rs. 11,999. The total cost for other crops like nagali, gram and groundnut are reported as Rs. 10,905, Rs. 4,274 and Rs. 15,950 respectively. The major part of the total costs is due to the additional costs such as labour and machinery.

Table 2.6.2: Average cost of cultivation for conventional farming

Cost of cultivation for Conventional farming			
Crop	**Average Input Cost (per acre)**	**Average Additional Cost (per acre)**	**Average Total Cost (per acre)**
Paddy	Rs. 7340	Rs. 8964	Rs. 16305
Wheat	Rs. 10137	Rs. 8749	Rs. 18886
Ragi	Rs. 643	Rs. 1217	Rs. 1860
Urad	Rs. 554	Rs. 2413	Rs. 2967
Gram	Rs. 570	Rs. 508	Rs. 1078

Source: Own Compilation

Now, we look at the farming costs as reported by the control sample i.e., the farmers adopting conventional methods of farming for the production of crops in the state of Gujarat. According to the above table, the major crops reported by the control farmers are paddy, wheat, ragi, urad and gram. The average cost of inputs incurred per acre for the production of wheat is Rs. 10,137 and the additional costs incurred per acre for the production of wheat is Rs. 8,749 thus leading to a total cost of Rs. 18,886. For the production of paddy, the average input costs incurred per acre is Rs. 7,340 and the average additional costs incurred per care is Rs. 8,964 leading to a total cost of Rs. 16,305. For the production of crops like ragi, gram and urad the total costs incurred per acre are reported as Rs. 1,860, Rs. 1,078 and Rs. 2,967 respectively. Except for wheat, the major part of the total costs is contributed by the additional costs incurred on the production process.

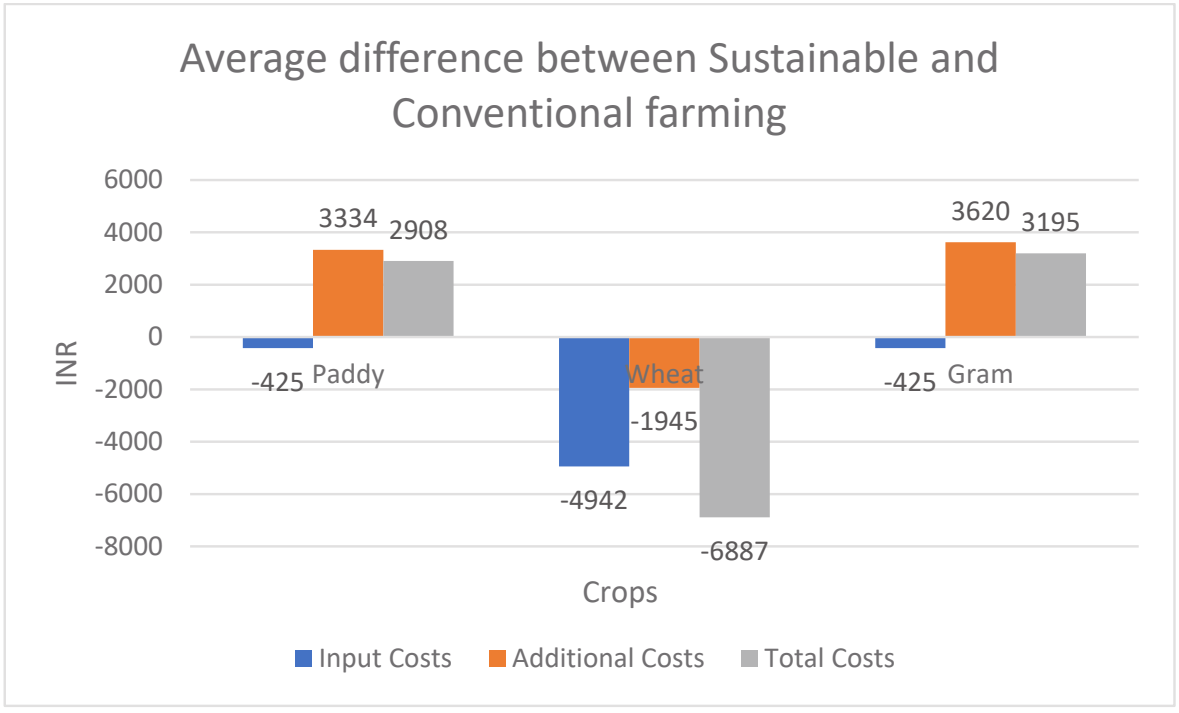

Figure 2.6.1: Average cultivation cost difference between sustainable and conventional farming

Figure 2.6.1 represents the average difference in the costs as reported by the farmers practicing sustainable agriculture and farmers using conventional methods. In the figure, the blue bars, orange bars, and grey bars represent the average difference between sustainable and

conventional farming in terms of input cost, additional cost, and total cost respectively. The difference is calculated by subtracting the costs incurred in conventional farming from their sustainable counterparts. So, a positive amount says that sustainable farming is costlier, while a negative amount means that conventional farming is costlier.

According to the figure, the average input costs incurred per acre on the production of gram, wheat and paddy are higher in case of conventional farming as compared to sustainable farming. In case of wheat the input costs per acre exceeds by Rs. 4,942 in case of conventional farming as compared to sustainable farming. We can see that except for wheat, the additional costs are reported to be higher in case of farming using sustainable practices for the production of paddy and gram by Rs. 3,334 and Rs. 3,620 respectively. Due to the higher additional costs the total costs for the crops of paddy and gram are also reported to be higher while practicing sustainable farming as compared to conventional farming. Only wheat seems to be the only crop where sustainable farming seems to be cheaper than conventional methods in all aspects. Otherwise, we can see that sustainable farming generally seems to be costlier in terms of additional mechanisms, while the inputs for this is cheaper. This difference in terms of higher additional costs for sustainable farming compared to conventional farming can be attributed to the fact that it includes labour and machinery charges required for initial conversion of land to make it suitable for organic farming. Also, sustainable practices start giving returns after a lag on investment, i.e., after a couple of years of practicing sustainable farming; thus, a better comparison could be drawn when the farmers were used to sustainable practices for a longer time.

CHAPTER

3

BIHAR

3. Introduction

Bihar is a predominantly rural economy, with 88.7 per cent of the population living in rural areas and about 75 per cent of the workforce engaged in agricultural and allied activities. Bihar's agrarian experience goes beyond its primary role of providing food to its masses, to include providing income and livelihood support for the large dependent workforce. Therefore, the development of agriculture and allied sectors in Bihar is crucial and it can go a long way in bringing about economic-transformation in the state. The state is well endowed with natural resources, especially fertile soil and water, which together support a diversified cropping system. Though the topography and water resources are favourable for crop cultivation, the issues of climatic change, high input cost, small landholdings and population pressure on land have added stress to this sector in recent years.

The primary sector has grown at a pace of 2.1 per cent during the last five years (2016-17 to 2020-21). Despite the Covid-19 pandemic and the subsequent lockdown, the robust performance of agriculture sector in Bihar is notable. The agricultural sector is vital for increasing rural incomes for ensuring food security and regulating food prices in the economy. Several programmes have been outlined in the Agriculture Roadmap – III (2017-22), extended its implementation till 2023. This roadmap lays an emphasis on organic farming, including the development of organic and natural farming corridors in the Ganga riverine areas and off the national and state highways.

Accordingly, the state government is developing an organic corridor comprising of 13 districts from Buxar (West) to Bhagalpur (East) viz., Bhagalpur, Saran, Nalanda, Buxar, Vaishali, Samastipur, Bhojpur, Munger, Lakhisarai, Khagaria, Patna, Begusarai and Katihar. In Bihar, sustainable farming has been promoted since 2015. Javik Corridor Yojana (JCY) was initially planned in 2018-19, but launched in 2019-20 for three years i.e., 2019-20 to 2021-22. A sum of Rs. 155.88 crores (excluding Rs. 4.18 crores for Katihar district) was sanctioned for its implementation in 13 districts. The main objective of the scheme is to promote sustainable farming, protect environmental and water pollution, produce poison free vegetables, save health of the soil, conserve micro-organism available in the soil and to make the agriculture long term and sustainable.

During 2015-16, a centrally sponsored Paramparagat Krishi Vikas Yojana (PKVY) was launched in the state. Further, during 2017-18 promotion of sustainable farming begun under centrally sponsored Namami Gange Swachhata Abhiyan and as of now, after the implementation of PKVY, Namami Gange Swachhata Abhiyan, Javik Corridor Yojana (under the state plan), the Central Government has also sanctioned Bhartiya Prakritik Krishi Padhatti (BPKP) Yojana for its implementation on 31,000 hectares in 17 districts of the state. The scheme will be implemented in the principle of Zero Budget Natural Farming (ZBNF).

Table 3.1: Coverage, cluster and districts of PKVY in Bihar

SN	Year	Cluster (Each 50 acres)	Coverage	Name of the Districts
1.	2015-16	327	15 districts	Patna, Nalanda, Rohtas, Kaimur, Gaya, Nawada, Arurangabad, Jehanabad, Arwal, Munger, Banka, Jamui, Lakhisarai, Sheikhpura and Darbhanga.
2.	2016-17	No fresh sanction was made.		
3.	2017-18	100	07 districts	Patna, Nalanda, Begusarai, Lakhisarai, Munger, Gaya & Nawada
4.	2017-18 (Under Namami Gange Swachhata Abhiyan)	103	05 districts	Bhojpur, Buxar, Chapra, Vaishali & Patna.
5.	2018-19	No fresh sanction was made		
6.	2019-20	After revalidation of the fund, implementation of 2015-16 sanctioned schemes was made.		
7.	2020-21	65 (05 cluster per district)	13 Aspirational Districts	Araria, Aurangabad, Banka, Begusarai, Gaya, Jamui, Katihar, Khagaria, Muzaffarpur, Nawada, Purnea, Sheikhpura & Sitamarhi.
8.	2020-21 (Under Namami Gange Swachhata Abhiyan)	28*	12 Districts	Begusarai, Patna, Samastipur, Buxar, Saran, Katihar, Bhojpur, Bhagalpur, Khagaria, Munger, Vaishali & Lakhisarai.

*Each cluster having 500 hectares distributed across 700 local groups (20 ha/LG x 700 LG = 14000 ha). Implementation was scheduled for 2021-22 after validation of fund for the financial year 2021-22.

3.1. Socio Economic and Farm Level Characteristics

The socio-economic and farm level characteristics comprises of average age of farmers, educational qualification, gender, caste, occupation, average landholding and income from farmers.

Table 3.1.1: List of sample districts based on uptake

State	District	Taluka	Number of Farmers
Bihar	Munger	Munger Sadar, Bariyarpur	50 treatment + 20 control
Bihar	Bhagalpur	Nathnagar	11 control
Bihar	Patna	Patna Sadar, Fatuha	50 treatment + 19 control
Total			**150 (100 - Treatment + 50 - Control)**

Source: Own Compilation

Table 3.1.1 presents the samples collected from three districts in the state of Bihar. The number of treatment group farmers surveyed was 50 each in Munger and Patna district, while Bhagalpur has only control farmer representation. The farmers have been classified into two categories as treatment group farmers and control group farmers with a sample of 150 being divided as 100 for treatment group farmers and 50 for control group farmers.

Table 3.1.2: Sample characteristics of treatment farmers

Sample Characteristics of Treatment Farmers		
Average Age of farmers		44.47 ~ 44 years
Average HH Size		5.33 ~ 5 members
Average HH engaged in Agriculture		2.94 ~ 3 members
Average Annual HH Income		**Rs. 2,91,010**
	Munger	Rs. 2,51,243
	Patna	Rs. 3,30,778
Average Income from agriculture and allied sources		**Rs. 2,65,253**
	Munger	Rs. 2,28,443
	Patna	Rs. 3,02,064
Average Income from non-agricultural sources		**Rs. 49,533**
	Munger	Rs. 39,310
	Patna	Rs. 62,422

Source: Own Compilation

The table 3.1.2 presents the data on the sample characteristics of treatment farmers. According to the table the average age of farmers is reported at 44 years, and the average household size of the farmers is reported at five members. On an average 3 members among the five members in the household are engaged in agricultural activities. The table also shows the average annual household income of the farmers as Rs. 2,91,010 with Munger district having an average annual household income of Rs. 2,51,243 and Patna district having an annual income of Rs. 3,30,778. The average income from agriculture and allied sources is Rs. 2,65,253 with Munger district reporting an average income from agriculture sources as Rs. 2,28,443 and Patna district reporting an average income of Rs. 3,02,064. The average income from the non-agriculture sources as Rs. 49,533 with Munger district reporting the income from non-agriculture sources as Rs. 39,310 and Patna district reporting an income of Rs. 62,422 from non-agriculture sources on an average basis.

Table 3.1.3: Landholding characteristics of treatment farmers

Landholding Characteristics		
Average Landholding	**1.22 acres**	
	Munger	1.4 acres
	Patna	1.03 acres
Average Net Operated Land	**2.2 acres**	
	Munger	2.35 acres
	Patna	2.05 acres
Average Area Irrigated out of Net Operated Land	**2.2 acres**	
Percentage Operated Land Irrigated (average)	**100%**	
	Munger	100%
	Patna	100%
Average Area dedicated to sustainable farming	**0.61 acres**	
Percentage Operated Land under sustainable farming (average)	**28.7%**	
	Munger	27.08%
	Patna	30.32%

Source: Own Compilation

Table 3.1.3 shows the data on the landholding characteristics of the surveyed farmers. The average landholding of the treatment group farmers is reported at 1.22 acres with Munger district having an average landholding of 1.4 acres and Patna district an average landholding of 1.03 acres. The average net operated land of the treatment farmers is 2.2 acres with Munger district having an average net operated land of 2.35 acres and Patna district reporting an average net operated land at 2.05 acres. The average irrigated area out of the net operated area is 2.2. acres where 100% of the operated land is irrigated in both the surveyed districts. The average area dedicated to the sustainable agricultural practices is reported at 0.61 acres. The percentage of the operated land under the sustainable agricultural practices is 28.7% with Munger district having operated land under sustainable farming as 27.08% on average whereas Patna district having the percentage of operated land under sustainable farming at 30.32%.

Table 3.1.4: Secondary occupational structure of the treatment group

Secondary Occupational Structure	
Occupation	**Percent**
Self Employed / Own Business	6%
Livestock / Poultry Rearing / Fishery	10%
Salaried Employment	1%
Agricultural Labour	21%
Non-Agricultural Labour	0%
Others	1%

Source: Own Compilation

Table 3.1.4 above reports the secondary occupational structure of the treatment group farmers. The table shows that 21% of the surveyed farmers reported agricultural labour as the secondary occupational structure followed by 10% reporting livestock/poultry rearing/ fishery as their secondary occupation, 6% of the surveyed farmers reports own business as their secondary occupation whereas 1% of the farmers individually reports salaried employment and other occupations as their secondary occupation.

3.2. Paramparagat Krishi Vikas Yojana

Table 3.2.1: Incentives for the leader

Incentive Provided		
District	**Cash**	**Kind**
Munger	10%	0%
Patna	10%	0%

Source: Own Compilation

The above table reports the incentive structure under PKVY in the state of Bihar. The table above shows that 10% of the farmers individually in both the districts surveyed reported to receive cash benefits whereas none of the farmers report receiving benefits on the kind basis.

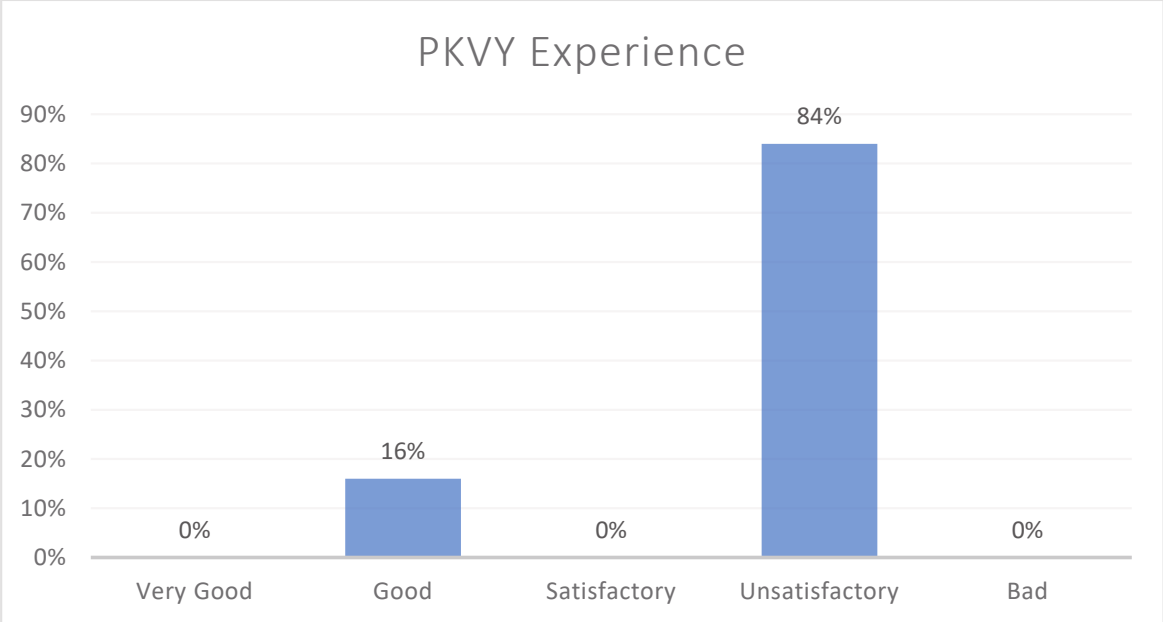

Figure 3.2.1: Sources of information about Sustainable Agricultural Practices

The figure above presents the information about the sources of information about PKVY. According to the figure, 63% of the surveyed farmers reported fellow villagers as the main source of information about PKVY, followed by 28% pointing to sources other than listed as the main source of information. Nearly 5% of the surveyed farmers reported government awareness programmes as the main source of information about PKVY whereas 4% of the farmers pointed to implementing agencies as the source of information about PKVY.

3.2.1. Certification Status

Figure 3.2.2: Certification status of treatment group farmers

The above figure 3.2.2 represents the certification status of the surveyed treatment group farmers. The figure shows the presence of C1 and C2 farmers in the surveyed area. The C1 farmers represent the farmers carrying on with the sustainable farming activity for a year whereas C2 farmers represents the farmers carrying them out for two consecutive years. According to the figure, in Munger district all the farmers reported having a C1 level of certification whereas in Patna district all of the farmers reported having a C2 level of certification status. On an overall basis in the state of Bihar, 50% of the surveyed farmers reported having C1 level of certification status, whereas the remaining 50% of the farmers reported having C2 level of certification status.

3.2.2. Drivers for adoption of sustainable farming

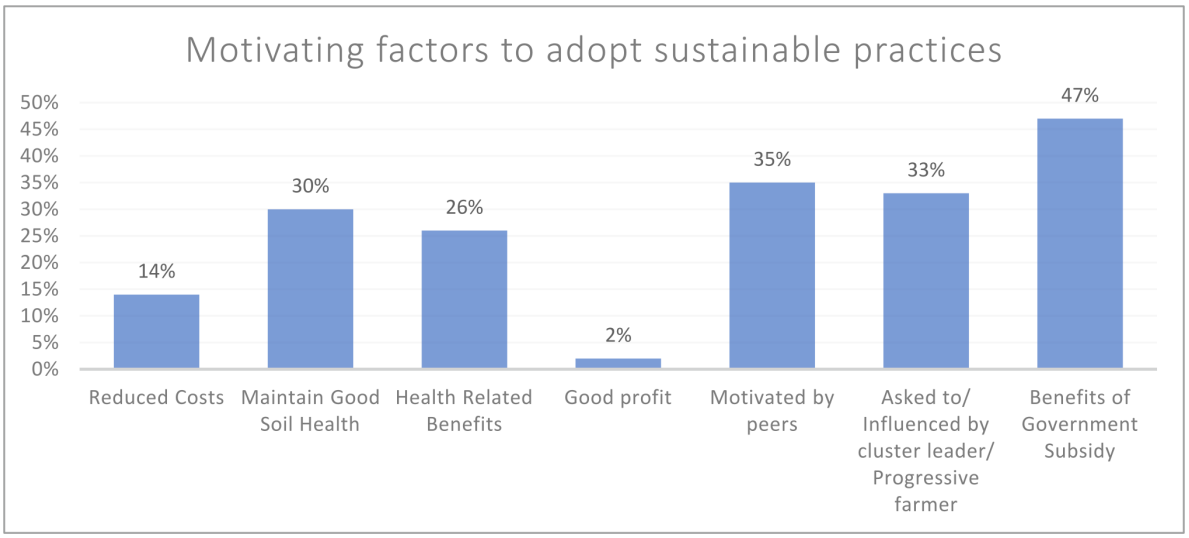

Figure 3.2.3: Motivating factors for adoption of Sustainable Agricultural Practices

The above figure shows the motivating factors presented on an average basis reported by surveyed farmers to practice sustainable farming. According to the figure, 47% of the farmers reported benefits of government subsidy as the main motivating factor to practice sustainable

agricultural practices followed by 35% reporting peers' motivation as the main motivating factor. One- third of the surveyed farmers said that the influence of cluster leader or progressive farmer was the main motivating factor to practice sustainable agricultural practices followed by 30% saying good soil health due to sustainable farming as the main motivating factor. As per the data, 26% of the farmers reported health benefits as the main motivating factor whereas 14% pointed out to cost reduction as the main motivating factor. Only 2% of the farmers reported good profits as the reason for practicing sustainable agricultural practices.

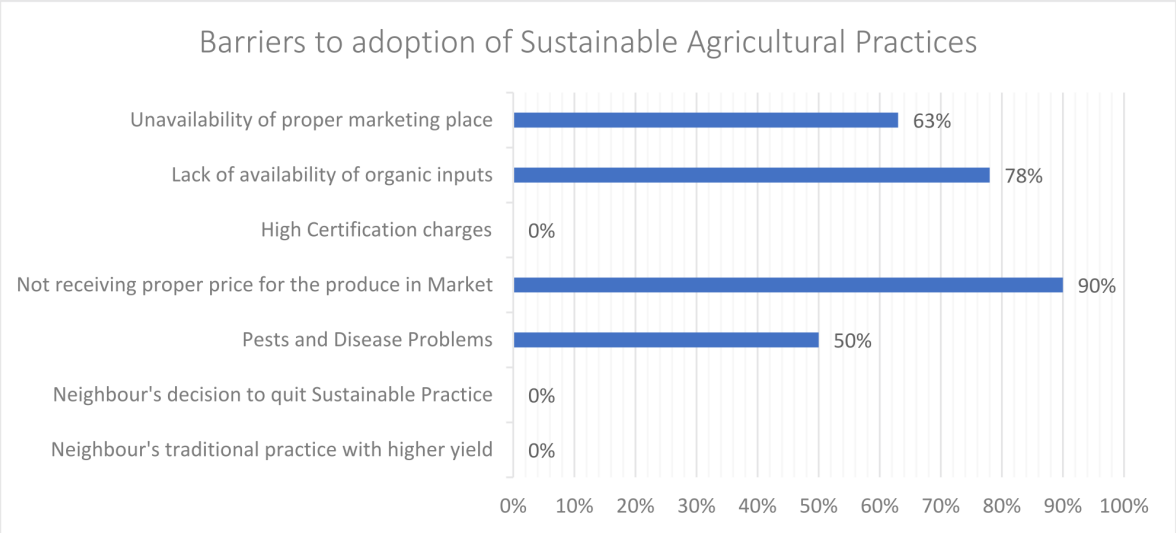

Figure 3.2.4: Barriers to adoption of Sustainable Agricultural Practices

The above figure represents the barriers reported by treatment group farmers in percentage terms. Nearly 90% of the surveyed farmers reported insufficient market price for the produce as the main demotivating factor against practicing sustainable agricultural practices followed by 78% reporting lack of availability of organic inputs as the main barrier. Nearly 63% of the surveyed farmers reported unavailability of the proper marketing place as the main barrier and 50% of the surveyed farmers reported pests and disease problems as the main challenge to practicing sustainable agricultural practices.

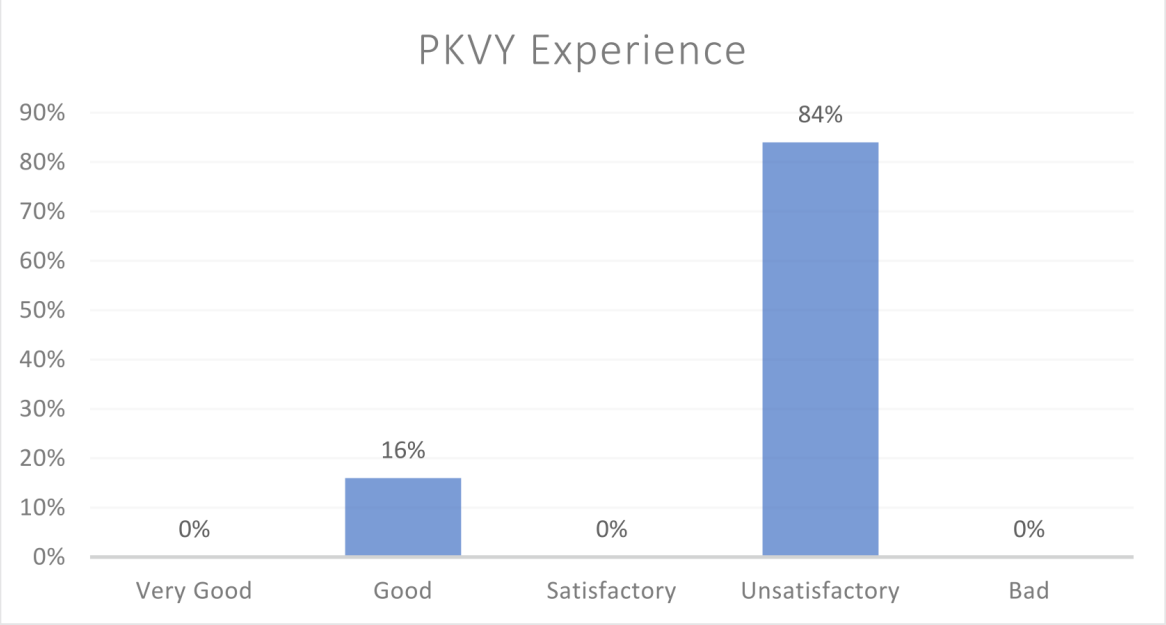

Figure 3.2.5: Experience with Paramparagat Krishi Vikas Yojana (PKVY)

The above figure shows the experience of the PKVY scheme as reported by the surveyed farmers. As can be seen, 84% of the farmers were not very satisfied with the scheme among the surveyed treatment group farmers whereas 16% reported that their experience of the scheme was good.

3.2.3. Challenges under sustainable farming

Table 3.2.2: Challenges under Sustainable Agricultural Practices

Biggest challenge in following sustainable farming	
Reason	**Percentage of farmers**
Low Yield	0%
Pests and Disease management	6%
No proper prices	16%
Problem of market linkages	56%
Lack of access to organic inputs	8%
Lack of training and awareness	0%
Lack of continued support	6%
Others	8%

Source: Own Compilation

The table shows the biggest challenges in following sustainable agricultural. According to the table 56% of the farmers reported problems of market linkages as the biggest challenge in following sustainable farming followed by 16% reporting improper marking pricing as the main challenge in following sustainable practices. Nearly 8% of the surveyed farmers reported lack of access to organic inputs as the biggest challenge and 6% of the farmers reported lack of continued support from government and other supporting organizations as the biggest challenge in following sustainable agricultural practices.

3.3. Cropping Pattern

Table 3.3.1: Sustainable Agricultural Practices cropping pattern

Cropping Pattern		
Munger		
Kharif	***Rabi***	***Zaid***
NA	Tomato	Maize
Patna		
Kharif	***Rabi***	***Zaid***
NA	Beetroot	Maize

Table 3.3.2: Conventional cropping pattern

Cropping Pattern (Conventional)		
Munger		
Kharif	***Rabi***	***Zaid***
Paddy	Wheat	Maize
Patna		
Kharif	**Rabi**	**Zaid**
Paddy	Nenua	Maize

Source: Own Compilation

The tables above represent the cropping pattern using both sustainable and conventional methods as reported by the surveyed treatment farmers in the state of Bihar. According to the table in Munger district in Bihar, tomato is the major crop grown in Rabi season using sustainable practices whereas wheat is the major crop grown in Rabi season using conventional methods. In the summer season maize is reported to be the major crop grown using both sustainable and conventional methods. Whereas, in Patna district, beetroot is reported to be the major crop grown in Rabi season organically and Nenua is reported to be major grown in the same season using conventional methods. In the summer season in Patna, maize is reported to be the major crop grown using both sustainable and conventional methods. As a whole in Bihar, 52% of the farmers reported growing wheat using conventional methods in Kharif season whereas in Rabi season 75% of the farmers reported growing tomato using sustainable methods. In the summer season approximately 25% of the farmers reported growing maize as the major crop using both sustainable and conventional methods while in the perennial season 12% of the surveyed farmers reported having mango cultivation in the fields.

3.4. Perception of Farmers towards PKVY

Figure 3.4.1: Perception of farmers towards Sustainable Agricultural Practices

This figure 3.4.1 gives us a qualitative idea about how the respondents perceived this scheme and the general idea of sustainable farming. We put forward 13 instances to get the perspectives of the respective farmers. Starting from the bottom in the above figure, farmers were asked how inclined do they feel towards sustainable agricultural practices after evaluating its positive and negative consequences. Nearly 70% strongly disagreed to this inclination. When asked about how outside sources like reference groups and information channels influence their behaviour and decisions, 75% of the sample are neutral about this and about 25% farmers disagreed that outside influence matters.

Next, farmers were asked if it is difficult to adopt sustainable agriculture depending on the internal and external obstacles or opportunities such as personal abilities, knowledge, economic resources and infrastructural facilities. All the farmers agreed that there are obstacles to adoption of sustainable practices with 84% farmers strongly agreeing to the fact.

Only 6% of the farmers believe that adopting sustainable farming would improve prospects like yield, soil health, income, and health, whereas the rest remain neutral. More than 65% of the farmers believe that it is not easy to learn and practice sustainable agriculture. Similarly, moving up in the table, all the farmers agree that sustainable farming fits their traditional values, past experiences, and current needs, with 12% of the farmers strongly agreeing to this.

While all the farmers are confident that they can adopt sustainable practices with the level of skills and knowledge they have, around 80% of the farmers strongly agree with this notion. We find that all of the farmers disagree that they have the necessary resources and technical infrastructure required to adopt sustainable practices, where about 30% of the sample strongly disagree to this. When asked how formal media sources like television, radio, and newspapers influence their decisions, all of the farmers were unlikely to do so. Nearly 13% of the farmers agreed that they were more likely to adopt sustainable practices if provided sufficient training, workshops, and exposure visits for the same, whereas 73% of them disagreed. Similarly, only 20% farmers were more likely to adopt sustainable practices if provided consultations or influenced by extension workers. It can be seen that continuing sustainable practices without government support and paying for certification is not found to be agreeable by majority of the respondents, indicating the crucial role of government support to push sustainable practices.

3.5. Control Farmers

3.5.1. Socio Economic Characteristics of Control Farmers

The socio-economic characteristics of control farmers in Bihar covers the information related to age of farmers, caste profile of farmers, educational qualification, landholding characteristics of farmers, among others. The table below represents the socio-economic characteristics of control farmers.

Table 3.5.1: Sample characteristics of control farmers

Sample Characteristics of Control Farmers		
Average Age of farmers	42 years	
Average HH Size	5 members	
Average HH engaged in Agriculture	3 members	
Average Annual HH Income	**Rs. 1,82,016**	
	Munger	Rs. 79,299
	Bhagalpur	Rs. 3,48,823
	Patna	Rs. 1,93,568
Average Income from agriculture and allied sources	**Rs. 1,34,034**	
	Munger	Rs. 63,577
	Bhagalpur	Rs. 2,99,586
	Patna	Rs. 1,12,352
Average Income from non-agricultural sources	**Rs. 85,684**	
	Munger	Rs. 34,938
	Bhagalpur	Rs. 90,267
	Patna	Rs. 1,18,700

Source: Own Compilation

The above table represents the data on family size, average age of farmers and average household income of farmers from agricultural and non- agricultural sources. The average age of farmers as reported by the surveyed control farmers is 42 years whereas average household size is reported to be 5 members per household. It is reported that on an average 3 members per household are engaged in agricultural activities thus indicating agriculture to be the primary occupation of the control farmers. The average household income is Rs. 1,82,016. When estimated district wise, the average household income in Munger district is reported as Rs. 79,299, in Bhagalpur district it is Rs. 3,48,822 whereas in Patna district it is reported to be Rs.1,93,567. The income from agricultural and allied sources is Rs. 1,34,033 in which the income from agricultural sources in Munger district is reported at Rs. 63,577, in Bhagalpur district it is reported at Rs.2,99,586 and in Patna district it is reported at Rs. 1,12,351. The income from non-agricultural sources is reported at Rs. 85,684. In Munger district the income from non-agricultural sources is reported at Rs. 34,938, in Bhagalpur district it is reported at Rs. 90,267 whereas in Patna district the income from non-agricultural sources is reported at Rs. 1,18,700 on an average basis respectively.

Table 3.5.2: Caste profile of control farmers

Caste Profile	
Caste	**Percent**
General	24%
SC	0%
ST	0%
OBC	76%

Source: Own Compilation

The above table represents the caste profile of the surveyed control farmers in the state of Bihar. According to the table 76% of the farmers surveyed belong to the OBC category while 24% of the farmers belong to the general category respectively. Also, among the surveyed farmers 88% of the surveyed farmers were male members while 12% of the surveyed farmers were female members.

Table 3.5.3: Educational qualifications of control farmers

Educational Qualification Status	
Qualification	**Percent**
Illiterate	12%
Primary Education	44%
Secondary Education	26%
Higher Secondary / Diploma	14%
Graduation	2%
Post-graduation and above	2%

Source: Own Compilation

The above table represents the educational qualification status of the control farmers surveyed in the state of Bihar. According to the table, 44% of the surveyed farmers reported having education till primary level, 26% of the surveyed farmers reported having education till

secondary level while 14% of the farmers reported having education till higher secondary level. Almost 12% of the farmers reported to be illiterate while 2% of the farmers were found having a graduation degree and 2% reported having a post-graduation degree as well.

Table 3.5.4: Landholding characteristics of control farmers

Landholding Characteristics		
Average Landholding	**2.09 acres**	
	Munger	0.59 acres
	Bhagalpur	6.65 acres
	Patna	1.04 acres
Average Net Operated Land	**2.12 acres**	
	Munger	1.31 acres
	Bhagalpur	4.1 acres
	Patna	1.82 acres
Average Area Irrigated out of Net Operated Land	**2.12 acres**	
Percentage Operated Land Irrigated (average)	**100%**	
	Munger	100%
	Bhagalpur	100%
	Patna	100%

Source: Own Compilation

The above table represents the landholding characteristics of the surveyed control farmers in the state of Bihar. The average landholding of the farmers in the surveyed area is found to be 2.09 acres. When considered district wise, in Munger the average landholding is reported as 0.59 acres, in Bhagalpur district it is reported as 6.65 acres, in Patna district it is reported as 1.04 acres. The average net operated land as per the data is reported as 2.12 acres which if considered district wise, in Munger district is reported as 1.31 acres, in Bhagalpur district it is reported as 4.1 acres and in Patna district it is reported as 1.82 acres. The average net irrigated area out of net operated area is reported as 2.12 acres while it is reported from the data that on an average basis 100% of the reported operated land is irrigated in the surveyed area.

Table 3.5.5: Secondary occupational structure of control farmers

Secondary Occupational Structure	
Occupation	**Percent**
Self Employed / Own Business	6%
Livestock / Poultry Rearing / Fishery	2%
Salaried employment	2%
Agricultural Labour	12%
Non-Agricultural Labour	2%
Others	0%

Source: Own Compilation

The above table shows that while agriculture is the primary occupation of the surveyed farmers, some secondary occupational structures have also been reported by the farmers. Nearly 12% of the surveyed control farmers reported agricultural labour to be their major secondary occupation, 6% of the farmers reported self-employment or business activities as the major secondary occupation, 2% of the farmers reported livestock/poultry/fishery to be their major secondary occupation while 2% reported salaried employment as their major secondary occupation and 2% of the sample reported non-agricultural labour respectively.

3.5.2. Paramparagat Krishi Vikas Yojana

The control farmers represent the group of farmers who may be aware about the scheme of sustainable farming but are dependent on chemicals and fertilizers for the agricultural production in order to earn their livelihood and hence are not part of PKVY clusters in the state of Bihar.

Table 3.5.6: Sources of information regarding PKVY

How do you know about PKVY?	Percent
Govt. Awareness Programs	0%
Implementing Agencies	26%
Panchayat	0%
Other Villagers	74%
Other sources	0%
Total	100%

Source: Own Compilation

The above table presents the sources of information through which the control farmers are made aware regarding PKVY in the state. According to the responses 74% of the farmers reported to have received information regarding PKVY through their peers or other villagers while 26% of the reported farmers reported to have received the information through the implementing agencies in the surveyed area.

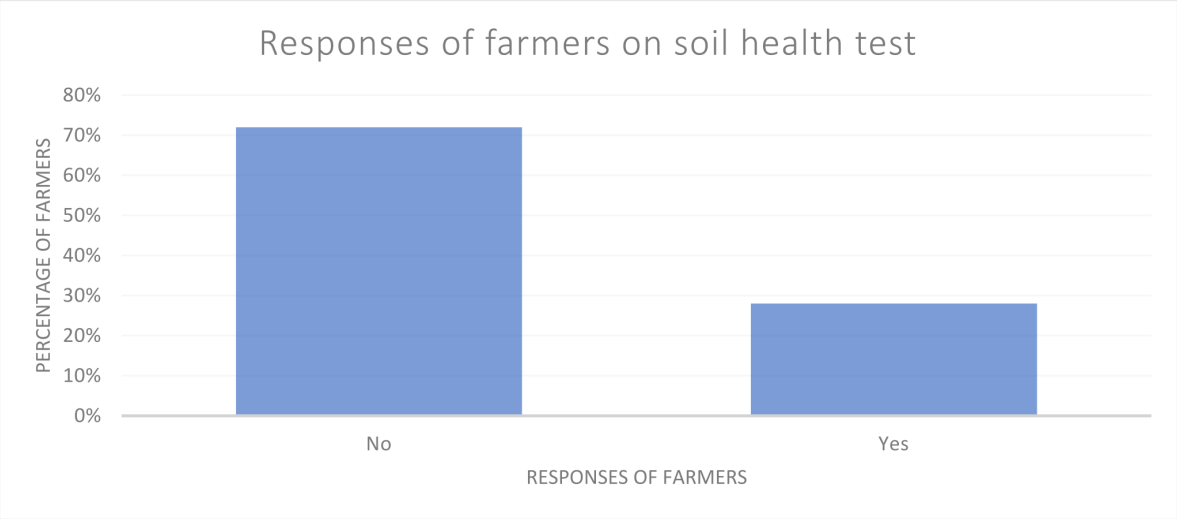

Figure 3.5.1: Response of control farmers on conduct of soil health tests

The above figure represents the responses of the surveyed control farmers on the conduct of soil health test in the surveyed area. According to the figure 72% of the surveyed farmers responded negatively on the implementation of soil health test while 28% of the surveyed farmers responded positively on the implementation of soil health tests.

3.5.3. Cropping Pattern

The cropping pattern represents the information regarding the crops grown in different seasons of Kharif, Rabi, Zaid and Perennial.

Table 3.5.7: Cropping pattern

Cropping Pattern (Conventional)		
Munger		
Kharif	***Rabi***	***Zaid***
Maize	Wheat, Potato	Moong
Bhagalpur		
Kharif	***Rabi***	***Zaid***
Paddy	Wheat	Moong
Patna		
Kharif	***Rabi***	***Zaid***
Maize	Wheat	Moong

The above table presents the cropping pattern of the control farmers. In Munger district maize is reported to be the dominant crop grown in Kharif season using conventional methods, Wheat and potato are reported to be the dominant crop grown in the Rabi season whereas moong is reported to be the dominant crop grown in summer season. Mango is reported as a dominant crop grown in Perennial season using conventional methods. In Bhagalpur district farmers reported paddy to be the dominant crop grown in Kharif season, wheat to be the dominant crop grown in Rabi season and moong to be the dominant crop grown in summer season using conventional methods. In Patna district the surveyed farmers reported maize to be the dominant crop grown in Kharif season, wheat to be the dominant crop grown in Rabi season and moong the dominant crop grown in summer season. In the state of Bihar as a whole, 70% of the farmers reported to grow maize as the dominant crop during Kharif season followed by 42% reporting growing wheat in the Kharif season using conventional methods. In Rabi season among the surveyed farmers 100% reported growing wheat in Rabi season followed by 56% reported growing wheat as well. In the summer season, 22% of the farmers reported growing only moong during the summer season.

3.5.4. Perception of farmers towards sustainable agricultural practices

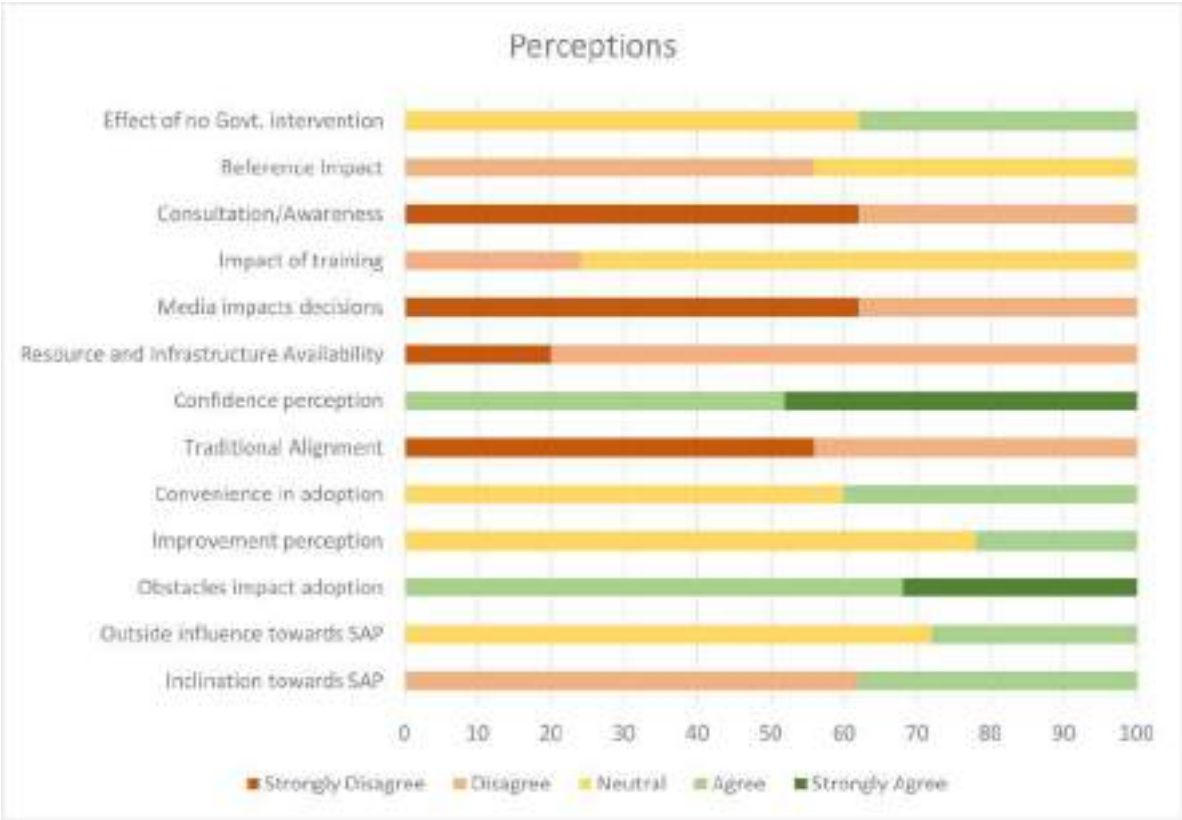

Figure 3.5.2: Perception of farmers towards Sustainable Agricultural Practices

The figure 3.5.2, like in the case of PKVY farmers gives us a qualitative idea of how the general idea of sustainable farming was perceived by the control sample. As we can see, when farmers were asked how inclined do they feel towards sustainable agricultural practices after evaluating its positive and negative consequences, and more than 60% of the farmers are not inclined towards sustainable practices. When asked about how outside sources like reference groups and information channels influence their behaviour and decisions, more than 70% farmers are neutral that outside influence matters while the rest agree.

When farmers were asked if it is difficult to adopt sustainable agriculture depending on the internal and external obstacles or opportunities such as personal abilities, knowledge, economic resources and infrastructural facilities; all the farmers agree that there are obstacles to adoption of sustainable practices, with around 30% farmers strongly agreeing to this notion. More than 20% of the farmers believed that adopting sustainable farming would improve prospects like yield, soil health, income, and health, whereas the rest of the farmers are neutral to this point. Around 40% of the farmers believed that it is easy to learn and practice sustainable agriculture. Similarly, all the farmers agree that sustainable farming does not fit their traditional values, past experiences, and current needs.

All the farmers are confident that they can adopt sustainable practices with the level of skills and knowledge they have, and around 50% of the farmers strongly agree with this notion. It can be seen that all the farmers disagree that they have the necessary resources and technical infrastructure required to adopt sustainable practices. When asked how formal media sources like television, radio and newspapers influence their decisions, all the farmers were unlikely to adopt sustainable practices. Around 20% of the farmers disagreed that they were more likely to adopt sustainable practices if provided sufficient training, workshops, and exposure visits for

the same, while the rest were indifferent. Also, all the farmers disagreed that they were likely to adopt sustainable practices even if provided consultations or influenced by extension workers.

We can see that around 60% of the farmers disagree that reference groups in terms of closer environment such as friends, neighbours and overall community, influence their behaviour and decisions regarding sustainable practices.

3.6. Cost of Cultivation

This section of the chapter represents the average input costs and average additional costs incurred in the production of crops in the state of Bihar. The cost of inputs for the sustainable farming includes the costs for seeds, Jivamurtha/Bijamurtha, compost, organic fertilizers, farmyard manure and green manure, among others. The input costs for the farmers adopting conventional farming include costs for seed, fertilizers, pesticides and urea. Additional costs include labour costs, machinery costs and other miscellaneous costs. Together with the input costs, we derive the total cost.

Table 3.6.1: Average cost of cultivation for sustainable farming

	Cost of cultivation		
Crop	**Average Input Cost (per acre)**	**Average Additional Cost (per acre)**	**Average Total Cost (per acre)**
Cucumber	Rs. 1887	Rs. 3401	Rs. 5288
Nenua	Rs. 2144	Rs. 3492	Rs. 5636
Onion	Rs. 8846	Rs. 11058	Rs. 19903
Maize	Rs. 2922	Rs. 14946	Rs. 17868
Tomato	Rs. 2699	Rs. 9145	Rs. 11844

Source: Own Compilation

The above table presents the reported input and additional costs of treatment sample i.e. farmers who are doing crop production using sustainable practices. According to the table, the average input costs per acre for the production of tomato is reported at Rs. 2,699, whereas the additional costs per acre is reported at Rs. 9,145, leading to a total cost per acre of Rs. 11,844. The average input costs incurred in the production of onion is reported at Rs. 8,846, whereas the additional costs are reported at Rs. 11,058, thus, leading to the total cost amount of Rs. 19,903. Similarly, the total average costs for crops of cucumber, nenua and maize is reported at Rs. 5,288, Rs. 5,636 and Rs. 17,868 respectively. According to the table we can conclude that the major part of the total costs per acre is formed by the additional costs being much higher than the input costs.

Table 3.6.2: Average cost of cultivation for conventional farming

	Cost of cultivation for Conventional farming		
Crop	**Average Input Cost (per acre)**	**Average Additional Cost (per acre)**	**Average Total Cost (per acre)**
Paddy	Rs. 6854	Rs. 10734	Rs. 17587
Wheat	Rs. 8176	Rs. 13501	Rs. 21677
Maize	Rs. 4387	Rs. 9466	Rs. 13853
Onion	Rs. 5644	Rs. 12560	Rs. 18203
Potato	Rs. 15496	Rs. 14176	Rs. 29672

Source: Own Compilation

The above table presents the input costs as reported by the control sample i.e., farmers who use conventional methods of farming for the production of crops. According to the table, the average input costs per acre for the production of potato is reported at Rs. 15,496, whereas the additional costs per acre is reported at Rs. 14,176, thus, leading to a total cost of Rs. 29,672. The average input costs for the production of wheat are reported at Rs. 8,176 and the additional costs per acre for wheat production is reported at Rs. 13,501, thus, leading to a total cost of Rs. 21,677. Similarly, the total costs per acre for crops of paddy, maize and onion is reported at Rs. 17,587, Rs. 13,853 and Rs. 18,203 respectively.

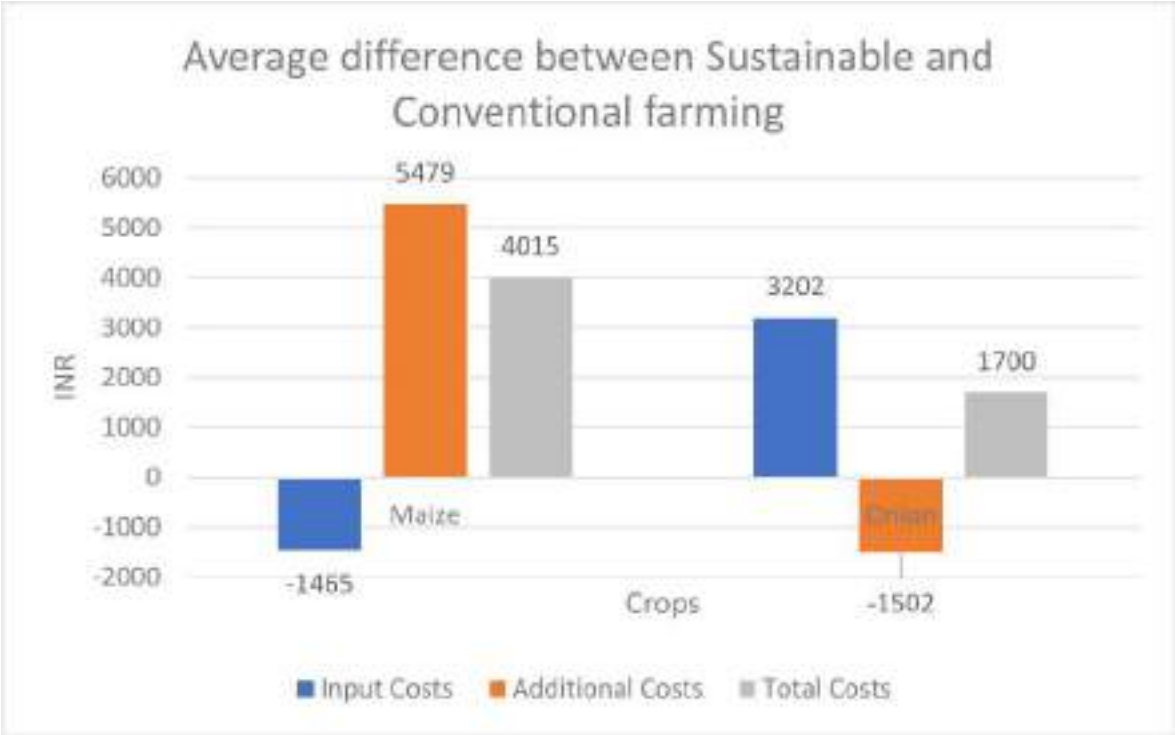

Figure 3.6.1: Average cultivation cost difference between sustainable and conventional farming

The above figure represents the difference in input costs among the surveyed farmers practicing sustainable and conventional farming methods. The blue bars, orange bars, and grey bars represent the average difference between sustainable and conventional farming in terms of input cost, additional cost, and total cost respectively. Negative values indicate cases where costs involved with conventional methods are more than that of sustainable farming and vice-versa. According to the figure, in case of onion production it is observed that the average additional costs is higher in case of conventional farming as compared to sustainable farming methods by Rs. 1,502 and in case of maize production the input costs are reported to be higher for farmers practicing conventional farming as compared to farmers practicing sustainable farming by Rs. 1,465. The total costs as shown in the figure is reported to be higher for the farmers practicing sustainable farming as compared to farmers practicing conventional farming by Rs. 1,700 and Rs. 4,015 for onions and maize respectively. In case of maize, the additional costs involved in sustainable farming are more than the conventional counterpart, amounting to a difference of Rs. 5,479 which adds to a higher cost of production in total. This difference in cost of cultivation under sustainable and conventional farming may be due to the cost of conversion of land and the additional labour required for that process.

CHAPTER

4

HIMACHAL PRADESH

4. Introduction

Agriculture provides direct employment to 71% of the population in Himachal Pradesh and the sector contributes nearly 30% of the total state domestic product. The new sown area of Himachal Pradesh is 5,38,412 hectares and the total cropped area is 9,40,597 hectares. The total irrigated area is 70 lakh hectares. The agro-climatic zones of Himachal Pradesh are:

- **Shivalik Hill Zone:** Occupies about 35% of the total geographical area and around 40% of the total cultivated area. The major crops grown are wheat, maize, paddy, gram, sugarcane, mustard, potato and other vegetables.
- **Mid Hill Zone:** Occupies about 32% of the total geographical area and around 37% of the total cultivated area. The major crops sown are wheat, maize, barley, black gram, beans, paddy, etc. This zone has good potential for the cultivation of cash crops, such as off-season vegetables, and temperate vegetables, such as cauliflower and root crops.
- **High Hill Zone:** Occupies about 35% of the total geographical area and around 21% of the total cultivated area. The commonly grown crops are wheat, barley, lesser millets, pseudo-cereals (buckwheat and Amaranthus), maize and potato, etc. The area is suitable for the production of seed potatoes and temperate vegetables.
- **Cold Dry Zone:** Occupies about 8% of the total geographical area and 2% of the total cultivated area. The major crops grown are wheat, barley, and pseudo-cereals.

Schemes for promoting natural farming

Himachal Pradesh practices Natural Farming under the Prakritik Kheti Khushal Kissan (PK3) Yojana. The scheme aims to reduce the cost of cultivation and enhance farmers' income. The scheme was announced by the Chief Minister in the Budget speech of 2018–19. The scheme seeks to promote the production of food grains, vegetables, and fruits without the use of synthetic chemicals/pesticides and fertilizers. The scheme went beyond its target of covering 500 farmers to 2669 in 2018–19. By 2019–20, 54,914 farmers were practicing Natural Farming on 2,451 hectares of land. The scheme has now targeted to bring more farmers under its ambit and cover 20,000 hectares.

A survey done in the first year of the implementation of the scheme found that Natural Farming lowered the cost of cultivation by 46% and increased profit by 22%. Another survey was conducted on the impact of this practice on the incidence of diseases in apples. The results were encouraging. Scab incidences in Natural Farming orchards were found to be 9.2% on leaves and 2.1% on fruit—in chemical farming, such incidences are found on 14.2% of the leaves and 9.2% of fruits. The incidences of marssonina were also found to be only 12.2% in Natural Farming orchards as compared to 18.4% in the chemical ones. The Himachal Pradesh government hopes to bring 9.61 lakh farmer families under the ambit of this Yojana by the end of 2022.

4.1. Socio Economic and Farm level characteristics

This section covers the analysis on average age of farmers, educational qualification, caste, gender, occupation, average landholding and income from farmers. Lists of Detailed districts based on uptake:

Table 4.1.1: Lists of sampled districts based on uptake

State	District	Block	Number of farmers
Himachal Pradesh	Shimla	Theog	50 treatment + 25 control
Himachal Pradesh	Solan	Kandaghat	50 treatment + 25 control
Total			100 treatment + 50 control

Source: Own Compilation

The table 4.1.1 presents the lists of sampled districts undertaken for the project. In the state of Himachal Pradesh for a sample collection of 150 in total including 100 treatment group farmers and 50 control group farmers, two sample districts of Shimla and Solan were selected to assess the status of PKVY in the state.

Table 4.1.2: Sample characteristics of treatment farmers

Sample Characteristics of Treatment Farmers		
Average Age of farmers	49 years	
Average HH Size	5.3 ~ 5 members	
Average HH engaged in Agriculture	3.06 ~ 3 members	
Average Annual HH Income	**Rs. 6,59,158**	
	Shimla	Rs. 8,34,275
	Solan	Rs. 4,84,040

Sample Characteristics of Treatment Farmers		
Average Income from agriculture and allied sources	**Rs. 5,07,456**	
	Shimla	Rs. 6,74,593
	Solan	Rs. 3,40,320
Average Income from non-agricultural sources	**Rs. 1,61,851**	
	Shimla	Rs. 1,73,174
	Solan	Rs. 1,50,527

Source: Own Compilation

The table 4.1.2 presents the sample characteristics of the treatment group farmers. According to the table the average age of farmers in the sampled area is reported as 49 years whereas the average household size is reported at 5 members. Out of this 3 members engage in agricultural activities on an average. The average household income of the state is Rs. 6,59,158 of which the average annual household income for Shimla district is reported at Rs. 8,34,275 and for Solan district is reported at Rs. 4,84,040. The average income from agriculture and allied sources is reported at Rs. 5,07,456, of which the income of Shimla district from agricultural sources is reported at Rs. 6,74,593 and of Solan district is reported at Rs. 3,40,320. The average income from the non-agricultural sources is reported at Rs. 1,61,851, of which Shimla district reported an annual income of Rs. 1,73,174 from non-agricultural sources and income of Solan district from non-agricultural sources is reported at Rs. 1,50,527.

Nearly 88% of the surveyed farmers belong to the general category whereas 12% are reported to belong to the scheduled caste category. Roughly, 57% of the famers reported having secondary education followed by 16% reporting having higher secondary/ diploma degree and 12% of the surveyed farmers reported having a graduate degree.

Table 4.1.3: Landholding characteristics of surveyed farmers

Landholding Characteristics		
Average Landholding	**2.99 acres**	
	Shimla	2.93 acres
	Solan	3.06 acres
Average Net Operated Land	**1.92 acres**	
	Shimla	2.12 acres
	Solan	1.71 acres
Average Area Irrigated out of Net Operated Land	**1.03 acres**	
Percentage Operated Land Irrigated (average)	**57.73%**	
	Shimla	56.72%
	Solan	58.75%
Average Area dedicated to sustainable farming	**0.85 acres**	
Percentage Operated Land under sustainable farming (average)	**52.79%**	
	Shimla	49.81%
	Solan	55.77%

Source: Own Compilation

The table 4.1.3 presents the data on the landholding characteristics of the farmers on an average basis. According to the table the average landholding of the famers is reported at 2.99 acres, of which average landholding of Shimla district is reported at 2.93 acres and of Solan district is reported at 3.06 acres. The average net operated land of the sampled farmers is reported at 1.92 acres, of which the average net operated land of Shimla district is reported at 2.12 acres and of Solan district is reported at 1.71 acres. The average irrigated area out of net operated land is reported at 1.03 acres. On the percentage basis the irrigated land out of net operated land is reported at 57.73%, of which the percentage of irrigated operated land is reported at 56.72% for Shimla and for Solan it is reported at 58.75%. According to the sampled data the average area dedicated to sustainable agricultural practices is reported at 0.85 acres whereas the percentage of operated land under sustainable agricultural practices is reported at 52.79%.

Table 4.1.4: Secondary occupational structure of the treatment group

Secondary Occupational Structure	
Occupation	**Percent**
Self Employed / Own Business	21.00%
Livestock / Poultry Rearing / Fishery	12.00%
Salaried employment	10.00%
Agricultural Labour	4.00%
Non-Agricultural labour	30.00%
Others	1.00%

Source: Own Compilation

The table 4.1.4 represents the secondary occupational structure of the surveyed farmers. Around 30% of the farmers reported non-agricultural labour as the main secondary occupational structure after agricultural activity followed by 21% who reported own business as the major secondary occupation. Twelve percent of the surveyed farmers reported livestock/poultry/ fishery as the major secondary occupation followed by 10% reporting salaried employment and just 4% of the surveyed farmers reported agricultural labour as the major secondary occupation.

4.2. Paramparagat Krishi Vikas Yojana

Paramparagat Krishi Vikas Yojana scheme was started in Himachal Pradesh in the year 2015 under the aegis of Directorate of Agriculture and now the control of the scheme has been shifted under the aegis of Department of Agriculture since 2018.

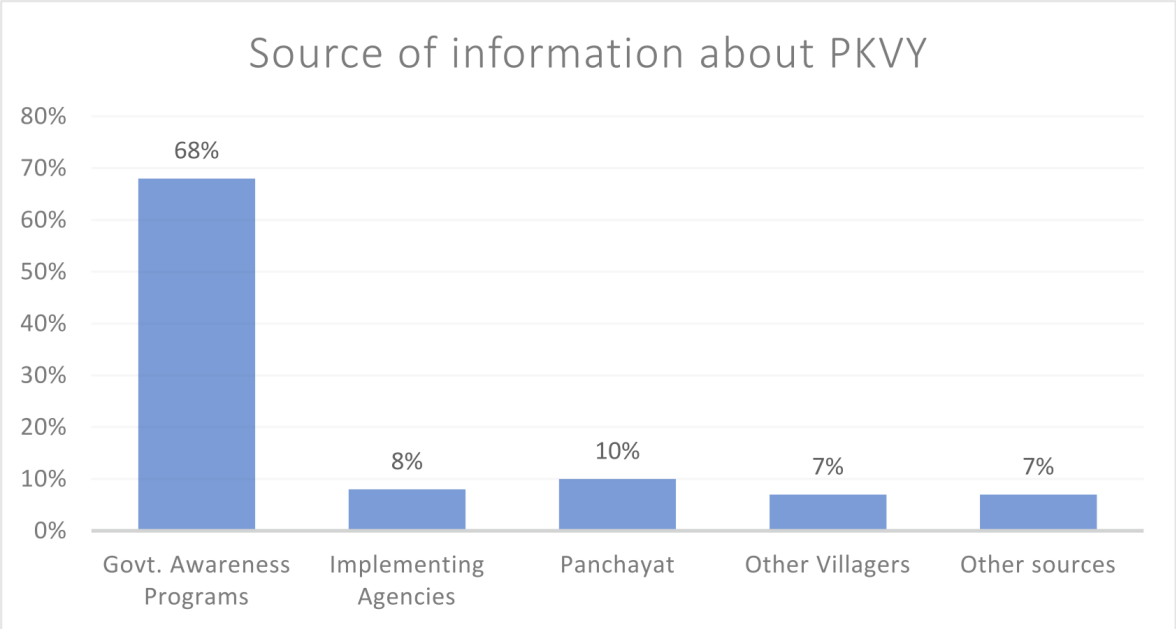

Figure 4.2.1: Source of Information about Sustainable Agricultural Practices

The above figure represents the sources which provided information to surveyed farmers regarding sustainable agriculture practices. Sixty-eight percent of the surveyed farmers reported to have received the information through the government awareness programmes, 10% of the surveyed farmers reported to have received information through panchayats, 8% of the surveyed farmers reported to have receive information through implementing agencies and 7% reported receiving information through peers.

4.2.1. Certification Status

There are three levels of certification being received by surveyed farmers in form of C1, C2 and C3. The information regarding the same will be provided in the figure below.

Figure 4.2.2: Certification status of treatment group farmers

The above figure 4.2.2 represents the certification status of the surveyed treatment group farmers in the state of Himachal Pradesh. In Shimla district, 40% of the famers had the C3 level of certification thus falling in the category of progressive farmers in terms of sustainable farming, 36% of the farmers had C2 level of certification and 24% of farmers had C1 level of

certification. In Solan district of Himachal Pradesh, all of the farmers reported having C2 level of certification. On an overall basis in the state of Himachal Pradesh, 68% of the surveyed farmers reported having C2 level of certification, 20% of the farmers reported having C3 level of certification and 12% of the farmers reported having C1 level of certification.

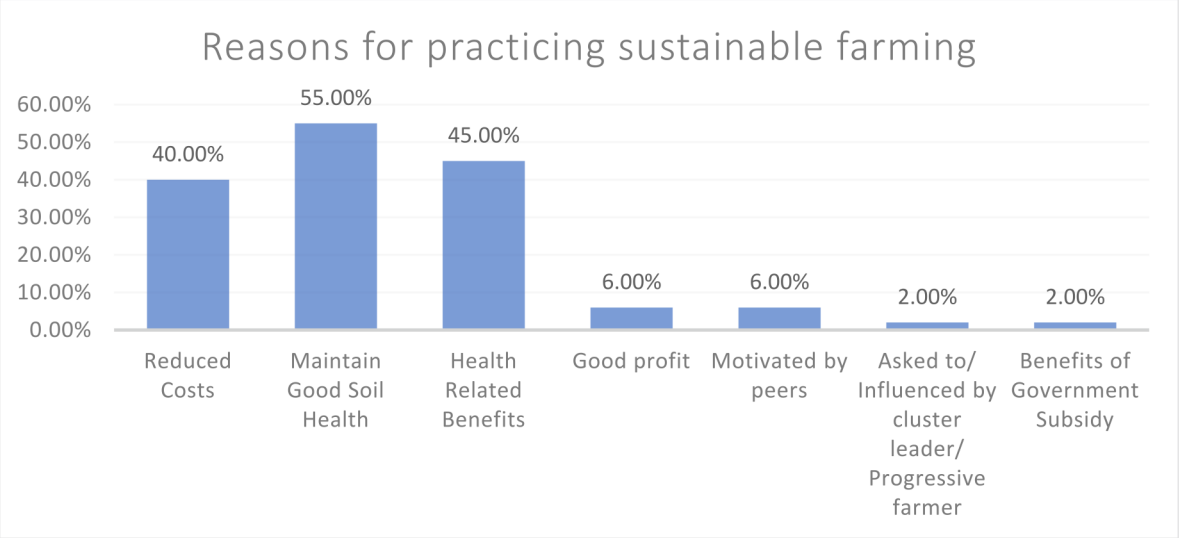

Figure 4.2.3: Motivating factors for adoption of Sustainable Agricultural Practices

The above figure 4.2.3 represents the major motivating factors to practice sustainable agricultural practices. Fifty-five percent of the farmers reported good soil health due to sustainable farming as the main motivating factor for practicing sustainable agricultural practices. This was followed by 45% farmers who reported health benefits as the main motivating factor for sustainable practices. Nearly 40% of the surveyed farmers reported cost reduction with sustainable farming as the main motivating factor to practice sustainable agricultural practices and 6% of the farmers reported good profits as the main motivating factor among others.

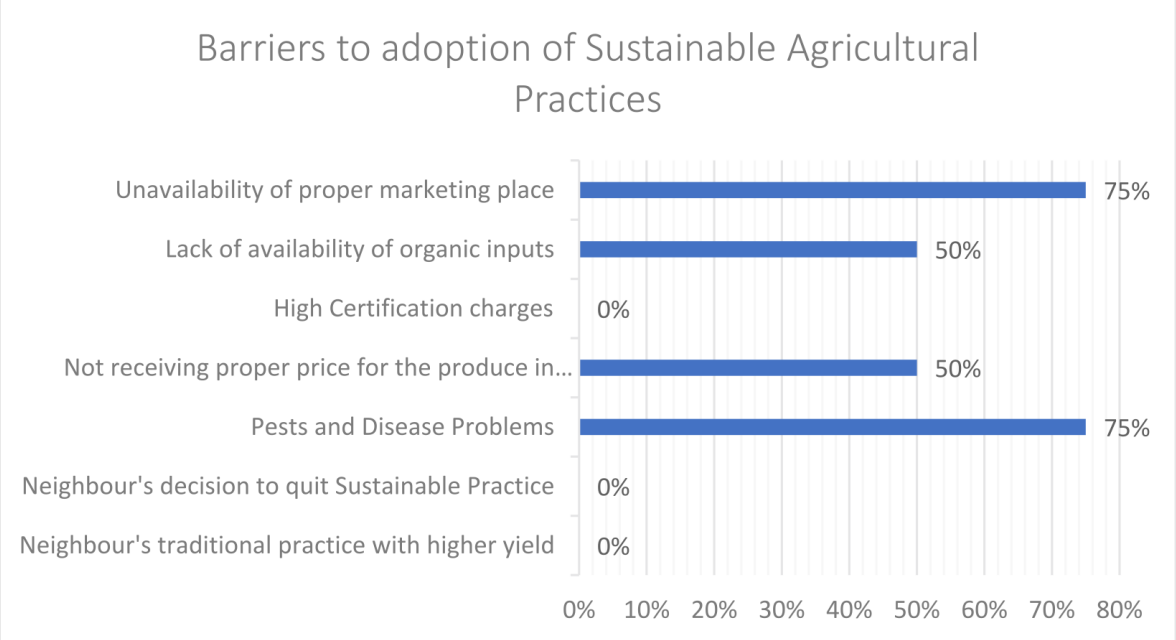

Figure 4.2.4: Barriers to adoption of Sustainable Agricultural Practices

The above figure 4.2.4 represents the barriers against practicing sustainable agricultural practices. Although most of the surveyed farmers are willing to continue with sustainable farming practices, some decided to discontinue. Among them, 75% of the farmers listed lack of proper marketing place and 75% listed pests and disease problems as the barriers. Lack of availability of organic inputs and not receiving proper prices in the market were demotivating reasons for 50% of farmers each.

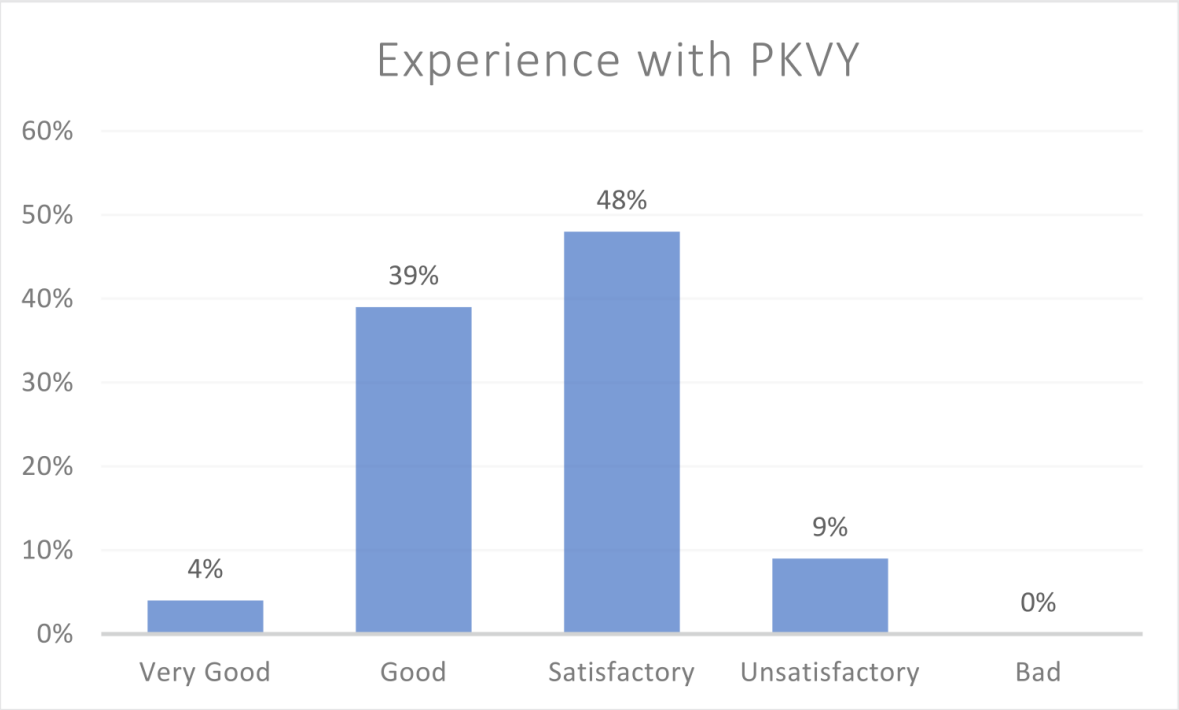

Figure 4.2.5: Experience with Paramparagat Krishi Vikas Yojana (PKVY)

The above figure presents the farmers response on their experience with PKVY scheme. According to the figure 48% of the surveyed farmers reported a satisfactory response with the PKVY scheme followed by 39% reported having a good experience under the scheme and 9% of the farmers reported having an unsatisfactory experience with PKVY.

4.2.2 Challenges under sustainable farming

Table 4.2.1: Challenges under Sustainable Agricultural Practices

Biggest challenge in following sustainable farming	
Reason	**Percent**
Low Yield	13%
Pests and Disease management	2%
No proper prices	13%
Problem of market linkages	58%
Lack of access to organic inputs	4%
Lack of training and awareness	8%
Lack of continued support	0%
Others	2%

Source: Own Compilation

The above table presents the biggest challenges as reported by farmers in following sustainable agricultural practices. Fifty-eight percent of the surveyed farmers said that problem of market

linkages is the biggest challenge in following sustainable agricultural practices. This was followed by 13% of the surveyed farmers who reported improper price discovery for the natural produce as the biggest challenge and 13% reported low yield due to sustainable farming as the biggest challenge. Eight percent reported lack of training and awareness as the biggest challenge and 4% reported lack of access to organic inputs as the biggest challenge in following sustainable practices.

4.3. Cropping Pattern

Table 4.3.1: Sustainable Agricultural Practices cropping pattern

Cropping Pattern		
Shimla		
Kharif	***Rabi***	***Zaid***
Beans	Peas	Apple
Solan		
Kharif	***Rabi***	***Zaid***
Tomato	Wheat	NA

Table 4.3.2: Conventional cropping pattern

Cropping Pattern (Conventional)		
Shimla		
Kharif	***Rabi***	***Zaid***
Beans	Potato	Apple
Peas		
Solan		
Kharif	***Rabi***	***Zaid***
Capsicum	Peas	Pear, Plum

Source: Own Compilation

The above tables, 4.3.1 and 4.3.2, represents the cropping pattern using sustainable and conventional practices in the state of Himachal Pradesh. In Shimla district in the Kharif season peas and beans are reported to be the major crop grown using both sustainable and conventional practices. In the Rabi season, peas are reported to be the dominant crop grown using sustainable farming while potato is reported to be dominant crop grown in the same season using conventional practices. In the summer season apple is reported to be the dominant crop grown using both sustainable and conventional practices. In Solan in Kharif season tomato is reported to be the dominant crop grown using sustainable farming while capsicum is reported to be the dominant crop grown using conventional practices in the same season. In the Rabi season, wheat is the dominant crop grown using sustainable practices while peas are the dominant crop grown using conventional methods. In summer season fruit crops are grown such as pear and plum using conventional practices in Solan district. Nearly 39% of the farmers reported peas as the dominant crop grown in Kharif season using sustainable practices and 13% grow beans using conventional methods. During perennial season fruit crops like apple, plum, pear and guava are mainly harvested.

4.4. Perceptions of farmers towards sustainable farming

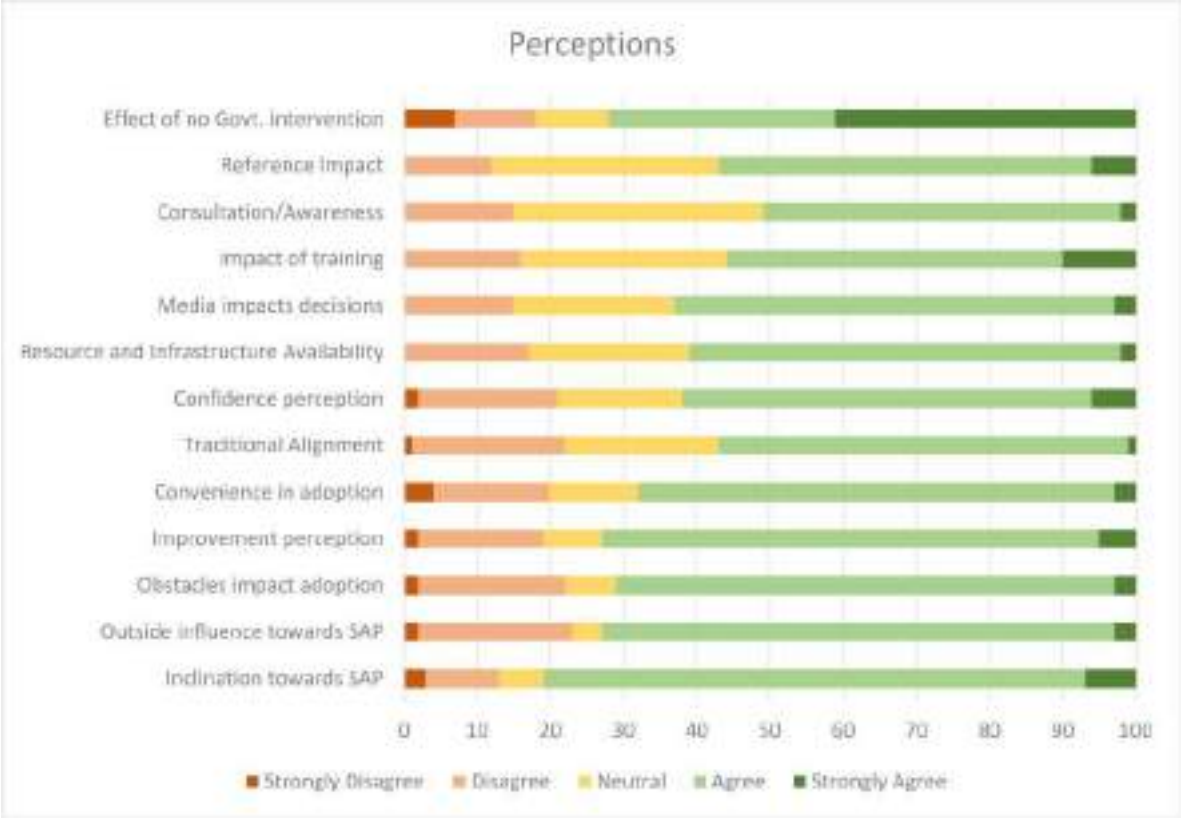

Figure 4.4.1: Perception of farmers towards Sustainable Agricultural Practices

The figure 4.4.1 reflects how the sample respondents perceived this scheme and the general idea of sustainable farming. We put forward 13 instances to get the perspectives of the respective farmers. Starting from the bottom in the above figure, farmers were asked how inclined do they feel towards sustainable agricultural practices after evaluating its positive and negative consequences. More than 80% of the farmers agree that they are inclined towards sustainable practices in Himachal Pradesh. Next, when asked about how outside sources like reference groups and information channels influence their behaviour and decisions, more than 70% farmers agree that outside influence matters.

When farmers were asked if it is difficult to adopt sustainable agriculture depending on the internal and external obstacles or opportunities such as personal abilities, knowledge, economic resources and infrastructural facilities, more than 70% of the farmers agreed that there are obstacles to adoption of sustainable practices, whereas, more than 20% farmers disagree to this. More than 70% of the farmers believe that adopting sustainable farming would improve prospects like yield, soil health, income, and health, whereas around 15% of farmers also disagree to this point. About 65% of the farmers believe that it is easy to learn and practice sustainable agriculture. Similarly, more than 55% of the farmers agree that sustainable farming fits their traditional values, past experiences, and current needs; but more than 20% of the farmers disagree to this.

About 60% of the farmers are confident that they can adopt sustainable practices with the level of skills and knowledge they have, and around 20% of the farmers disagree with this notion. Around 60% of the farmers agree that they have the necessary resources and technical infrastructure required to adopt sustainable practices, whereas 17% of the sample disagrees that they are endowed with the resources required. When asked how formal media sources like

television, radio, newspapers, etc. influence their decisions, more than 60% of the farmers were favourably affected, whereas 15% of the farmers were unlikely to adopt sustainable practices. Around 55% of the farmers agreed that they were more likely to adopt sustainable practices if provided sufficient training, workshops, and exposure visits for the same. Similarly, around 50% farmers were more likely to adopt sustainable practices if provided consultations or influenced by extension workers.

It can be seen that around 55% of the farmers agree that reference groups in terms of closer environment such as friends, neighbours, overall community, etc. influence their behaviour and decisions regarding sustainable practices. It can be seen that continuing sustainable practices without government support and paying for certification and other services is disagreed by around 70% of the sample, implying necessity of government support to push sustainable practices.

4.5. Control Farmers

4.5.1. Socio Economic Characteristics of Control Farmers

Table 4.5.1: Sample characteristics of control farmers

Sample Characteristics of Control Farmers		
Average Age of farmers	50 years	
Average HH Size	5.72 ~ 6 members	
Average HH engaged in Agriculture	3.26 ~ 3 members	
Average Annual HH Income	**Rs. 5,60,087**	
	Shimla	Rs. 8,50,886
	Solan	Rs. 2,69,287
Average Income from agriculture and allied sources	**Rs. 3,61,082**	
	Shimla	Rs. 5,89,764
	Solan	Rs. 1,32,400
Average Income from non-agricultural sources	**Rs. 1,99,005**	
	Shimla	Rs. 2,61,122
	Solan	Rs. 1,36,887

Source: Own Compilation

The above table represents the socio-economic profile of the control farmers in Himachal Pradesh. The average age of the control farmers is reported to be 49.84 years and average household size is reported to be 6 members. On an average, 3 members per household are engaged in agricultural activities which makes up for 50% of the households. The table also presents the data on the average household income of the control farmers. According to the table the household income of control farmers is reported to be Rs.5,60,087. In Shimla, the average household income is reported at Rs. 8,50,886 and in Solan district it is reported at Rs. 2,69,287 on an average. The average income from agriculture and allied sources is reported at Rs.3,61,082 under which in Shimla the average income from agricultural sources is reported at Rs. 5,89,764 and in Solan it is reported at Rs. 1,32,400 on an average basis. The data represents that the average income from non- agricultural sources is Rs. 1,99,005 under which in Shimla district the average income from non-agricultural sources is reported at Rs. 2,61,122 and in Solan district it is reported at Rs. 1,36,887 respectively.

Table 4.5.2: Caste profile of the control farmers

Caste Profile	
Caste	**Percent**
General	80%
SC	20%
ST	0%
OBC	0%

Source: Own Compilation

The above table represents the caste profile of the control farmers. According to the table 80% of the surveyed farmers reported to be belonging to the general category and 20% of the farmers reported to be belonging to SC category.

Table 4.5.3: Educational qualifications of control farmers

Educational Qualification Status	
Qualification	**Percent**
Illiterate	4%
Primary Education	14%
Secondary Education	42%
Higher Secondary / Diploma	22%
Graduation	14%
Post-Graduation and above	4%

Source: Own Compilation

The above table represents the educational qualification status of the control farmers. According to the data, 42% of the farmers reported to being qualified till the secondary educational level followed by 22% of the farmers reported to be qualified till higher secondary level. Among the surveyed farmers 14% of the farmers reported to having qualified till primary education level whereas 14% of the farmers reported having a graduation degree while 4% of the farmers reported having a post-graduation degree whereas 4 % of the farmers reported being illiterate.

Table 4.5.4: Landholding characteristics of control farmers

Landholding Characteristics		
Average Landholding	**2.31 acres**	
	Shimla	2.19 acres
	Solan	2.43 acres
Average Net Operated Land	**1.80 acres**	
	Shimla	1.77 acres
	Solan	1.84 acres
Average Area Irrigated out of Net Operated Land	**0.97 acres**	
Percentage Operated Land Irrigated (average)	**55%**	
	Shimla	39.7%
	Solan	69.6%
Average Area dedicated to sustainable farming	**1.78 acres**	
Percentage Operated Land under sustainable farming (average)	**99%**	
	Shimla	100%
	Solan	98%

Source: Own Compilation

The above table represents the landholding characteristics of the control farmers. According to the table the average landholding of the control farmers is reported as 2.3 acres in which the farmers in Shimla reported their average landholding at 2.2 acres and in Solan district the average landholding is reported at 2.4 acres on an average basis. The average net operated land according to the data is reported at 1.804 acres in which in Shimla district net operated land is reported at 1.77 acres and in Solan district net operated land is reported at 1.84 acres. The average area irrigated out of net operated land is reported at 0.97 acres. The data also indicates the percentage of irrigated land in the total operated area and on an average basis it is reported at 55% whereas in Shimla the percentage is reported at 39.7% whereas in Solan it is reported at 69.6%. The average area dedicated to sustainable agricultural practices is reported at 1.8 acres. The percentage of operated land under sustainable agricultural practices is reported at 99% on an average basis in which the percentage in Shimla is reported at 100% whereas in Solan is reported at 98%.

Table 4.5.5: Secondary occupational structure of control farmers

Secondary Occupational Structure	
Occupation	**Percent**
Self Employed / Own Business	10%
Livestock / Poultry Rearing / Fishery	2%
Salaried employment	2%
Agricultural Labour	0%
Non-Agricultural Labour	38%
Others	12%

Source: Own Compilation

The above table 4.5.5 represents the secondary occupational structure of the control farmers in the state of Himachal Pradesh. According to the table 38% of the surveyed control farmers reported non-agricultural labour as the major secondary occupation after agriculture while 10% of the farmers reported self-employed/business as the major secondary occupation, 2% of the farmers reported livestock/poultry rearing/fishery as the major secondary occupation and 2% of the farmers reported salaried employment as the major secondary occupation.

4.5.2. Paramparagat Krishi Vikas Yojana

Table 4.5.6: Sources of information regarding PKVY

How do you know about PKVY?	Percent
Govt. Awareness Programs	38%
Implementing Agencies	14%
Panchayat	8%
Other Villagers	2%
Other sources	38%
Total	100%

Source: Own Compilation

The above table represents the sources of information regarding PKVY for control farmers. According to the table 38% of the surveyed farmers reported to have received the information

regarding PKVY through government awareness programmes while 14% of the surveyed farmers reported to have receive the information through implementing agencies followed by 8% reporting to have receive the information through panchayat while 2% reported having information through their peers.

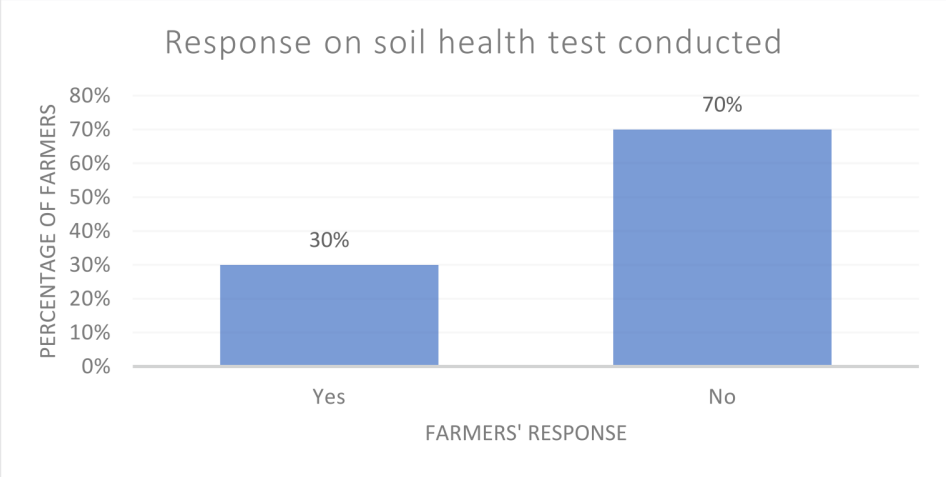

Figure 4.5.1: Response of control farmers on conduct of soil health tests

The above figure represents the response of farmers on the conduct of soil health test. According to the figure among the surveyed farmers of the control group 70% of the farmers reported negatively on the conduct of soil health test which implies that they denied that no soil health test is conducted by any agency while 30% of the farmers responded positively on the conduct of soil health test.

4.5.3. Cropping Pattern

The cropping pattern represents the data on the crops grown in different cropping seasons including Kharif, Rabi, Summer and Perennial season.

Table 4.5.7: Cropping pattern

Cropping Pattern (Conventional)		
Shimla		
Kharif	***Rabi***	***Zaid***
Peas	Peas	Apple
Solan		
Kharif	***Rabi***	***Zaid***
Tomato	Wheat	Pear, Plum

Source: Own Compilation

The above table represents the cropping pattern of the control farmers surveyed in the state of Himachal Pradesh. According to the data in the district of Shimla Peas is reported to be the dominant crop grown in the Kharif as well as the Rabi season with about 80-90% of the farmers reporting growing this crop in the following two seasons whereas in the perennial season apple is reported to be the major crop grown in the district of Shimla. In Solan district, Tomato is reported to be the major crop grown in Kharif season using conventional methods whereas wheat is reported to be the major crop grown in Rabi season. In perennial season plum and pear are reported to be the crops grown in Solan district using conventional methods. In the state of Himachal Pradesh in the Kharif season 72% of the surveyed farmers reported growing

wheat and 46% also reported growing tomato as well. In Rabi season 74% reported growing peas followed by 46% reported growing wheat as well in the season using conventional methods. In the perennial season three crops were reported to be grown by the surveyed farmers in the surveyed area as apples, pear and plums etc.

4.5.4. Perception of farmers towards sustainable agricultural practices

Figure 4.5.2: Perception of farmers towards Sustainable Agricultural Practices

The figure 4.5.2 in the case of PKVY farmers gives us a qualitative idea of how the general idea of sustainable farming was perceived by the control sample. We put forward 13 instances to get the perspectives of the respective farmers. Starting from the bottom in the above figure, farmers were asked how inclined do they feel towards sustainable agricultural practices after evaluating its positive and negative consequences, and more than 30% of the farmers agree that they are inclined towards sustainable practices. When asked about how outside sources like reference groups and information channels influence their behaviour and decisions, more than 40% farmers agree that outside influence matters. When farmers were asked if it is difficult to adopt sustainable agriculture depending on the internal and external obstacles or opportunities such as personal abilities, knowledge, economic resources and infrastructural facilities; more than 50% of the farmers agree that there are obstacles to adoption of sustainable practices.

More than 40% of the farmers believe that adopting sustainable farming would improve prospects like yield, soil health, income, and health. Around 40% of the farmers believe that it is easy to learn and practice sustainable agriculture. Similarly, we can see that, around 30% of the farmers agree that sustainable farming fits their traditional values, past experiences and current needs; but more than 30% of the farmers also disagree to this. A little more than 30% of the farmers are confident that they can adopt sustainable practices with the level of skills and knowledge they have, and around 30% of the farmers also disagree with this notion. It can be seen

that around 20% of the farmers disagree that they have the necessary resources and technical infrastructure required to adopt sustainable practices, whereas around 45% of the sample agrees that they are endowed with the resources required. When asked how formal media sources like television, radio, newspapers, etc. influence their decisions, around 55% of the farmers were likely to adopt sustainable practices, whereas around 25% of the farmers were unlikely to do so. Around 55% of the farmers agreed that they were more likely to adopt sustainable practices if provided sufficient training, workshops, and exposure visits for the same while 30% would not. Similarly, more than 60% farmers were more likely to adopt sustainable practices if provided consultations or influenced by extension workers.

We find that around 60% of the farmers agree that reference groups in terms of closer environment such as friends, neighbours, overall community, etc. influence their behaviour and decisions regarding sustainable practices. Looking at the important question, it can be seen that continuing sustainable practices without government support and paying for certification and other services is agreed by around 60% of the sample, with 20% strongly agreeing to it, implying there is no need of government support to push sustainable practices.

4.6. Cost of Cultivation

In the state of Himachal Pradesh, the major crops taken under consideration include peas, banana, tomato, wheat, maize, and apples. The cost of inputs for the sustainable farming includes the costs for seeds, Jivamurtha/Bijamurtha, compost, organic fertilizers, farmyard manure and green manure. The input costs for the farmers adopting conventional farming include costs for seed, fertilizers, pesticides and urea. Additional costs include labour costs, machinery costs and other miscellaneous costs. Together with the input costs, we derive the total cost. The table below presents the cultivation costs of major crops using sustainable practices.

Table 4.6.1: Average cost of cultivation for sustainable farming

	Cost of cultivation		
Crop	**Average Input Cost (per acre)**	**Average Additional Cost (per acre)**	**Average Total Cost (per acre)**
Peas	Rs. 17686	Rs. 21061	Rs. 38747
Beans	Rs. 19582	Rs. 24248	Rs. 43830
Tomato	Rs. 9276	Rs. 21622	Rs. 30898
Wheat	Rs. 3447	Rs. 6089	Rs. 9536
Maize	Rs. 5485	Rs. 6996	Rs. 12481

Source: Own Compilation

According to the table, for peas the average input costs incurred per acre amounts to Rs. 17,686 and the additional costs are reported at Rs. 21, 061, which amount to the total cost incurred in production of peas at Rs. 38,747. The costs for beans are reported at Rs. 43,830, of which, the input costs per acre are Rs.19, 582 and additional costs comprise of Rs. 24,248. The average input costs per acre for tomatoes is reported at Rs. 9,276 amounting to the total costs of Rs. 30,898 including the additional costs incurred per acre. Similarly, the average total costs per acre for wheat and maize is reported at Rs. 9,536 and Rs. 12,481 respectively. We can conclude that in case of peas, beans and tomato the average additional per acre on the production of crops exceeds the average input costs thus leading to a higher total cost per acre as compared to other crops.

Table 4.6.2: Average cost of cultivation for conventional farming

Cost of cultivation for Conventional farming			
Crop	**Average Input Cost (per acre)**	**Average Additional Cost (per acre)**	**Average Total Cost (per acre)**
Peas	Rs. 16572	Rs. 17729	Rs. 34301
Beans	Rs. 23406	Rs. 18719	Rs. 42125
Tomato	Rs. 12564	Rs. 15192	Rs. 2775
Wheat	Rs. 4555	Rs. 4412	Rs. 8967
Apple	Rs. 21326	Rs. 47252	Rs. 68578

Source: Own Compilation

The above table represents the average input costs as reported by control group farmers i.e. farmers using conventional methods of farming for the purpose of crop production. According to the data the average total costs per acre for peas is reported at Rs. 34,301 which includes the average input costs per acre of Rs. 16,572 and average additional costs incurred per acre of Rs. 17,729. The average costs per acre in the production of apple is reported at Rs. 68,578 including the average input costs per acre as Rs. 21,326 while the average additional costs per acre is reported at Rs. 47,252. Similarly, for the production of beans, tomato and wheat the average total costs per acre is reported at Rs. 42,125, Rs. 27,756 and Rs. 8,967 respectively.

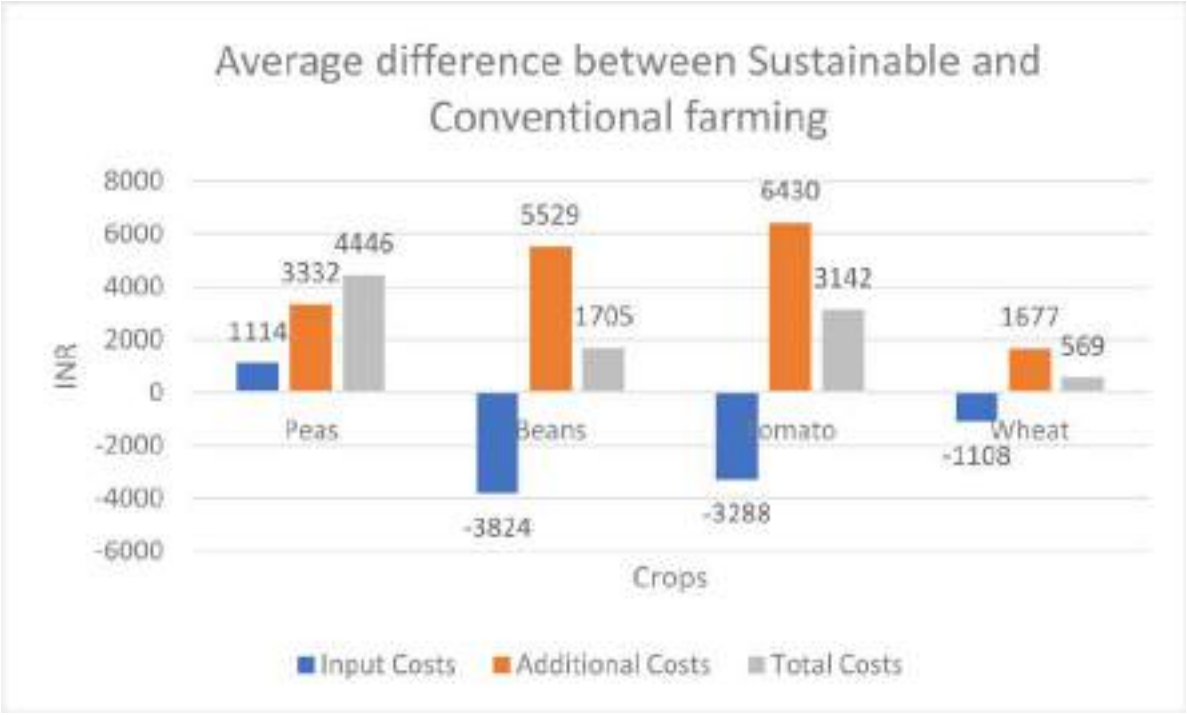

Figure 4.6.1: Average cultivation cost difference between Sustainable and Conventional farming

The above figure shows the average difference reported in the farming costs of conventional farming methods from sustainable methods. Similarly, like in previous cases, the blue bars, orange bars, and grey bars represent the average difference between sustainable and conventional farming in terms of input cost, additional cost, and total cost respectively. Negative values indicate cases where costs involved with conventional methods are more than that of sustainable farming and vice-versa. We can see that in production of peas the sustainable

farmers reported a higher input cost as compared to the farmers using conventional methods for the peas production whereas in case of wheat the sustainable farmers are incurring a lower input cost by Rs. 1,108 but a higher additional cost as compared to conventional farmers. Similarly, in case of beans and tomato production sustainable farmers reported to have been incurring a lower input cost and a higher additional cost as compared to farmers using conventional farming methods. In general, we can see that, in case of sustainable practices the input costs are lower, but are out-weighed by the additional costs like labour, machinery and processing which makes sustainable farming a little costlier in Himachal Pradesh. In general, sustainable practices require more extensive labour work compared to conventional farming and it also might include the one-time costs related to conversion of the field to farm for sustainable requirements. Thus, the additional costs tend to be higher in case of sustainable practices which might get neutralised in the future owing to the returns to this investment.

CHAPTER

5

KARNATAKA

5. Introduction

The Government of Karnataka released a state organic farming policy in 2004 (B. S. Reddy 2010). Karnataka was one of the first states in the country to establish a government policy on sustainable farming. In terms of organically certified area, Karnataka ranks 5th in India and 3rd in terms of area of cultivation[14]. The major motivation for interviewed farmers to adopt sustainable agriculture was their negative experiences with conventional farming, e.g., deteriorating natural resources, continuous pests and disease problems, high costs for external farm inputs, and health problems related to the use of pesticides (Lukas and Cahn 2008). Karnataka also has clusters under Zero Budget Natural Farming (ZBNF), for perennial crops like sugarcane and banana, which follow sustainable practices mainly based on the principle that remnants of one season serve as inputs for the next season.

5.1. Socio Economic and Farm Level Characteristics

Socio-economic profile of the farmers indicates the information on average age of famers, educational qualification, caste, gender, occupation, average land holding and income of farmers from various categories.

[14] https://www.agrifarming.in/SAP-farming-in-karnataka-how-to-start

Table 5.1.1: List of sampled districts based on uptake

State	District	Taluka	Number of Farmers
Karnataka	Tumkur	Tumkur, Madhugiri, Gubbi, Koratagere, Pavagada, Sira	33 treatment + 30 control
Karnataka	Mandya	Mandya, Pandavapura, K R Pete, Madduru	67 treatment + 25 control
Total			**155 (100 - Treatment + 55 - Control)**

Source: Own Compilation

Table 5.1.1 presents the information related to survey collected in different blocks of the state of Karnataka. The coverage of survey at the block level was equal for all the states. The farmers have been classified into two categories as treatment group farmers and control group farmers with a sample of 150 being divided as 100 for Treatment group farmers and 50 for control group farmers.

Table 5.1.2: Sample characteristics of treatment farmers

Sample Characteristics of Treatment Farmers		
Average Age of farmers	52 years	
Average HH Size	4.93 ~ 5 members	
Average HH engaged in Agriculture	2.52 ~ 3 members	
Average Annual HH Income	**Rs. 3,01,472**	
	Tumkur	Rs. 3,54,418
	Mandya	Rs. 2,75,394
Average Income from Agriculture and allied sources	**Rs. 2,14,133**	
	Tumkur	Rs. 2,46,515
	Mandya	Rs. 1,97,692
Average Income from Non-agricultural sources	Rs. 1,09,074	
	Tumkur	Rs. 1,27,171
	Mandya	Rs. 1,00,025

Source: Own Compilation

The table above represents the socio-economic characteristics of treatment farmers. According to the table the average age of farmers is reported to be 52 years and the average household size is 5 members. On an average 3 members in the household are engaged in the agricultural activities. The average household income of the farmers is Rs. 3,01,472. In Tumkur district it is reported at Rs. 3,54,418 and in Mandya district it is reported at Rs. 2,75,394. The average income from agriculture and allied sources in the state is reported at Rs. 2,14,133. In Tumkur, the average household income from agricultural sources is reported at Rs. 2,46,515 and in Mandya district it is reported at Rs. 1,97,692. The average income from non-agricultural sources is reported at Rs. 1,09,074; for Tumkur district it is reported at Rs. 1,27,171 whereas in Mandya district it is reported at Rs. 1,00,025 respectively.

Table 5.1.3: Landholding characteristics of treatment farmers

Landholding Characteristics		
Average Landholding	**3.46 acres**	
	Tumkur	3.12 acres
	Mandya	3.62 acres
Average Net Operated Land	**3.66 acres**	
	Tumkur	3.24 acres
	Mandya	3.86 acres
Average Area Irrigated out of Net Operated Land	**3.07 acres**	
Percentage Operated Land Irrigated (average)	**83.1%**	
	Tumkur	53.95%
	Mandya	97.46%
Average Area dedicated to sustainable farming	**2.13 acres**	
Percentage Operated Land under sustainable farming (average)	**67.78%**	
	Tumkur	57.48%
	Mandya	72.85%

Source: Own Compilation

The above table represents the landholding characteristics of treatment farmers in Karnataka. According to the table the average landholding of the farmers is reported at 3.46 acres. It is 3.12 acres in Tumkur district and at 3.62 acres in Mandya district. The average net operated land of the treatment farmers is reported at 3.66 acres. In Tumkur district it is reported at 3.24 acres and in Mandya district it is reported at 3.86 acres. The data also reports the average area irrigated land out of the net operated land at 3.07 acres. According to the data 83.1% of the operated land is reported to be irrigated. In Tumkur district it is reported at 53.95% whereas in Mandya district it is reported at 97.46%. The average area dedicated to sustainable agricultural practices per farmer in the state is reported at 2.13 acres. The data also reports the average percentage of operated land under sustainable practices at 67.78%. In Tumkur district it is reported at 57.48% whereas in Mandya district it is reported at 72.85% respectively.

Table 5.1.4: Secondary occupational structure of the treatment group

Secondary Occupational Structure	
Occupation	**Percent**
Self Employed / Own Business	38%
Livestock / Poultry Rearing / Fishery	23%
Salaried employment	16%
Agricultural Labor	8%
Non-Agricultural Labor	5%
Nothing	34%
Others	3%

Source: Own Compilation

The above table represents the secondary occupational structure of the treatment farmers. According to the table 38% of the farmers reported self-employed/own business as the major secondary occupational structure, 23% of the farmers reported livestock/poultry rearing/fishery as the major secondary occupation whereas 16% of the surveyed farmers reported salaried employment as the major secondary occupation. According to the data 8% of the farmers reported agricultural labour as the major secondary occupation whereas 5% of the farmers reported non-agricultural labour as the major secondary occupation respectively.

5.2. Paramparagat Krishi Vikas Yojana Status

The PKVY scheme is under the aegis of Department of Horticulture in Karnataka. The scheme works on the cluster approach in the state with each cluster having maximum 50 members and a total land size of 21 acres on an average under the cluster.

Table 5.2.1: Incentives for the leader

	Incentive Provided	
District	**Cash**	**Kind**
Tumkur	48.48%	18.18%
Mandya	44.78%	4.48%

Source: Own Compilation

The above table represents the data on incentives provided to the farmers under PKVY. The incentives are provided to farmers both in the form of cash and in kind. The data reports that 57% of the farmers reported positively on receiving incentives under the scheme whereas 43% responded negatively on the same. The data shows that in Tumkur district 48.48% of the farmers reported getting incentives in the form of cash whereas 18.18% reported receiving incentives in kind. In the Mandya district as per the data 44.78% of the farmers reported receiving incentives in cash whereas 4.48% of the farmers reported receiving incentives in kind respectively.

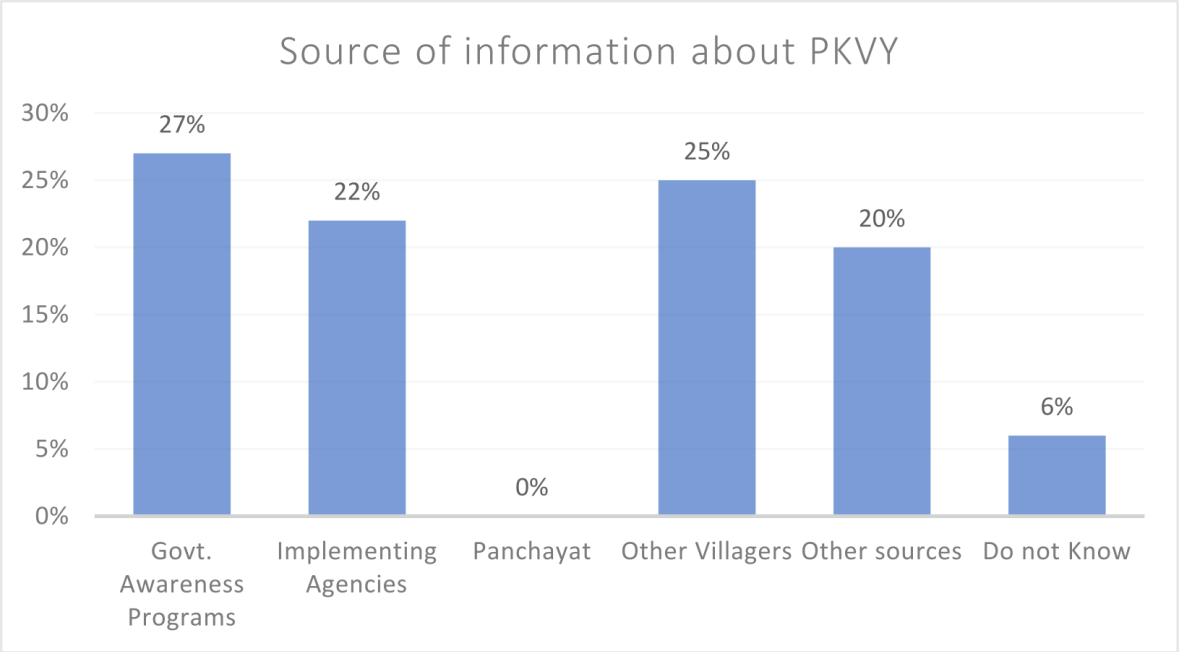

Figure 5.2.1: Source of information about Sustainable Agricultural Practices

The above figure represents the details on the sources that provide information regarding PKVY. According to the figure 27% of the farmers reported receiving information through government awareness programs, 25% reported receiving information through their peers, 22% reported receiving information through implementing agencies and 20% reported other sources as the major source of receiving information regarding PKVY.

5.2.1. Certification Status

The scheme is supported by the issuance of the certificate from the concerned agency. The certification process is divided into three phases as C1, C2 and C3. With C1 representing the farmers who have completed one year following the sustainable farming, C2 represents the farmers who have completed two years following the sustainable farming and C3 represents the farmers who are able to convert their land into a completely chemical-free land without the use of fertilisers for the period of three years.

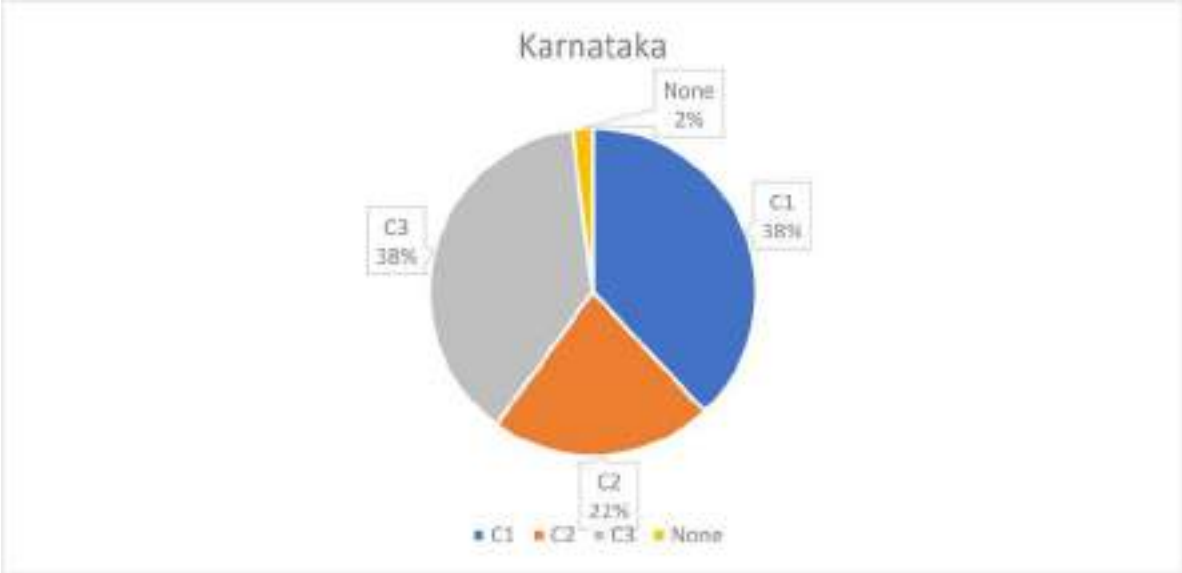

Figure 5.2.2: Certification status of treatment group

The figure above shows the certification status of the treatment farmers in the state of Karnataka. According to the figure 38% of the farmers reported belonging to C1 category of farmers which implies their existence in the field of sustainable farming since a year only whereas 22% of the farmers reported belonging to C2 category, 38% of the farmers reported belonging to C3 category whereas 2% of the farmers reported that they do not belong to any of the above categories of certification under the scheme. The study was conducted in two districts of Karnataka i.e., in Mandya and Tumkur. In Tumkur district around 24% of the farmers reported having C1 level of certification, about 67% of the farmers reported having C2 level of certification and about 9% of the farmers reported having C3 level of certification. In Mandya district, around 45% of the farmers reported having C1 level of certification and 52% of the farmers reported having C3 level of certification, whereas the remaining 3% of the farmers reported having no certification under the scheme.

5.2.2. Drivers for adoption of Sustainable Agricultural Practices

This section will cover the motivating factors as well as the barriers that played a role in the functioning of PKVY in the state of the Karnataka.

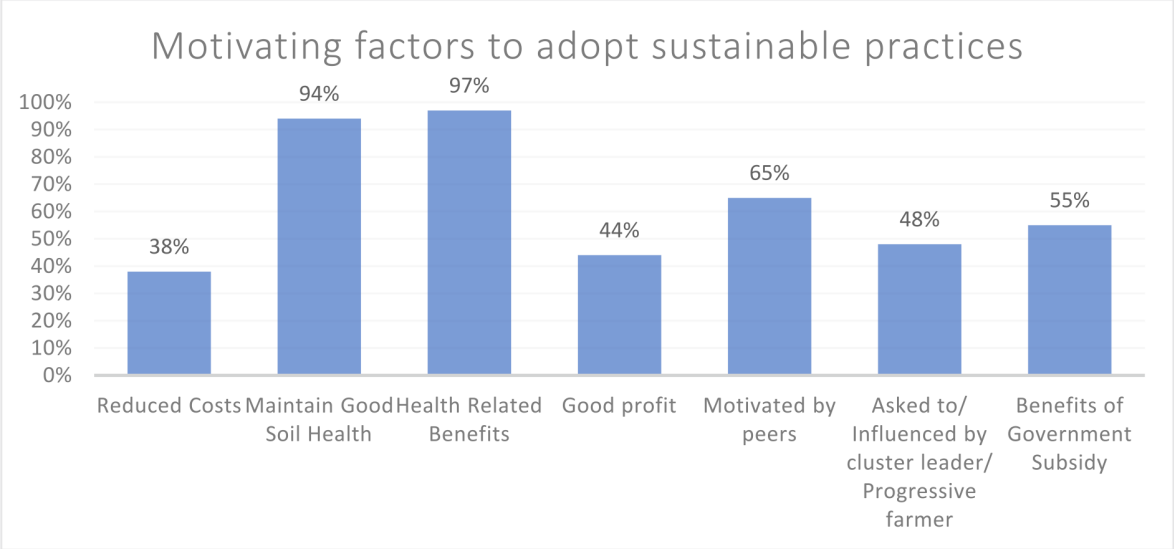

Figure 5.2.3: Motivating factors for adoption of Sustainable Agricultural Practices

The above figure represents the factors that motivate farmers to practice sustainable agricultural practices. According to the figure, 97% of the farmers reported health benefits as the major motivation behind practicing sustainable practices; 94% reported good soil health as the major motivation behind practicing sustainable practices; 65% of the farmers reported being motivated by their peers in order to practice sustainable practices whereas 44% reported good profit from sustainable farming as the major motivation to practice sustainable practices. Nearly 38% reported reduced input costs as the major motivating driver to practice sustainable practices. The data also shows that 55% of the farmers reported benefits of government subsidy as a motivating factor whereas 48% reported cluster leader influence as the major motivating driver to practice farming using sustainable inputs over traditional methods of farming.

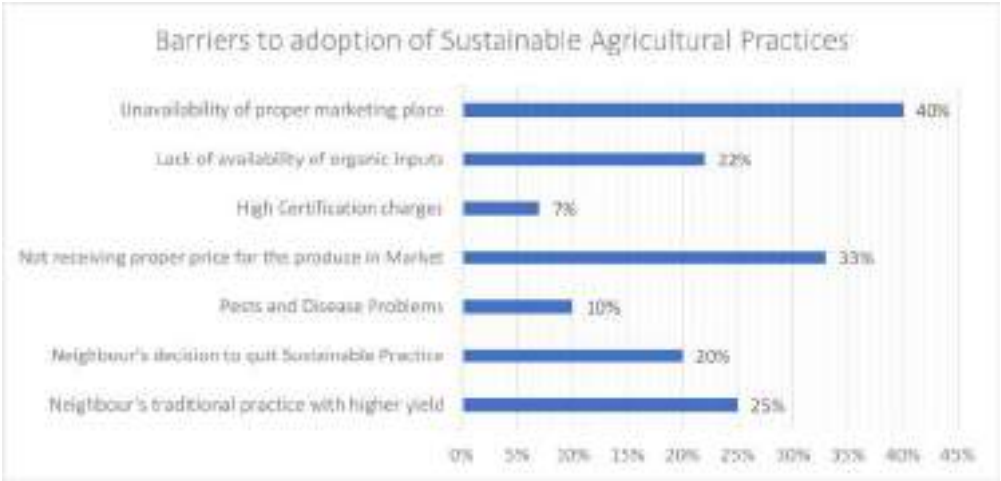

Figure 5.2.4: Barriers to adoption of Sustainable Agricultural Practices

The above figure presents the major factors that create barriers for farmers to practice sustainable practices. According to the figure, 40% of the farmers reported unavailability of proper marketing place as the major demotivating factor in order to practice sustainable practices. Nearly 33% reported improper market price for the sustainable crop produce and 25% reported traditional practices by peers yielding higher yields as the major demotivating factor. The data also reports that 22% of the farmers reported lack of availability of organic inputs whereas 10% of the farmers reported pests and diseases problem as a demotivating factor to practice sustainable practices.

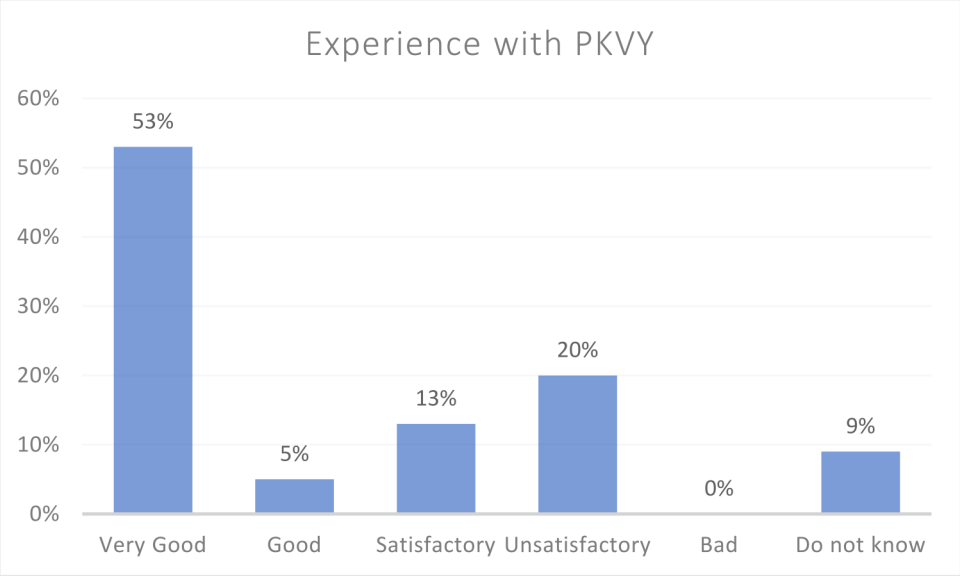

Figure 5.2.5: Experience with Paramparagat Krishi Vikas Yojana (PKVY)

The above figure represents the farmers experience under the PKVY scheme. According to the figure 53% of the farmers reported the experience as very good under the scheme, 20% of the farmers found the experience to be unsatisfactory, 13% of the farmers reported the experience to be satisfactory under the scheme and 5% of the farmers reported the experience under the scheme to be good.

5.2.3. Challenges under Sustainable Agricultural Practices

Table 5.2.2: Challenges under Sustainable Agricultural Practices

Biggest challenge in following sustainable farming	
Reason	**Percent**
Low Yield	27%
Pests and Disease management	27%
No proper prices	28%
Problem of market linkages	69%
Lack of access to organic inputs	8%
Lack of training and awareness	17%
Lack of continued support	30%

Source: Own Compilation

The above table presents the challenges observed while following sustainable practices. Nearly 69% of the farmers reported market linkages as the major challenge while practicing sustainable practices; 30% reported lack of continued support, 28% reported improper pricing, 27% reported low yield whereas another 27% reported pests and disease management as the major challenge in following sustainable practices. The data also shows that 17% of the farmers reported lack of training and awareness whereas 8% reported lack of access to organic inputs as the major challenge.

5.3. Cropping Pattern

Table 5.3.1: Sustainable farming cropping pattern

Cropping Pattern			
Mandya			
Kharif	**Rabi**	**Summer**	**Perennial**
Ragi	Amaranthus Tomato Beans	NA	Arecanut
Tumkur			
Kharif	**Rabi**	**Summer**	**Perennial**
Paddy	Sambhar Onion	Jowar	Sugarcane

Source: Own Compilation

The above table 5.3.1 represents the cropping pattern of treatment farmers using sustainable practices in the state of Karnataka. In the district of Mandya, Ragi is reported to be the dominant crop grown in Kharif season by about 76% of the surveyed farmers, whereas in the Rabi season Amaranthus, Tomato and Beans are reported to be the dominant crops grown. In the perennial season Arecanut is reported to be the dominant crop grown by about 48% of the surveyed farmers using sustainable methods. In Tumkur, paddy is reported to be the dominant crop grown in Kharif season by about 25% of the farmers whereas in Rabi season sambhar onion is reported to be the dominant crop grown. In the summer season Jowar is reported to be the dominant crop whereas in perennial season, 46% of the surveyed farmers reported to be growing sugarcane in the following season.

Table 5.3.2: Conventional cropping pattern

Cropping Pattern (Conventional)			
Mandya			
Kharif	***Rabi***	***Summer***	***Perennial***
Vegetable	NA	Ragi	Coconut
Curry Leaves			Sugarcane
Cauliflower			Arecanut
Tumkur			
Kharif	***Rabi***	***Summer***	***Perennial***
Vegetables	Ragi	NA	Sugarcane

Source: Own Compilation

The above table represents the cropping pattern of treatment farmers using conventional methods in the state of Karnataka. According to the data in the Mandya district, vegetables, curry leaves and flower are reported to be the dominant crop grown in Kharif season. In Summer season, ragi is reported to be the dominant crop grown whereas in the perennial season coconut, sugarcane and arecanut are reported to be the dominant crop. In Tumkur, vegetables are reported to be the dominant crop grown in Kharif season whereas Ragi is reported to be the dominant crop grown in Rabi season using conventional methods. In the perennial season, sugarcane is reported to be the dominant crop grown by about 15% of the surveyed farmers.

5.4. Perception of Farmers towards Sustainable Agricultural Practices

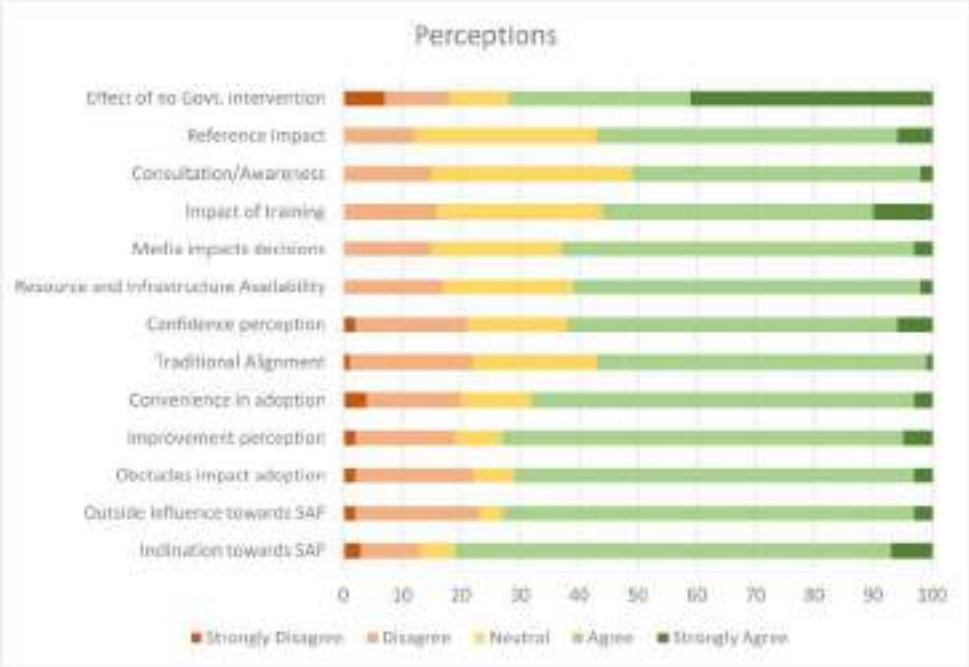

Figure 5.4.1: Perception of farmers towards Sustainable Agricultural Practices

The figure 5.4.1 represents how the sample perceived this scheme and the general idea of sustainable farming. We put forward 13 instances to get the perspectives of the respective farmers. First, farmers were asked how inclined do they feel towards sustainable agricultural practices after evaluating its positive and negative consequences. More than 80% of the farmers agreed that they are inclined towards sustainable practices. When asked about how outside sources like reference groups and information channels influence their behaviour and decisions, more than 70% farmers agree that outside influence matters.

When farmers were asked if it is difficult to adopt sustainable agriculture depending on the internal and external obstacles or opportunities such as personal abilities, knowledge, economic resources and infrastructural facilities - more than 70% of the farmers responded that there are obstacles to adoption of sustainable practices. More than 70% of the farmers believed that adopting sustainable farming would improve prospects like yield, soil health, income, and health. A little less than 40% of the farmers said it is easy to learn and practice sustainable agriculture. Almost 60% of the farmers agree that sustainable farming fits their traditional values, past experiences and current needs.

A little more than 60% of the farmers are confident that they can adopt sustainable practices with the level of skills and knowledge they have, and around 20% of the farmers also disagree with this notion. When asked how formal media sources like television, radio, newspapers, influence their decisions, more than 60% of the farmers were likely to adopt sustainable practices, whereas around 15% of the farmers were unlikely to do so. Around 55% of the farmers agreed that they were more likely to adopt sustainable practices if provided sufficient training, workshops, and exposure visits for the same while around 15% would not. Similarly, more than 60% farmers were more likely to adopt sustainable practices if provided consultations or influenced by extension workers.

5.5. Control Farmers

The data was collected for two set of farmers including the treatment group and the control group of farmers where the control group signifies the group of farmers practicing the traditional methods of farming using fertilizers and pesticides for the purpose of crop production.

5.5.1. Socio Economic Characteristics of the Control Farmers

The socio-economic characteristics of the control farmers represents the age of farmers, educational qualification, gender and caste. The table below represents the socio-economic characteristics of the control farmers.

Table 5.5.1: Sample characteristics of control farmers

Sample Characteristics of Control Farmers		
Average Age of farmers	50.6 ~ 51 years	
Average HH Size	5.04 ~ 5 members	
Average HH engaged in Agriculture	2.36 ~ 2 members	
Average Annual HH Income	**Rs. 1,93,413**	
	Tumkur	Rs. 1,79,263
	Mandya	Rs. 2,10,394
Average Income from Agriculture and allied sources	**Rs. 1,08,962**	
	Tumkur	Rs. 1,20,172
	Mandya	Rs. 95,417
Average Income from Non-agricultural Sources	**Rs. 97,255**	
	Tumkur	Rs. 67,603
	Mandya	Rs. 1,34,994

Source: Own Compilation

The above table presents the socio-economic characteristics of control farmers. According to the table the average age of farmers is reported at 51 years and the average household size in the state of Karnataka is reported at 5 members. The data reports that 2 members per household on an average basis are engaged in agricultural activities. The average annual household income is reported at Rs. 1,93,413 under which in Tumkur district the average annual household income is reported at Rs. 1,79,263 and in Mandya district the average annual household income is reported at Rs. 2,10,394. The average income from agriculture and allied sources is reported at Rs. 1,08,962 under which in Tumkur district it is reported at Rs.1,20,172 and in Mandya district it is reported at Rs. 95,417. According to the data the average income from non-agricultural sources is reported at Rs. 97,255 under which in Tumkur district it is reported at Rs. 67,603 and in Mandya district it is reported at Rs. 1,34,994 respectively.

Table 5.5.2: Caste profile of the control farmers

Caste Profile	
Caste	**Percent**
General	20%
SC	3.64%
ST	18.18%
OBC	58.18%

Source: Own Compilation

The above table presents the caste profile of the control farmers in the state of Karnataka. According to the table 58.18% of the farmers reported to be belonging to OBC category, 20% farmers reported to be belonging to general category, 18.18% farmers reported to be belonging to ST category and 3.64% farmers reported to be belonging to SC category respectively.

Table 5.5.3: Educational qualifications of the control farmers

Educational Qualification Status	
Qualification	**Percent**
Illiterate	21.82%
Primary Education	25.45%
Secondary Education	25.45%
Higher Secondary / Diploma	9.09%
Graduation	14.55%
Post-graduation and above	3.64%

The above table shows the educational qualification status of the control farmers. According to the data 25% of the farmers reported to be being educated till secondary level and 25% reported to be educated till primary level. As per the data 22% of the farmers reported to be illiterate,15% of the farmers reported to be holding a graduation degree, 9% of the farmers reported to be holding a higher secondary/diploma degree and 4% of the farmers reported to be holding a post-graduation degree respectively.

Table 5.5.4: Landholding characteristics of the control farmers

Landholding Characteristics		
Average Landholding	**2.86 acres**	
	Tumkur	3.08 acres
	Mandya	2.6 acres
Average Net Operated Land	**2.82 acres**	
	Tumkur	2.87 acres
	Mandya	2.76 acres
Average Area Irrigated out of Net Operated Land	**2.37 acres**	
Percentage Operated Land Irrigated (average)	**88.26%**	
	Tumkur	89.73%
	Mandya	86.55%

Source: Own Compilation

The above table represents the landholding characteristics of control farmers. According to the table the average landholding of the farmers is reported at 2.86 acres under which in Tumkur district the average landholding is reported at 3.08 acres and in Mandya district the average landholding is reported at 2.6 acres. The average net operated land is reported at 2.82 acres under which in Tumkur district it is reported at 2.87 acres and in Mandya district it is reported at 2.76 acres. The average area irrigated out of net operated land is reported at 2.37 acres and the average percentage of operated land irrigated is reported at 88.3% which in Tumkur district is reported at 89.73% and in Mandya district is reported at 86.55% respectively.

Table 5.5.5: Secondary occupational structure of control farmers

Secondary Occupational Structure	
Occupation	**Percent**
Self Employed / Own Business	25.45%
Livestock / Poultry Rearing / Fishery	16.36%
Salaried employment	12.72%
Agricultural Labor	12.72%
Non-Agricultural Labor	1.81%
Others	9.09%

Source: Own Compilation

The above table represents the secondary occupational structure of the control farmers. According to the data 25.45% of the farmers reported to be self-employed, 16.36% of the farmers reported livestock/poultry rearing/fishery as the major secondary occupation,12.72% of the farmers reported salaried employment as the major secondary occupation, 12.72% of the farmers reported agricultural labour as the major secondary occupation while 2% of the farmers on an approximate basis reported non-agricultural labour as the major secondary occupation.

5.5.2. Paramparagat Krishi Vikas Yojana

The control farmers were enquired about having information related to the Paramparagat Krishi Vikas Yojana scheme. The table below represents the source of information for the control farmers regarding PKVY.

Table 5.5.6: Sources of information regarding PKVY

How do you know about PKVY?	Percent
Govt. Awareness Programs	21.82%
Implementing Agencies	3.64%
Panchayat	1.82%
Other Villagers	10.91%
Other sources	20%
No response	41.82%
Total	100%

Source: Own Compilation

The above table represents the sources through which the farmers receive the information regarding Paramparagat Krishi Vikas Yojana. According to the table around 22% of the farmers reported to have received the information through the government awareness programs, 11% of the farmers approximately reported to have received information through their peers while 4% of the farmers reported receiving information through the implementing agencies under the project such as ICOWA and 2% of the farmers reported to have received the information through Panchayat organizations respectively.

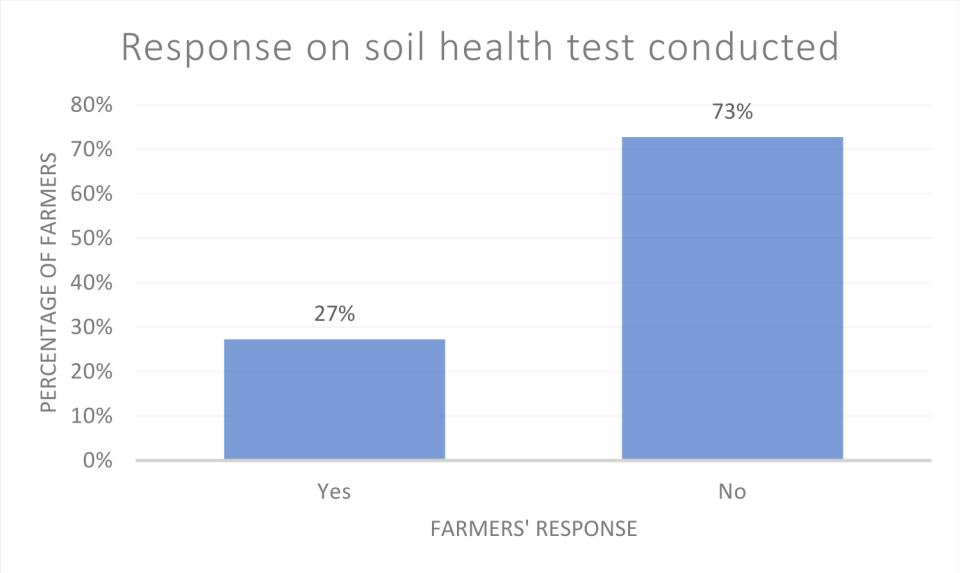

Figure 5.5.1: Response of control farmers on conduct of soil health tests

The above figure represents the response of the control farmers on the conduct of soil health test under the scheme. According to the figure 72.73% of the farmers reported negatively on the conduct of soil health tests while 27.27% of the farmers responded positively on the conduct of soil health tests respectively.

5.5.2. Cropping Pattern

The cropping pattern represents the data on the crops grown in different cropping seasons including Kharif, Rabi, Summer and Perennial season for control farmers.

Table 5.5.7: Cropping Pattern

Cropping Pattern		
Mandya		
Kharif	***Rabi***	***Perennial***
Groundnut	NA	Arecanut
Ragi		
Tumkur		
Kharif	***Rabi***	***Perennial***
Sugarcane	NA	Coconut
Groundnut		

Source: Own Compilation

The above table represents the cropping pattern using conventional methods of control farmers in the state of Karnataka. According to the data in the district of Mandya groundnut is reported to be the dominant crop grown using conventional methods with about 50% of the farmers reported growing the crop in the following season followed by ragi, whereas, Arecanut is reported to be the dominant crop grown in the perennial season using conventional methods by approximately 46% of the surveyed farmers. In the district of Tumkur, sugarcane and groundnut are reported to be the dominant crop grown in Kharif season using conventional methods, whereas, coconut is reported to be the dominant crop grown in the perennial season using conventional methods by about 45% of the surveyed control farmers.

5.5.2. Perception of Farmers towards Sustainable Agricultural Practices

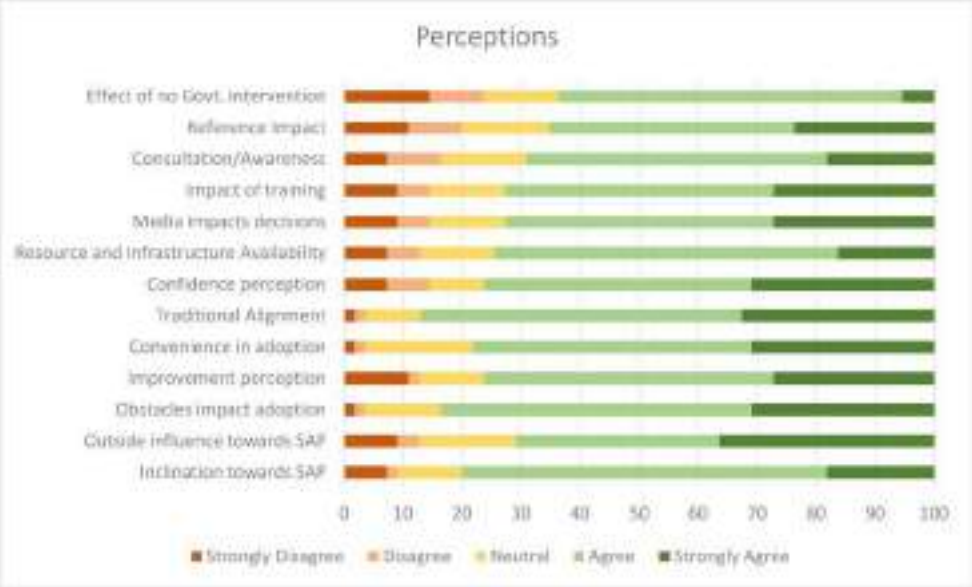

Figure 5.5.2: Perception of farmers towards Sustainable Agricultural Practices

The figure 5.5.2 like in the case of PKVY farmers gives us a qualitative idea of how the general idea of sustainable farming was perceived by the control sample. We put forward 13 instances to get the perspectives of the respective farmers. Starting from the bottom in the above figure, farmers were asked how inclined do they feel towards sustainable agricultural practices after evaluating its positive and negative consequences, and around 80% of the farmers agree that they are inclined towards sustainable practices. When asked about how outside sources like reference groups and information channels influence their behaviour and decisions, more than 70% farmers agree that outside influence matters.

When farmers were asked if it is difficult to adopt sustainable agriculture depending on the internal and external obstacles or opportunities such as personal abilities, knowledge, economic resources and infrastructural facilities; more than 80% of the farmers agree that there are obstacles to adoption of sustainable practices. More than 75% of the farmers said that adopting sustainable farming would improve prospects like yield, soil health, income, and health. A little than 80% of the farmers believe that it is easy to learn and practice sustainable agriculture. Similarly, we can see that, more than 85% of the farmers agree that sustainable farming fits their traditional values, past experiences, and current needs, which is peculiar considering these farmers are practicing conventional farming.

A little more than 75% of the farmers are confident that they can adopt sustainable practices with the level of skills and knowledge they have, and around 15% of the farmers also disagree with this notion. It can be seen that only a little more than 10% of the farmers disagree that they have the necessary resources and technical infrastructure required to adopt sustainable practices, whereas around 75% of the sample agrees that they are endowed with the resources required. When asked how formal media sources like television, radio, newspapers, etc. influence their decisions, more than 70% of the farmers were likely to adopt sustainable practices, whereas around 15% of the farmers were unlikely to do so. Around 70% of the farmers agreed that they were more likely to adopt sustainable practices if provided sufficient training, workshops, and exposure visits for the same. Similarly, a little than 70% of farmers were more likely to adopt sustainable practices if provided consultations or influenced by extension workers.

5.6. Cost of Cultivation

This section of the chapter outlines the input costs and the additional costs on the crop production per acre as reported by the surveyed treatment and the control samples. The cost of inputs for the sustainable farming includes the costs for seeds, Jivamurtha/Bijamurtha, compost, organic fertilizers, farmyard manure and green manure. The input costs for the farmers adopting conventional farming include costs for seed, fertilizers, pesticides and urea. Additional costs include labour costs, machinery costs and other miscellaneous costs. The major crops under cultivation by these farmers include ragi, groundnut, arecanut, banana, coconut and sugarcane.

Table 5.6.1: Average cost of cultivation for sustainable farming

	Cost of cultivation		
Crop	**Average Input Cost (per acre)**	**Average Additional Cost (per acre)**	**Average Total Cost (per acre)**
Ragi	Rs. 11362	Rs. 18535	Rs. 29897
Arecanut	Rs. 28292	Rs. 19663	Rs. 47955
Banana	Rs. 29246	Rs. 37375	Rs. 66621
Coconut	Rs. 17482	Rs. 17194	Rs. 34676
Sugarcane	Rs. 17954	Rs. 16811	Rs. 34765

Source: Own Compilation

The above table represents the average farming costs including the average input costs per acre and the average additional costs per acre as reported by the surveyed treatment farmers. According to the table, the average input costs per acre incurred on the production of banana is reported at Rs. 29,246 and the average additional costs incurred per acre on the production of banana is reported at Rs.37,375, which amount to a total cost per acre of Rs. 66,621. The average input costs per acre on the production of arecanut is reported at Rs. 28,292 and the additional costs incurred per acre on the production of arecanut at Rs. 19,663, leading to a total cost per acre of Rs.47,955. The average total costs per acre reported on the production of ragi, coconut and sugarcane are Rs. 29,897, Rs. 34,676 and Rs. 34,765 respectively. Except for banana, in case of other crops, the major part of the total cost comprises of the input costs incurred on the production of crops.

Table 5.6.2: Average cost of cultivation for conventional farming

	Cost of cultivation for Conventional farming		
Crop	**Average Input Cost (per acre)**	**Average Additional Cost (per acre)**	**Average Total Cost (per acre)**
Groundnut	Rs. 6585	Rs. 5855	Rs. 12440
Ragi	Rs. 9962	Rs. 22911	Rs. 32873
Sugarcane	Rs. 19989	Rs. 23412	Rs. 43400
Arecanut	Rs. 21894	Rs. 25629	Rs. 47523
Coconut	Rs. 8901	Rs. 20295	Rs. 29196

Source: Own Compilation

The above table represents the average farming costs including the average input costs per acre and average additional costs per acre as reported by the surveyed control sample i.e., farmers following conventional methods of farming. According to the table the average input costs per

acre incurred on the production of arecanut is reported at Rs. 21,894 and the additional cost incurred per acre is reported at Rs. 25,629, leading to the reported total costs per acre of Rs. 47,523. The average input costs per acre for sugarcane is reported at Rs. 19,989 and the additional costs incurred per acre amount to Rs. 23,412, adding to a total cost of Rs. 43,400 per acre. Among both the crops the additional costs and input costs almost contribute equally to the total costs per acre incurred on the production of crops. The total costs per acre for the production of groundnut, ragi and coconut is reported at Rs. 12,440, Rs. 32,873 and Rs. 29,196 respectively.

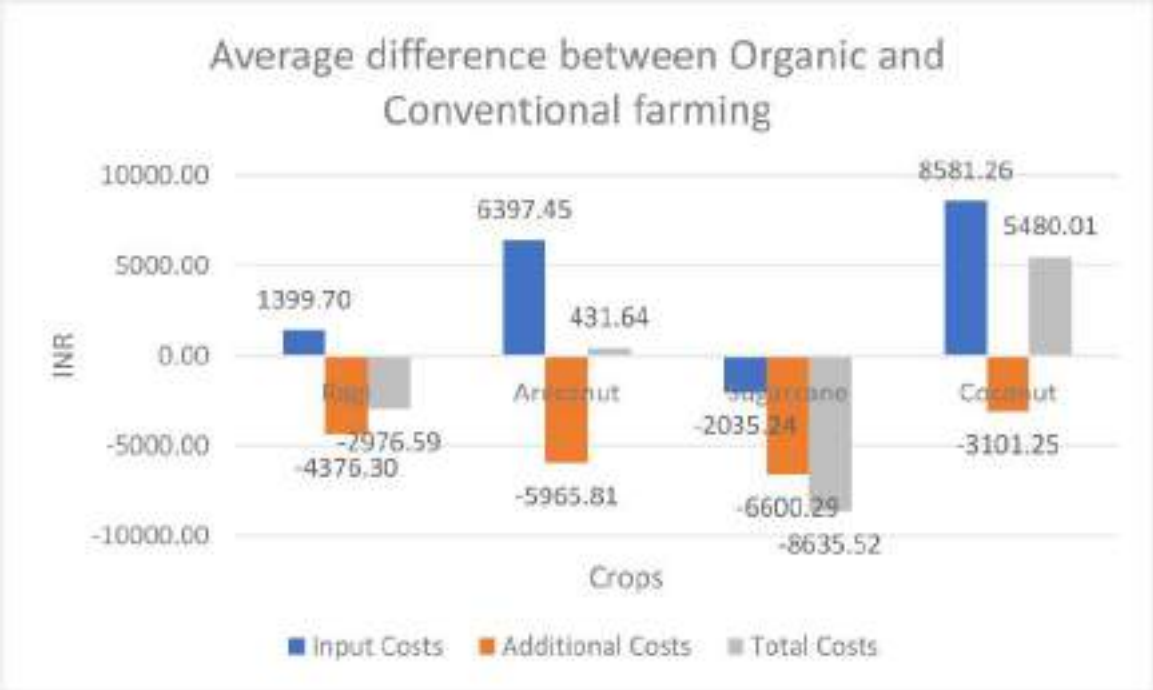

Figure 5.6.1: Average cultivation cost difference between sustainable and conventional farming

The above figure represents the average difference in input costs under conventional farming from sustainable farming in Karnataka. Similarly, like in previous cases, the blue bars, orange bars, and grey bars represent the average difference between sustainable and conventional farming in terms of input cost, additional cost, and total cost respectively. Negative values indicate cases where costs involved with conventional methods are more than that of Sustainable farming and vice-versa. According to the figure, the average difference in cultivation costs of conventional farming from sustainable farming for crops of ragi, arecanut and coconut shows that input costs is higher in case of sustainable practices as compared to conventional practices and hence, showing a positive figure. For the additional costs the figure, generally, we can see that it is higher in case of conventional farming methods as compared to sustainable farming methods. Like in the case of sugarcane production, it is reported that the additional costs exceed for the conventional farmers by Rs. 6,600 and for arecanut it exceeds by Rs. 5,966. In case of ragi and sugarcane, we can see that the overall average cost in sustainable farming is lower than that of their conventional counterparts, whereas, sustainable practices in coconut and arecanut look costlier, with sustainable arecanut cultivation almost at par with its conventional counterpart. The high input costs related to sustainable methods for arecanut and coconut might represent investments in procuring seeds, the returns on which are to be realised for a lot of years in the future since they are perennial crops. Also, a market for organic inputs is lacking, which leads to higher procurement costs, and thus, higher cost of cultivation.

CHAPTER

6

COMPARISON ACROSS SELECTED STATES

6. Introduction

We have looked into the PKVY scheme status in the individual states of Bihar, Gujarat, Himachal Pradesh, and Karnataka till now. Now, we look into a general overview and try to compare the similarities and dissimilarities among the different states by looking at their insights together.

6.1. Income and Farm Level Characteristics

In this section, we look into the income profile, landholdings, irrigation status, rate of conversion of land to sustainable practices. This presents us with the farmers' condition gives us a general idea of the characteristics of farmers in the different selected states.

Table 6.1.1: Income profile in the selected states

Average Income (Rs.)	Bihar	Gujarat	Himachal Pradesh	Karnataka	Overall
Annual Household Income	Rs. 2,91,010	Rs. 2,00,610	Rs. 6,59,158	Rs. 3,01,472	Rs. 3,63,062
Agriculture and allied sources	Rs. 2,65,253	Rs. 1,59,970	Rs. 5,07,456	Rs. 2,14,133	Rs. 2,85,955
Non-agricultural sources	Rs. 49,533	Rs. 65,548	Rs. 1,61,851	Rs. 1,09,074	Rs. 1,07,339

Source: Own Compilation

In the above table 6.1.1, we look at the income profile in selected states. The average household income overall amounts to approximately Rs. 3,63,062, where Himachal Pradesh represents the highest income, averaging about Rs. 6,59,158 and Gujarat shows the least annual household income averaging around Rs. 2,00,610. When we look at the income from agricultural sources, Himachal Pradesh is still the highest where the income is about Rs. 5,07,456 and Gujarat again the lowest around Rs. 1,59,970. The overall average income from agricultural sources among the selected states amounts to about Rs. 2,85,955. In terms of income from non-agricultural sources, the overall average is around Rs. 1,07,339, with Himachal Pradesh representing the highest income around Rs. 1,61,851 and Bihar with the lowest average around Rs. 49,533 only.

Table 6.1.2: Landholding pattern

Average Landholding	Bihar	Gujarat	Himachal Pradesh	Karnataka	Overall
Owned land (acres)	1.22	2.83	3.00	3.46	2.62
Net-operated land (acres)	2.20	3.62	1.92	3.66	2.85

Source: Own Compilation

In this table 6.1.2, we compare the landholding patterns in the select states. The average land owned and net-operated land in the select states is around 2.62 acres and 2.85 acres respectively. Karnataka leads here in terms of both land owned and net-operated land with 3.46 acres and 3.66 acres respectively. Bihar has the lowest average in terms of land owned around 1.22 acres,

while Himachal Pradesh represents the lowest average in terms of net-operated land around 1.92 acres. While all the states have a general trend where net-operated land is more than their landholding implying leasing in of land, Himachal Pradesh shows the contrary, where owned land is more than the net-operated land which could indicate leasing out of land, or just land remaining uncultivated.

Table 6.1.3: Irrigation status

Irrigation status	Bihar	Gujarat	Himachal Pradesh	Karnataka	Overall
Average irrigated land (acres)	2.2	2.93	1.03	3.07	2.31
Percentage operated land under irrigation	100%	68.73%	57.73%	83.10%	77.39%

Source: Own Compilation

In the above table 6.1.3, we compare the availability or use of irrigation in the select states. The overall irrigated land in operation averages about 2.31 acres which accounts for about 77.39% of net-operated land (2.85 acres as in the previous table). Only in Bihar, we can see that there's 100% irrigation rate, while Himachal Pradesh shows the least rate of irrigation, where, only about 57.73% of the operated land is irrigated which can be attributed to the difficult terrain. Karnataka shows an irrigation rate of about 83.10% and Gujarat shows only about 68.73%.

Table 6.1.4: Sustainable Agriculture Practices status

Status	Bihar	Gujarat	Himachal Pradesh	Karnataka	Overall
Average land devoted to sustainable farming (acres)	0.61	0.57	0.85	2.13	1.04
Percentage operated land under sustainable farming	28.70%	34.96%	52.79%	67.78%	46.06%

Source: Own Compilation

In this table 6.1.4, we look at the land conversion to sustainable practices in the select states. The overall rate of conversion in these 4 states is around 46.06% of the net operated area under sustainable practices which accounts for about 1.04 acres on an average. Bihar shows the least rate of conversion, where only 28.7% of the net operated area is converted for sustainable practices; followed by Gujarat at 34.96%, Himachal Pradesh at 52.79%, and Karnataka with the highest rate of conversion at 67.78% of net-operated land under sustainable practices.

6.2. Paramparagat Krishi Vikas Yojana

Now, we look into some specific issues regarding the PKVY scheme and how the different states have fared in terms of that.

Table 6.2.1: Incentives to group leaders of the cluster

Group leader gets incentives?	Bihar	Gujarat	Himachal Pradesh	Karnataka	Total
No	0	13	10	43	66
Yes	10	86	24	57	177
Do not Know	90	1	66	0	157
Total	100	100	100	100	400

Source: Own Compilation

In the above table, we compare how the farmers' perception about the incentives group leaders get under PKVY. We can see that in Bihar and Himachal Pradesh, most of the farmers are unaware of the incentives being provided to group leaders, but in Gujarat and Karnataka most of the sample agree that incentives are being provided to the group leader.

Table 6.2.2: Type of incentives to group leader of the cluster

Incentive type	Bihar	Gujarat	Himachal Pradesh	Karnataka	Total
Cash	10%	50%	0%	46%	26.50%
Kind	0%	37%	21%	9%	16.75%

Source: Own Compilation

This table 6.2.2, sheds further insights on how incentives were provided to the group leaders under PKVY scheme. Most of the incentives seem to be in cash which is agreed by 50% of the sample in Gujarat, 46% of the sample in Karnataka, and 10% of the sample in Bihar. According to Himachal Pradesh sample, only incentives by kind is provided, with 21% of the sample vouching for it. Gujarat and Karnataka also show kind incentives agreed by 37% and 9% of the sample respectively. Overall, 26.5% of the whole sample tell us that incentives are provided in cash, while 16.75% of the sample agree to incentive in kind.

Table 6.2.3: Availability of market for sustainable produce

Market for sustainable produce	Bihar	Gujarat	Himachal Pradesh	Karnataka	Total
No	53%	88%	90%	68%	299 74.75%
Yes	0%	1%	0%	32%	33 8.25%
Do not know	47%	11%	10%	0%	68 17%
Total	100%	100%	100%	100%	400

Source: Own Compilation

In the table above, we look into the market availability for sustainable produce in the selected states. Looking at the overall sample, we can see that 74.75% of the sample say that there is no market for sustainably produced crops, while 8.25% of the farmers agree to the presence of markets, and 17% of the farmers are unaware about the markets for such produce. Only Karnataka shows some market prospect, where 32% of the sample have market linkages for sustainable produce.

Table 6.2.4: Continuation of Sustainable Agricultural Practices

Still continuing sustainable farming?	Bihar	Gujarat	Himachal Pradesh	Karnataka	Total
No	90%	49%	4%	36%	179 44.75%
Yes	10%	51%	96%	64%	221 55.25%
Total	100%	100%	100%	100%	400

Source: Own Compilation

The above table 6.2.4, depicts the response of farmers when asked if they are still continuing with sustainable practices. Looking at the overall response, 55.25% of the sample is continuing with sustainable practices, while the remaining are not. Himachal Pradesh shows the highest number of farmers, with 96% continuing with sustainable agricultural practices. Karnataka and Gujarat have significant number of farmers wanting to continue sustainable farming with 64% and 51% of the farmers continuing sustainable practices respectively. Bihar, on the other hand does not show such promise, where only 10% of the farmers are continuing with sustainable agricultural practices.

CHAPTER

7

CONCLUSIONS AND POLICY INSIGHTS

7.1. Concluding Remarks

The central idea of this study was to investigate the impact of Paramparagat Krishi Vikas Yojana (PKVY) along with BPKP and the feasibility of sustainable farming in India. Although, we have established the need for organic and natural farming (denoted as sustainable farming throughout the study) and the potential it carries to act as a development engine in rural India, plenty needs to be done to increase its feasibility, so that farmers can easily shift from conventional practices and adopt sustainable farming.

Sustainable farming practices are associated with better health benefits, improving soil health and make farming sustainable. One of the main reasons for shifting from conventional practices to sustainable farming is to eliminate the use of chemical pesticides and fertilizers which have long term degrading effects to the soil and find their way to the plates of consumer through the produce. Sustainable farming ensures natural inputs to be used for production and the produce is of significantly better quality without much negative effects to soil health or that of the consumer. In terms of sustainability, another advantage sustainable farming carries is the lesser dependency on water, which makes it even more suitable for rain-fed areas, where it has shown positive results in increasing yield as well.

In the context of India, sustainable farming has an upper hand in the sense that it can be aligned with the traditional indigenous knowledge the farmers have carried over generations, and can be replicated with a community approach. Farmers tend to agree that sustainable farming entails lower cost of cultivation as they can save from not using chemical inputs like pesticides and fertilizers. The net return however depends on provision of premium market prices for certified organic products, as conversion to organic or natural farming is followed by reduced yield in the initial years. Although, sustainable farming has less yield compared to conventional, lowered cost of cultivation and premium market prices have shown increased net returns, thus holds potential to increase farmers' income (A. A. Reddy, 2017).

The purpose of PKVY was to make it easier for the farmers to make a smooth transition towards sustainable farming from conventional methods. The success of PKVY however is hindered by certain problems in the production system. Our study shows that farmers found lack of proper market channels as the major hindrance to adopting sustainable practices. Also, regular markets will not benefit the farmers because of low yield in initial years, so dedicated markets where they can sell certified products at premium prices is necessary to encourage farmers to shift to sustainable practices. There also lacks a market for affordable and effective organic and bio inputs. To make up for that more labour must be employed which reduces the profit margins. Considering the general landholding status, majority of the farmers are small and marginal and to make up for the decrease in yield, there needs to be continued support in the initial years for farmers till they breakeven.

7.2. Policy Recommendations

Keeping all the above factors in mind, we come up with the following policy recommendations.

a. Appropriate market linkages

The main hindrance to adoption of sustainable farming has been the lack of markets to sell sustainable produce at proper prices. A supply chain needs to be developed to make sure that farmers opting to practice sustainable farming get proper prices for their produce and can sell their produce in markets differentiated from those of conventional produce. Farmers need to be provided certification in the initial years of conversion to sustainable farming and special markets need to be established where they can sell their certified products. Even separate provisions in APMCs can help. Certification agencies like PGS need to be strengthened, and awareness and training should be imparted to the farmers so that the process of certification is easier accessible and understood by the farmers.

Market for bio-based and organic inputs is also necessary so that adoption of sustainable farming is easier for the farmers. To make up for the loss in yield in the initial years, support needs to be provided like subsidized inputs through government supported input distribution systems. This can be withdrawn in due time when a proper market has been established, where farmers get appropriate prices from selling natural produce and private entities can enter the bio-based input markets. Also, integration of livestock helps in sustainable farming, so initial support to small and marginal farmers to handle livestock units can help with the problem of inputs and sustain agriculture.

b. Focus on specific areas for adoption

Large scale conversion to sustainable agriculture might result in food shortage with the present state of knowledge and technology owing to the fall in yield compared to conventional farming. However, in traditional rain-fed areas, natural farming shows potential to increase the yield (Singh and Rao, 2005). As was clear from the survey itself, major hilly areas in Himachal Pradesh and tribal areas of Dang in Gujarat have been using fewer chemical substances for agriculture, and it was easier for them to shift to sustainable farming and continue with it. Although, sustainable farming has potential to increase net returns, reduce the risks of crop failure and minimize environmental impacts, these advantages are site-dependent. It has been found that sustainable agriculture showed competitive results and higher net returns against conventional farming for most crops in Chitradurga, a dry region in Karnataka with high livestock density Patil, et al. 2014. The first phase of PKVY should be wielded to identify such hotspots where the conversion would be easier. With proper knowledge transfer and awareness they have a potential to increase yield and sustain healthy agriculture. Efforts are needed to get them due recognition through branding and marketing channels so that the entire zone can be converted to sustainable farming. After establishment of such markets, the plan can be replicated and expanded further.

c. Increasing awareness

Farmers need to be made aware of the benefits of sustainable farming, for their own farming viability. Training modules should be made more understandable for the local people and the trainers themselves need to be motivated to make sure that training imparted is properly used. Farmers are accustomed to subsidized chemical inputs for production, and any change which will reduce their income is usually not acceptable. Appropriate support needs to be provided initially to make up for the loss of yield, such that there is no extra burden is put on the farmers,

only then can the system move away from status quo. Establishing SHGs or Farmer Interest Groups (FIGs) can also motivate farmer groups to shift away from conventional farming towards a healthier and sustainable future.

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Some excerpts from the surveys carried out by AERC and AERU

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