Original Research Article

Different Agricultural Practices Adopted by Farmers in Kharar Division, Punjab

Abstract:

Since agriculture employs half of all workers worldwide, it is the largest employer and the economic engine of rural India. Rural India's development in relation to national development would be reflected in the development of agriculture [11]. Agriculture and allied industries are without a doubt the greatest employer in India, particularly in the vast rural areas. A vital basis for the Gross Domestic Product is also provided by it (GDP). The agriculture industry in India contributes considerably to the economy, accounting for around 20% of GDP. All of the procedures that a farmer follows from seed to seed, from seed sowing through seed harvesting and storage, are referred to as agronomical practices. A study on agronomic practices followed by 120 farmers from five villages viz. Shakrullapur (28 farmers), Rora (30 farmers), Bibipur (22 farmers), Batta (18 farmers) and Fatehpur-Theri (22 farmers) was considered. The data collected from the respondents include major crops grown, seed rate followed by respondents, fertilizer dose followed, major weeds affecting, major plant diseases, major insect and pests, harvesting methods and yield records. As per the data collected, wheat is cultivated by nearly 87% of the farmers in this region and 100% farmers who are growing wheat, agreed that the *Phalaris minor* is the major weed affecting the wheat production. Also Sheath blight and Yellow rust are the two major diseases affecting the paddy and wheat respectively. The study's conclusions illustrated the techniques used by farmers in the fields to ensure the best crop stand and highest yields.

Key words: *Agronomy, insects, pests, fertilizer, diseases, yield, weeds*

1. Introduction:

The agricultural sector contributes strategically to a nation's economic growth. It has already had a substantial impact on the economic prosperity of developed nations, and its contribution to the economic growth of less developed nations is crucial. In other words, the focus is on agriculture and other primary industries where per capita real income is low. One of the most established financial sectors in our country is agriculture. Different districts use different development strategies. Undoubtedly the largest source of employment in India is agriculture and its related sectors, especially in the vast rural areas. Additionally, it provides a crucial foundation for the Gross Domestic Product (GDP). In India, the agricultural sector contributes significantly to the economy, making up about 20% of GDP (GDP). India's population depends on it for survival to the tune of about 62% [4]. Given that it accounts for roughly 20.19% of GDP, agriculture is a vital sector of the Indian economy [2].

The most significant factor and largest contributor to the Indian economy is agriculture. As the "Agricultural Hub of India," states like Punjab, Haryana, and Uttar Pradesh are referred to. In rural India, the main source of employment is agriculture, which accounts for half of all employment worldwide [12]. Nearly 58% of Indians' income comes from agriculture, and their population is still expanding quickly [1]. Agriculture contributes $400 billion to India's GDP, which is second only to China [12]. Wheat (*Triticum aestivum* L.), the most important cereal crop in the world, is a staple food for around one-third of the world's population [5]. It accounts for about 21% of all cultivated land (30.597 million hectares) and about 35% of the nation's total food production (98.38 million tonnes) (2016–17) [8]. For India's food security and economic growth, rice (*Oryza sativa*), a staple crop, is essential [3]. It provides over one-fourth of all caloric intake and occupies more than one-fifth of all gross cropland [7].

A vital component of the sustainability of food systems is agricultural technology. An illustration of how scale-independent technology has changed agricultural productivity is the Green Revolution. The Green Revolution has improved harvests, decreased poverty, built infrastructure, increased access to food, and decreased food prices, among other things [6]. A farmer's activities from seed to seed are referred to as farming practices. From planting to gathering and storing. The relationship between agronomic practices and yields is direct. Farmers must use the finest agricultural techniques for the season and agro-climatic zone in order to get optimum harvests. By region, these traditions change. It has been crucial in assuring improved agricultural practices in nations like India, allaying worries that the country has reached the point of food excess, which happens when population growth outpaces agricultural production. India is second in the world for agricultural production despite having a little portion of the world's agricultural land.

2. Material and Methods:

The study was conducted in Kharar block, district SAS Nagar (Punjab). Where five villages were selected randomly Shakrullapur, Rora, Bibipur, Batta and Fatehpur-Theri.
A total of 120 farmers were selected on a random basis for the interview. A total of 28 respondents were selected from village Shakrullapur, 30 were from Rora, 22 were from Bibipur, 18 were from Batta and 22 respondents are from Fatehpur-Theri. A detailed interaction was directed with the farmers regarding their social status, and the Agronomical practices they follow throughout the year. The respondents were interviewed at their homes and in their fields. To cover every aspect regarding the agronomical practices followed by the farmers a questionnaire was prepared to interview the farmers and to analyze each parameter properly in a sequence.
After data collection from respondent, data were classified and analyzed with the help of suitable statistical measures such as percentages, graphical representation, bar graphs, and Pie charts.

Formulae used for calculation:

$$\textbf{Percentage} = \frac{\text{Number of respondents}}{\text{Total number of respondents}} * 100$$

$$\textbf{Average} = \frac{\text{Sum of total observations}}{\text{Total number of observations}}$$

3. Results and Discussion

3.1 Major Crops Grown by the Farmers:

The data represented in the Table 1 shows that the major crops grown by the farmers in their respective villages. As per the data collected overall, 87% farmers are growing wheat, 85% farmers are growing paddy and 52% farmers are growing mustard. Apart from these crops, 44% farmers are growing sugarcane, 41% farmers are growing berseem as a fodder crop, 35% farmers are growing maize, 34% farmers are growing bajra and 31% farmers are growing sorghum. Vegetable crops are grown less in this region. Less than 10% farmers are growing potato and onion.

Sr. No.	Crops grown	Shakrullapur (n=28)	Rora (n=30)	Bibipur (n=22)	Batta (n=18)	Fatehpur-Theri (n=22)	Overall (N=120)
1	Wheat	22 (79%)	28 (93%)	20 (91%)	15 (83%)	20 (91%)	105 (87%)
2	Paddy	18 (64%)	28 (93%)	22 (100%)	12 (67%)	22 (100%)	102 (85%)
3	Mustard	12 (43%)	13 (43%)	10 (45%)	11 (61%)	16 (73%)	62 (52%)
4	Sugarcane	13 (46%)	10 (33%)	14 (64%)	6 (33%)	10 (45%)	53 (44%)
5	Berseem	10 (36%)	11 (37%)	7 (32%)	11 (61%)	10 (45%)	49 (41%)
6	Maize	15 (54%)	8 (27%)	4 (18%)	5 (28%)	10 (45%)	42 (35%)
7	Bajra	12 (43%)	8 (27%)	7 (32%)	6 (33%)	8 (36%)	41 (34%)
8	Sorghum	11 (39%)	7 (23%)	6 (27%)	5 (28%)	8 (36%)	37 (31%)
9	Potato	3 (11%)	2 (7%)	1 (4%)	2 (11%)	3 (14%)	11 (9%)
10	Onion	2 (7%)	1 (3%)	3 (14%)	1 (6%)	3 (14%)	10 (8%)

Table 1: Major crops grown by respondent farmers

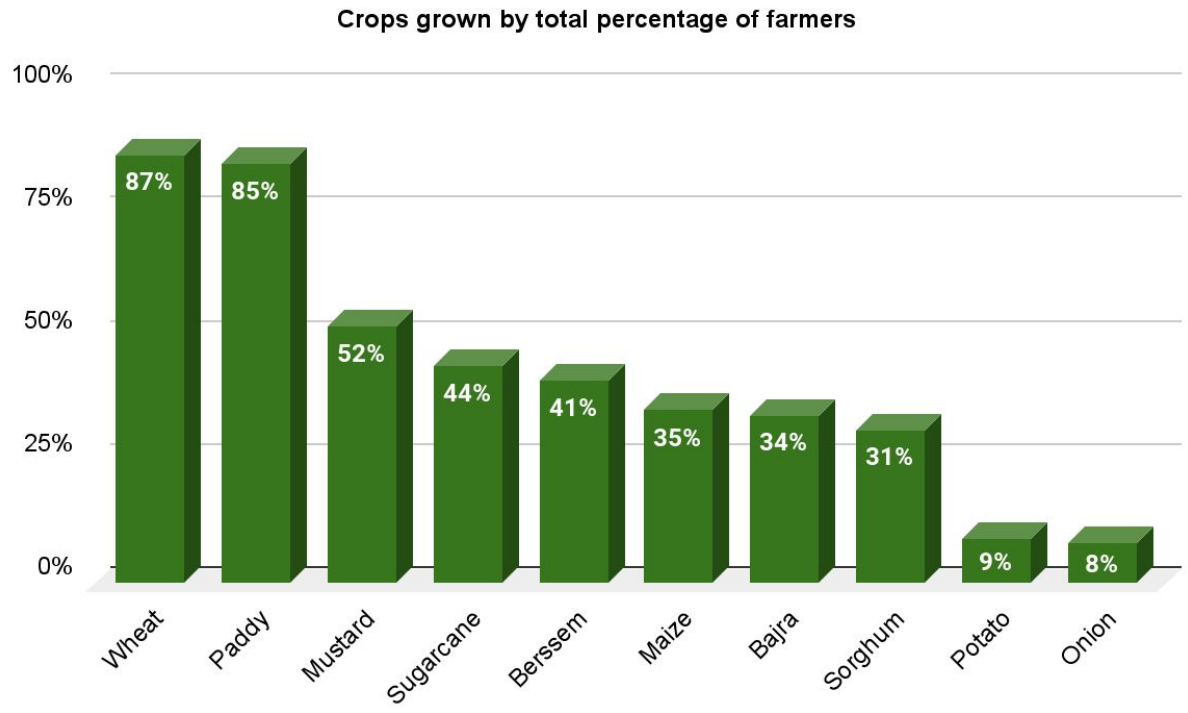

Fig 1: Crops grown by total percentage of farmers

3.2 Seed Rate Followed by the Farmers:

The data represented in Table 2 shows the total percentage of farmers using seeds less than the recommended rate, recommended rate and above the recommended rate.As per the data, most of the farmers are using recommended seed rate. In Shakrullapur village 7% farmers are using seeds below the recommended rate, 61% farmers using recommended seed rate and 32% farmers are using above recommended rate. In Rora village 10% farmers are using seeds below recommended rate, 53% farmers are using recommended rate and 37% farmers are using above recommended rate. In Bibipur village 55% farmers are using recommended seed rate and 45% farmers are using above than recommeded seed rate. In Batta village 11% farmers are using below recommended seed rate, 61% farmers are using recommended seed rate and 28% farmers are using above than the recommended seed rate. In the Fatehpur-theri village 68% farmers are using recommended seed rate and 32% farmers are using more than recommended seed rate.

Sr. No	Seed Rate	Shakrullapur (n=28)	Rora (n=30)	Bibipur (n=22)	Batta (n=18)	Fatehpur-Theri (n=22)	Overall (N=120)
1	Below	2 (7%)	3 (10%)	0	2 (11%)	0	7 (6%)

	recommended rate						
2	**Recommended rate**	17 (61%)	16 (53%)	12 (55%)	11 (61%)	15 (68%)	71 (59%)
3	**Above recommended rate**	9 (32%)	11 (37%)	10 (45%)	5 (28%)	7 ((32%)	42 (35%)

Table 2: Recommended seed rate followed by the farmers in percentage

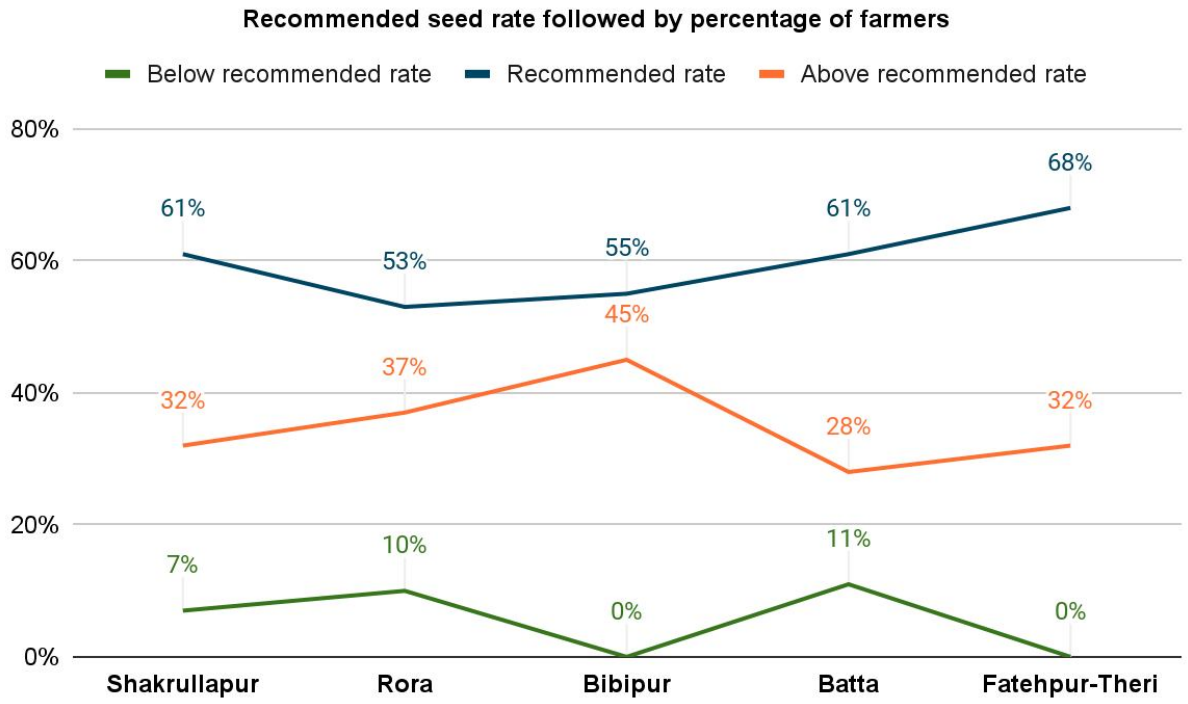

Fig 2: Recommended seed rate followed by farmers in percentage

3.3 Fertilizer Dose Applied by the Farmers:

As per the table (Table 1), the major crops grown by the farmers of these villages are wheat, paddy, mustard and sugarcane. This table (Table 3) depicts that the overall mean amount of fertilizers used by the respondents are more than the recommended dose. The recommended dose for the wheat crop is 120N: 60P: 40K [10], recommended dose for the paddy crop is 125N: 30P: 30K [9]**,** the recommended dose for mustard crop is 130N: 120P [10] and the recommended dose for sugarcane is 300N:100P:200K [9]**.** The data gathered allows for the identification of the application of unbalanced fertilizers. Potassic fertilizer are accorded less importance than nitrogenous and phosphoric fertilizer, respectively. However, most of these fertilizer application do not take into account the needs of the soil for N, P, and K.

Sr. no	Parameters	Shakrullapur	Rora	Bibipur	Batta	Fatehpur-Theri	Average	Recommended dose/ha
Wheat								
1	**Urea/ha**	300 kg/ha	340 kg/ha	282 kg/ha	326 kg/ha	293 kg/ha	308.2 kg/ha	120 kg/ha
2	**DAP/ha**	182 Kg/Ha	206 kg/ha	160 kg/ha	175 kg/ha	200 kg/ha	184.6 kg/ha	60 kg/ha
3	**Potassium/ ha**	-	-	-	-	-	-	40 kg/ha
Paddy								
1	**Urea/ha**	150 kg/ha	195 kg/ha	225 kg/ha	186 kg/ha	210 kg/ha	193.2 kg/ha	125 kg/ha
2	**DAP/ha**	373 kg/ha	356 kg/ha	340 kg/ha	330 kg/ha	347 kg/ha	349.2 kg/ha	30 kg/ha
3	**Potassium/ ha**	-	-	-	-	-	-	30 kg/ha
Mustard								
1	**Urea/ha**	195 kg/ha	225 kg/ha	202 kg/ha	190 kg/ha	212 kg/ha	204.8 kg/ha	130 kg/ha
2	**DAP/ha**	254 kg/ha	297 kg/ha	285 kg/ha	260 kg/ha	270 kg/ha	273.2 kg/ha	120 kg/ha
Sugarcane								
1	**Urea/ha**	540 kg/ha	460 kg/ha	402 kg/ha	512 kg/ha	520 kg/ha	486.8 kg/ha	300 kg/ha
2	**DAP/ha**	267 kg/ha	288 kg/ha	285 kg/ha	300 kg/ha	276 kg/ha	283.2 kg/ha	100 kg/ha
3	**Potassium/ ha**	291 kg/ha	321 kg/ha	326 kg/ha	298 kg/ha	310 kg/ha	309.2 kg/ha	200 kg/ha

Table 3: Represents the mean value of N:P:K amount applied by the respondents

3.4 Major Weeds:

As seen in the table (Table 4) different kinds of weeds (Crop specific) are present in their fields throughout the year. The main weed that all of the responders saw was *Phalaris minor* (87%). According to them, this weed shows resistance to most of the chemicals used to eradicate or eliminate this weed. It reduces the yield up to a significant level. This is the major concern of the farmers during the Rabi season, especially in wheat crop.

Sr. No	Name of weeds	Crop affected	Shakrullapur (n=28)	Rora (n=30)	Bibipur (n=22)	Batta (n=18)	Fatehpur-Theri (n=22)	Overall (N=120)
1	***Phalaris minor***	Wheat	22 (79%)	28 (93%)	20 (91%)	15 (83%)	20 (91%)	105 (87%)
2	***Avena fatua***	Wheat	22 (79%)	28 (93%)	19 (86%)	15 (83%)	19 (86%)	103 (86%)
3	***Avena ludoviciana***	Wheat	20 (71%)	27 (90%)	18 (82%)	14 (78%)	19 (86%)	98 (82%)
4	***Echinochloa crus-galli***	Paddy	16 (57%)	26 (87%)	19 (86%)	10 (56%)	21 (96%)	92 (77%)
5	***Parthenium hysterophorus***	Sugarcane	11 (39%)	9 (30%)	11 (50%)	5 (28%)	9 (41%)	45 (38%)

Table 4: various crops affected by major weeds

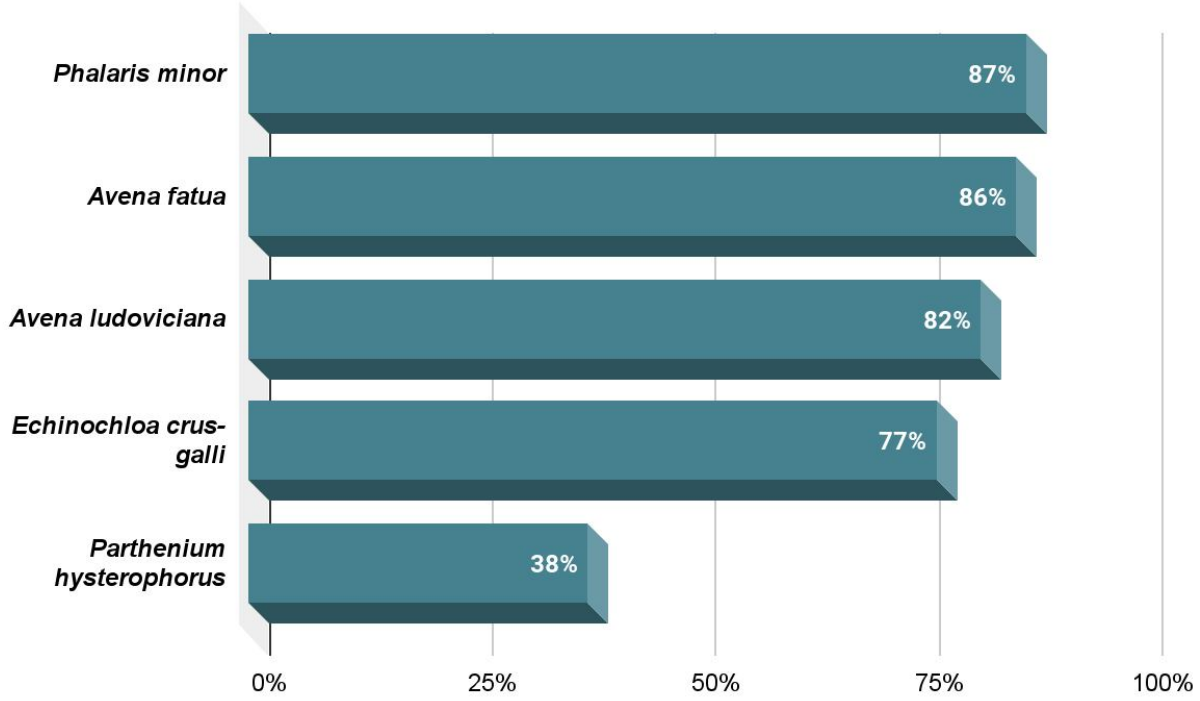

Fig 3: Percentage of farmers affected by different weeds

3.5 Plant Diseases:

According to information acquired from five villages (Table 5), around 78% of farmers producing rice reported seeing sheath blight, 63% reported seeing brown leaf spot, and 74% reported seeing dwarf plant diseases in their fields. 71% of farmers producing wheat reported seeing Powdery mildew, 83% reported yellow smut, and 72% reported loose smut disease in their wheat crop. In maize fields, 22% of farmers reported seeing Seed rot and 27% reported seeing Sheath blight in their maize crop. Similarly in sugarcane crop, 39% of farmers witnessed red rot and 32% of farmers, witnessed smut disease in their fields. In mustard crop 46% of Farmers reported *Alternaria blight* in their field, and 39% farmers witnessed Sclerotinia stem rot in their fields.

Sr No	Crop	Parameters	Shakrullapur (n=28)	Rora (n=30)	Bibipur (n=22)	Batta (n=18)	Fatehpur -Theri (n=22)	Overall (N=120)
1	Rice	Sheath Blight	17 (61%)	25 (83%)	19 (86%)	12 (67%)	20 (91%)	93 (78%)
		Brown leaf spot	12 (43%)	22 (73%)	15 (68%)	8 (44%)	18 (82%)	75 (63%)

		Dwarf plant disease	15 (54%)	24 (80%)	21 (95%)	10 (56%)	19 (86%)	89 (74%)
2	**Wheat**	**Powdery Mildew**	20 (71%)	21 (70%)	16 (72%)	12 (67%)	16 (73%)	85 (71%)
		Yellow rust	22 (79%)	27 (90%)	18 (82%)	13 (72%)	20 (91%)	100 (83%)
		Loose smut	21 (75%)	24 (80%)	13 (59%)	10 (56%)	18 (82%)	86 (72%)
3	**Maize**	**Seed rot**	9 (32%)	5 (17%)	3 (14%)	2 (11%)	7 (32%)	26 (22%)
		Sheath blight	12 (43%)	6 (20%)	3 (14%)	3 (17%)	8 (36%)	32 (27%)
4	**Sugarcane**	**Red rot**	11 (39%)	8 (27%)	12 (55%)	6 (33%)	10 (46%)	47 (39%)
		Smut	9 (32%)	10 (33%)	7 (32%)	4 (22%)	8 (37%)	38 (32%)
5	**Mustard**	**Alternaria blight**	11 (39%)	13 (43%)	10 (45%)	6 (33%)	15 (68%)	55 (46%)
		Sclerotinia Stem rot	12 (43%)	9 (30%)	7 (32%)	9 (50%)	10 (45%)	47 (39%)

Table 5: Represents the data of farmers affected by various crops diseases

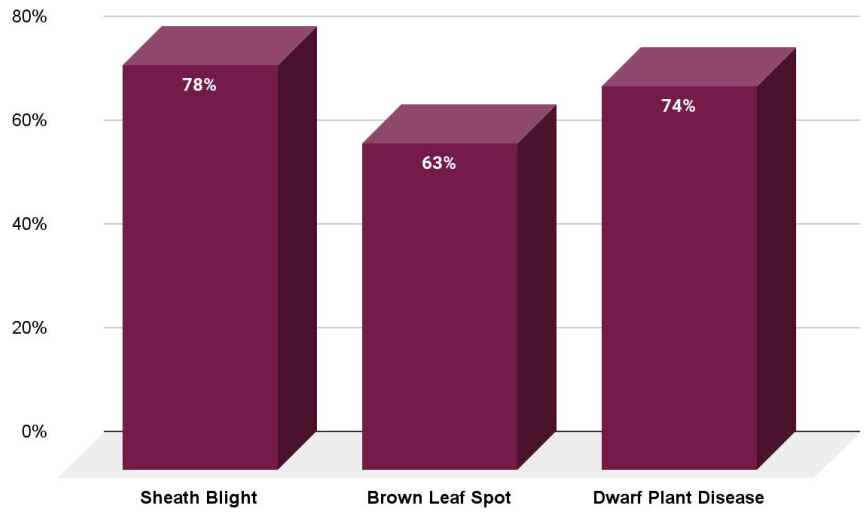

Fig 4: Percentage of farmers affected by diseases in rice

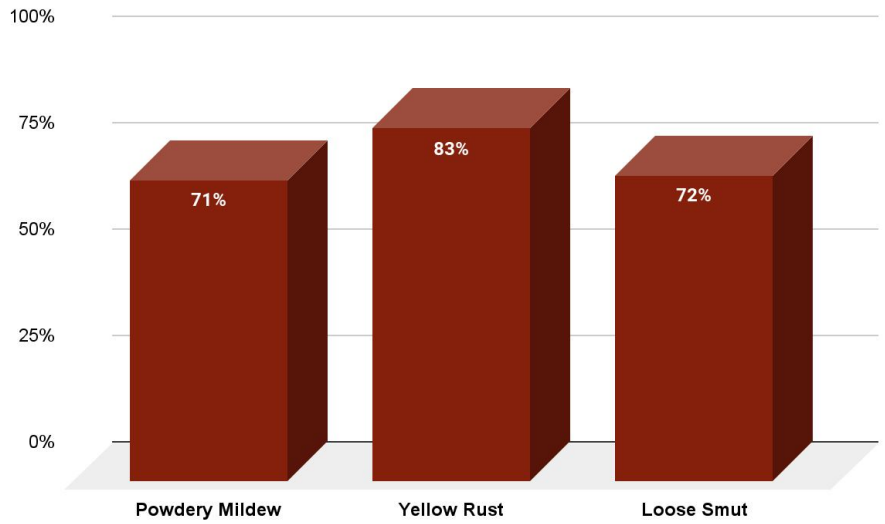

Fig 5 : Percentage of farmers affected by diseases in wheat

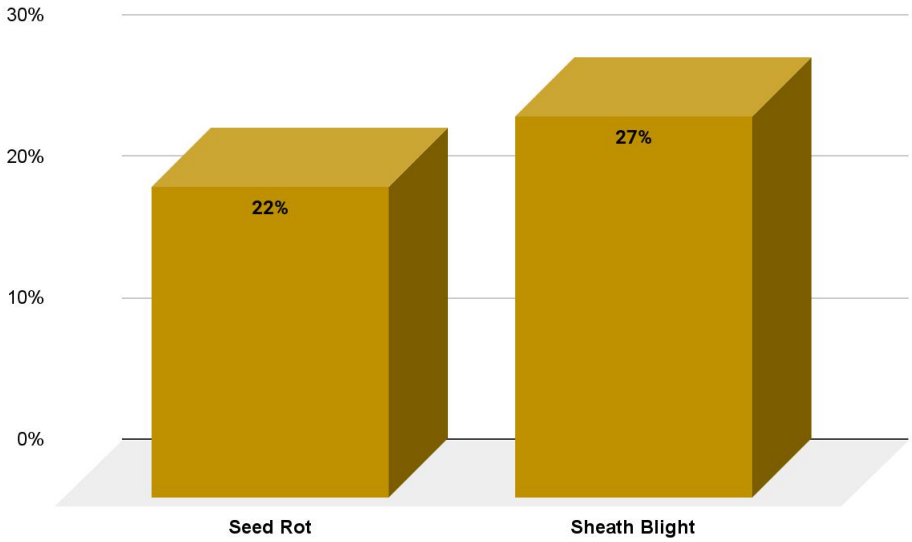

Fig 6: Percentage of farmers affected by diseases of maize

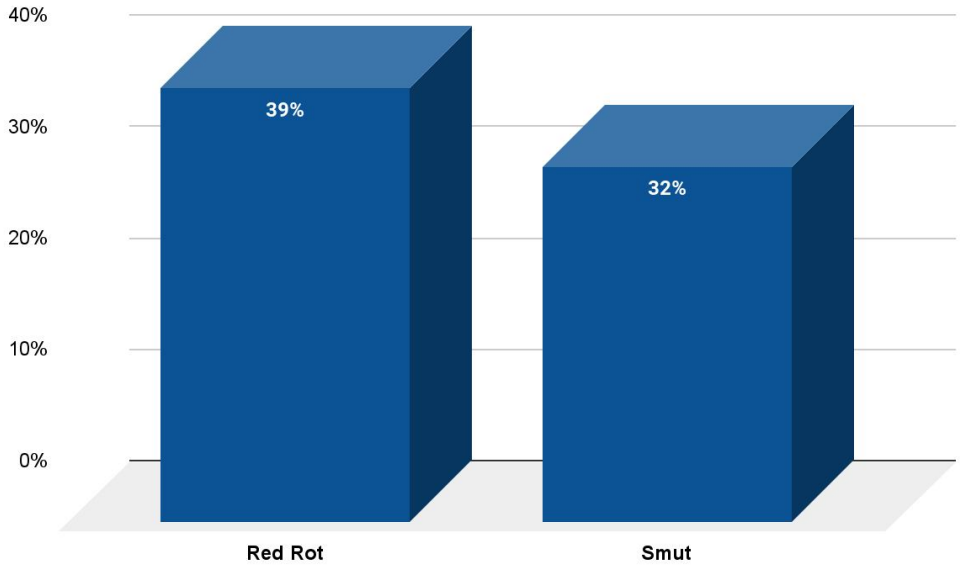

Fig 7: Percentage of farmers affected by diseases of sugarcane

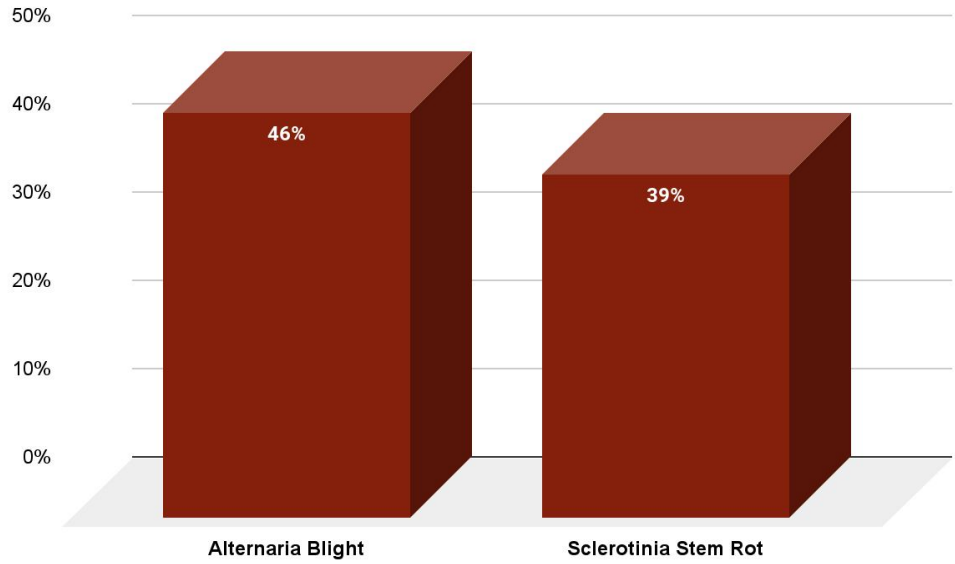

Fig 8: Percentage of farmers affected by diseases of mustard

3.6 Insect and Pest:

According to data gathered in 5 villages (Table 6), rice crop roughly 83% of farmers witnessed grasshoppers, 69% of farmers witnessed leaf folders, and 70% of farmers witnessed Rice Hispa in their fields. In fields of wheat, 85% of farmers witnessed aphids, while 68% farmers witnessed termites. In fields of maize, 24% of farmers witnessed mites, 26% of farmers witnessed stem

borer, and 17% farmers reported seeing Army worm in their field. Similarly in sugarcane crop, 38% of farmers witnessed termites in their field, while 41% of farmers observed top borer. In Mustard, 43% of farmers witnessed hairy caterpillars and 45% of farmers reported aphids attack in their fields.

Sr No	Crop	Parameters	Shakrullapur (n=28)	Rora (n=30)	Bibipur (n=22)	Batta (n=18)	Fatehpur Theri (n=22)	Overall (N=120)
1	Rice	Grasshopper	18 (64%)	28 (93%)	21 (95%)	12 (67%)	20 (91%)	99 (83%)
		Leaf folder	16 (57%)	24 (80%)	17 (77%)	10 (56%)	16 (3%)	83 (69%)
		Rice Hispa	17 (61%)	19 (63%)	15 (68%)	12 (67%)	21 (95%)	84 (70%)
2	Wheat	Aphids	22 (79%)	28 (93%)	17 (77%)	15 (83%)	20 (91%)	102 (85%)
		Termites	19 (68%)	17 (56%)	14 (63%)	13 (72%)	19 (86%)	82 (68%)
3	Maize	Mites	9 (32%)	6 (20%)	3 (14%)	2 (11%)	9 (41%)	29 (24%)
		Stem borer	12 (43%)	5 (17%)	3 (14%)	3 (17%)	8 (36%)	31 (26%)
		Army worm	7 (25%)	6 (20%)	1 (4%)	2 (11%)	4 (18%)	20 (17%)
4	Sugarcane	Top Borer	12 (48%)	9 (30%)	14 (64%)	6 (33%)	8 (36%)	49 (41%)
		Termites	13 (46%)	7 (23%)	11 (50%)	4 (22%)	10 (45%)	45 (38%)
5	Mustard	Aphids	10 (37%)	13 (43%)	10 (45%)	5 (28%)	16 (73%)	54 (45%)
		Hairy Caterpillar	12 (43%)	9 (30%)	8 (36%)	9 (50%)	14 (64%)	52 (43%)

Table 6: Represents the data of farmers affected by different pests infestation

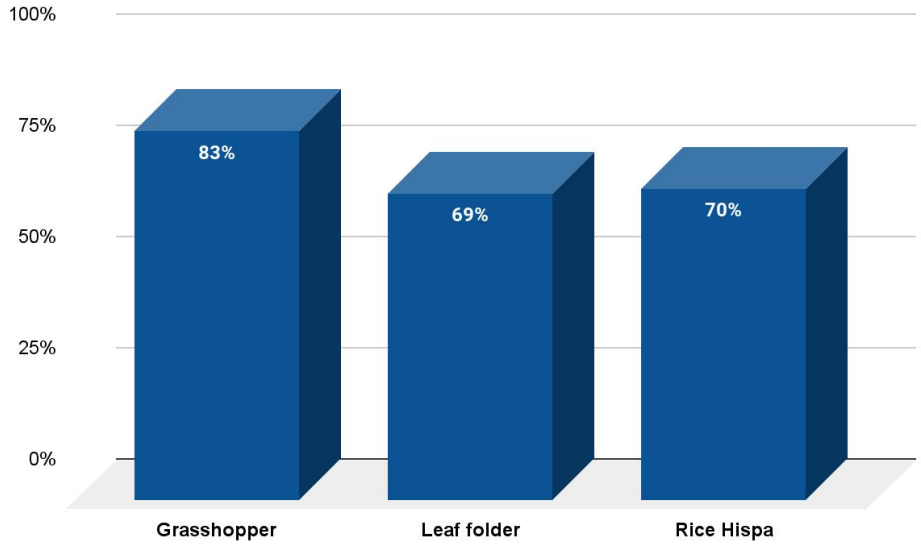

Fig 9: Percentage of farmers affected by different pests in rice

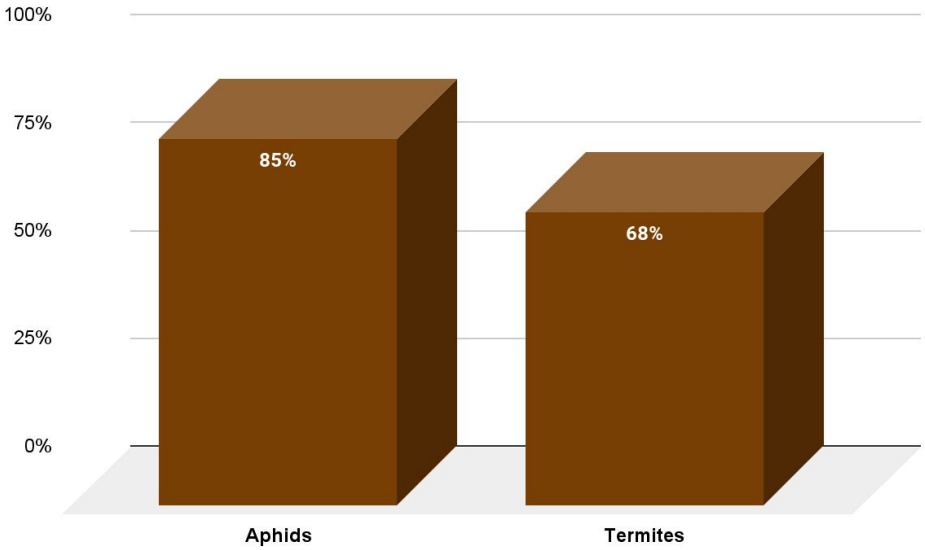

Fig 10: Percentage of farmers affected by different pests of Wheat

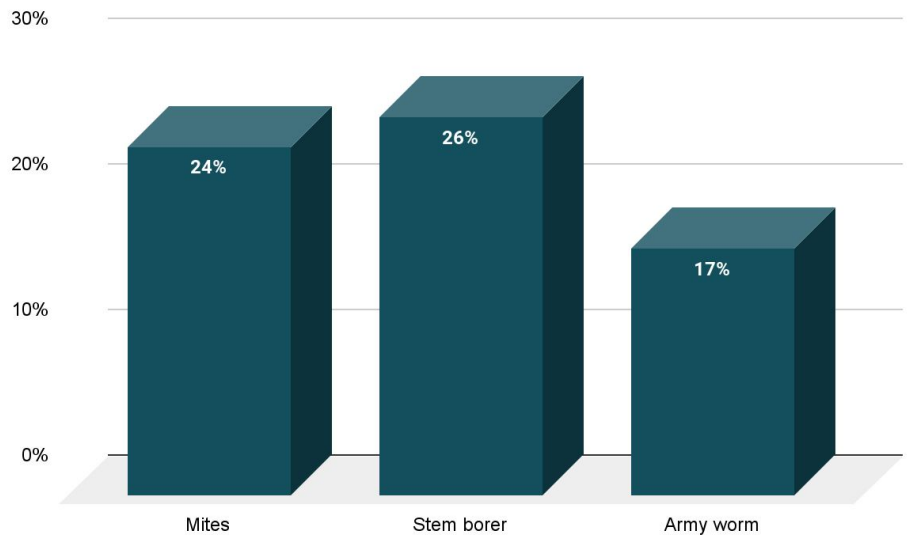

Fig 11: Percentage of farmers affected by different pests of maize

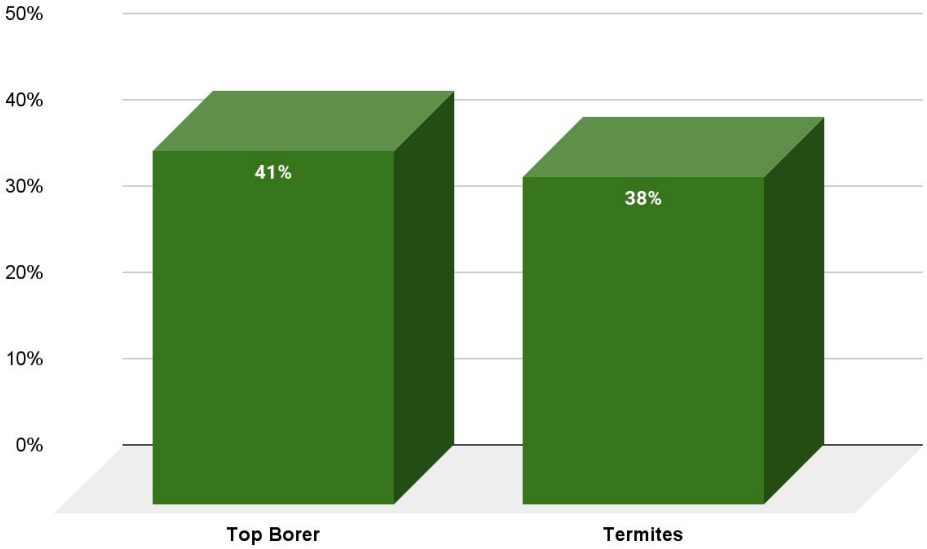

Fig 12: Percentage of farmers affected by different pests of sugarcane

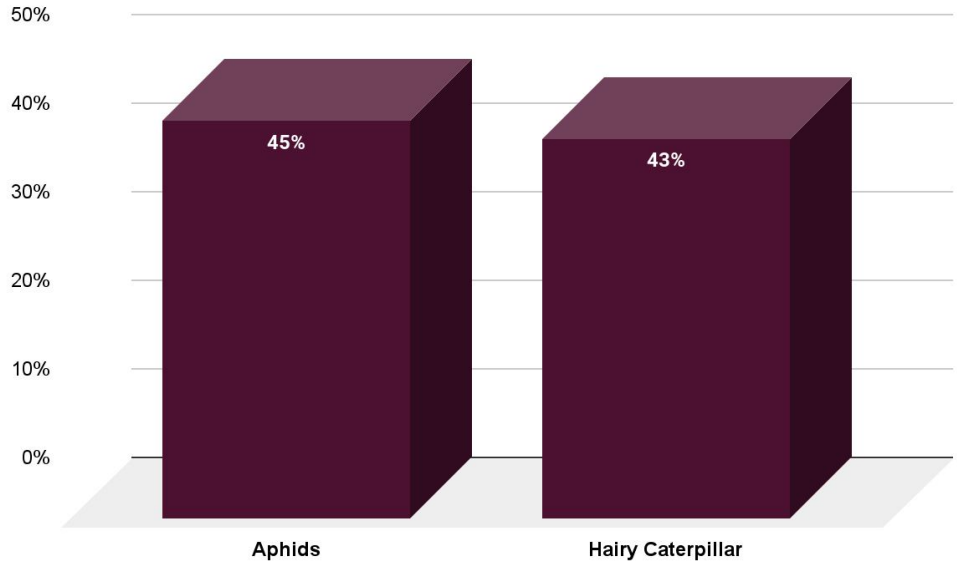

Fig 13: Percentage of farmers affected by different pests of mustard

3.7 Harvesting Method:

The data gathered (Table 7) shows that majority of farmers favor combine harvester for harvesting crops like wheat and rice. It requires less time and effort. Among rice producing farmers, combine harvester is used by about 72% of farmers, where as 13% prefer hand harvesting. In the wheat crop, 74% of farmers use combine harvesters, while 13% prefer manual harvesting. Farmers harvest maize, sugarcane, and mustard by hand. According to data, 50% of farmers' manually harvested mustard, 44% of farmers' manually harvested sugarcane, and 28% of farmers manually harvested maize.

Sr No	Crops	Parameters	Shakrullapur (n=28)	Rora (n=30)	Bibipur (n=22)	Batta (n=18)	Fatehpur Theri (n=22)	Overall (N=120)
1	Rice	Combine harvester	12 (43%)	25 (83%)	20 (91%)	8 (44%)	21 (95%)	86 (72%)
		Manual	6 (21%)	3 (10%)	2 (9%)	4 (22%)	1 (5%)	16 (13%)
2	Wheat	Combine harvester	16 (57%)	25 (83%)	18 (82%)	11 (61%)	19 (86%)	89 (74%)
		Manual	6 (21%)	3	2 (9%)	4	1 (5%)	16

				(10%)		(22%)		(13%)
3	Maize	Manual	12 (43%)	6 (20%)	3 (14%)	3 (17%)	9 (41%)	33 (28%)
4	Sugarcane	Manual	13 (46%)	10 (33%)	14 (64%)	6 (33%)	10 (45%)	53 (44%)
5	Mustard	Manual	12 (43%)	13 (43%)	10 (45%)	9 (50%)	16 (73%)	60 (50%)

Table 7: Represents the data of farmers following different harvesting methods

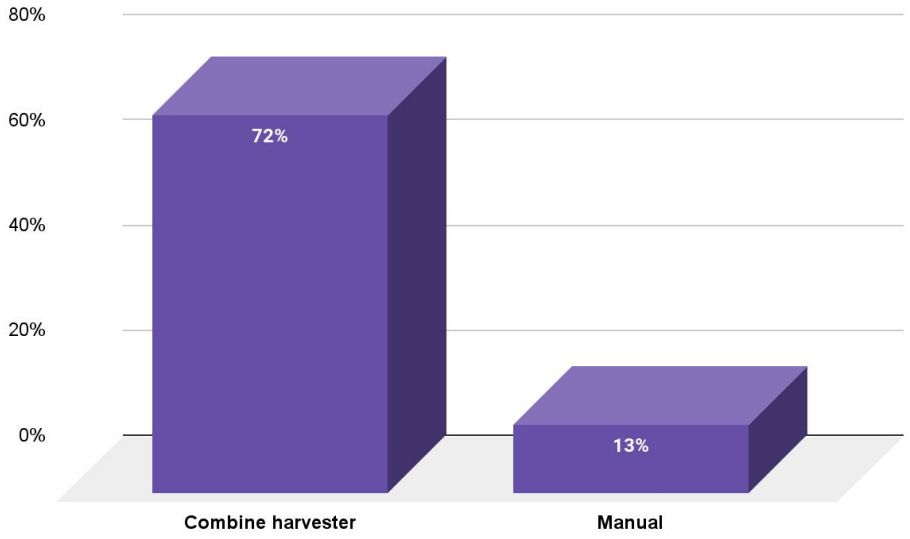

Fig 14: Percentage of farmers following different harvesting methods in rice

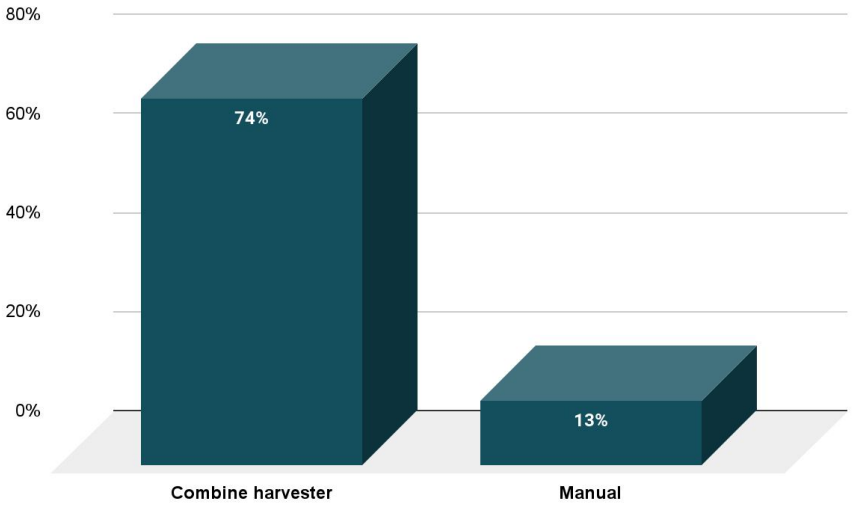

Fig 15: Percentage of farmers following different harvesting methods in wheat

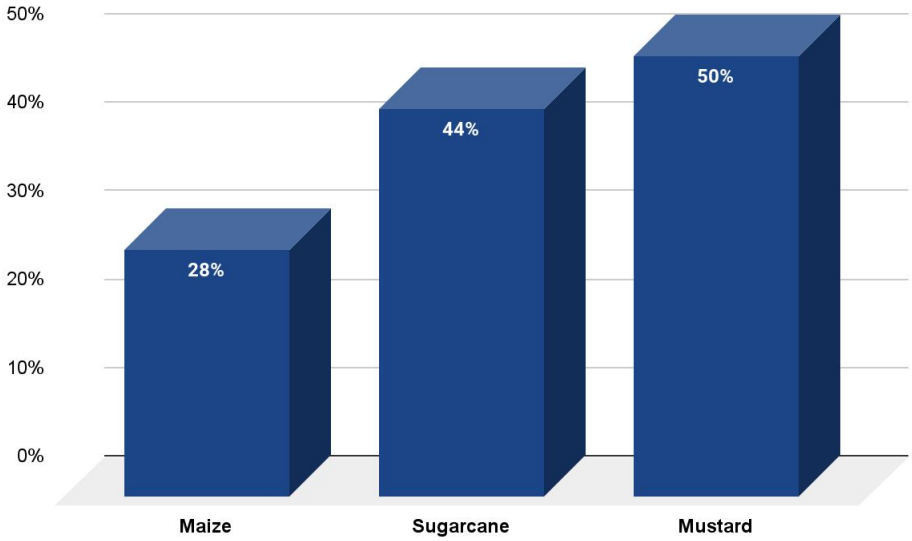

Fig 16: Percentage of farmers following manual harvesting method in maize, sugarcane and mustard

3.8 Yield Record:

As per data collected (Table 8), total average production of Rice is 61.4 quintals/ha with highest 63 quintals/ha in Bibipur and lowest 60 quintals/ha in Rora and Batta. The average production of wheat is 46.6 quintals/ha, with Rora village having the highest production 48 quintals/ha and Batta village with lowest productivity of a 45 quintals/ha. Average production of Maize is 37.8 quintals/ha with lowest 37 quintals/ha in Shakrullapur and Fatehpur Theri and highest in 39 quintals/ha in Rora. Average production of Sugarcane is 810 quintals/ha with lowest 790 quintals/ha in Shakrullapur and highest 830 quintals/ha in Fatehpur Theri. Similarly Average production of Mustard is 13.6 quintals/ha with lowest 12 quintals/ha in Bibipur and highest 14 quintals/ha in Shakrullapur.

Sr No	**Crop**	**Shakrullapur**	**Rora**	**Bibipur**	**Batta**	**Fatehpur- Theri**	**Average production**
1	Rice	62 quintals/ha	60 quintals/ha	63 quintals/ha	60 quintals/ha	62 quintals/ha	61.4 quintals/ha
2	Wheat	47 quintals/ha	48 quintals/ha	47 quintals/ha	45 quintals/ha	46 quintals/ha	46.6 quintals/ha
3	Maize	37 quintals/ha	39 quintals/h	38 quintals/h	38 quintals/	37 quintals/	37.8 quintals/ha

			a	a	ha	ha	
4	Sugarcane	790 quintals/ha	820 quintals/ha	810 quintals/ha	800 quintals/ha	830 quintals/ha	810 quintals/ha
5	Mustard	14 quintals/ha	15 quintals/ha	12 quintals/ha	13 quintals/ha	14 quintals/ha	13.6 quintals/ha

Table 8: Represents the average yield of major crops grown by the respondents

Conclusion:

Based on findings and the data collected it is concluded that a variety of crops are grown in this region like Wheat, paddy, sugarcane, maize, mustard, sorghum, berseem, potato, onion etc. Wheat and paddy are the two main cereal crops and mustard is the major oilseed crop cultivated in this area whereas major fodder crops like berseem and sorghum are also grown. Majority of the farmers using recommended seed rate followed by the number of farmers using seeds more than recommended rate. Most of the farmers (87%) facing the problem of *Phalaris minor*, commonly known as 'Gulli danda' in Punjabi. This is primarily caused by farmers not using crop rotation in their fields. They are following different manual methods and weedicides to control the weeds in the crop field. Majority of the farmers observed Sheath blight (78% farmers) in rice and Yellow rust in wheat (83% farmers). To deal with the diseases farmers preferring different chemical treatments. But the suggestion always be to use resistant crop varieties from certified agencies. Grasshopper and aphids are the major pests causing maximum damage in paddy and wheat field respectively. Harvesting is mainly done by combine harvester in the case of cereal crops like what and rice whereas manual harvesting is done in maize, mustard, sugarcane, bajra, berseem etc. Most of the farmers use excess amount of fertilizer. Farmers are the main ones who over-spray the fields with DAP and urea, although MOP and other potash fertilizers are given less attention. Farmers should undergo routine soil testing to stay informed about the macro- and micronutrient state of their soil and should supply the crop with the ideal amount of nutrients based on the soil nutrient status. By using these agronomical techniques, productivity and economic standing can be improved.

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