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Shivam Kumar Lal
University Institute of Agricultural
Sciences, Chandigarh University,
Mohali, Punjab, India

Shubham Kumar
University Institute of Agricultural
Sciences, Chandigarh University,
Mohali, Punjab, India

Aditi
University Institute of Agricultural
Sciences, Chandigarh University,
Mohali, Punjab, India

Gurshaminder Singh
University Institute of Agricultural
Sciences, Chandigarh University,
Mohali, Punjab, India

Corresponding Author:
Shivam Kumar Lal
University Institute of Agricultural
Sciences, Chandigarh University,
Mohali, Punjab, India

On-farm Realities: An analysis of agronomic practice gaps in the wheat-paddy system of Punjab, India

Shivam Kumar Lal, Aditi, Shubham Kumar and Gurshaminder Singh

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Abstract

Agriculture serves as the cornerstone of the Indian economy, providing sustenance to a substantial portion of the population. The prosperity of this sector is intricately linked to the agronomic practices employed by farmers to attain optimal yields. This study was undertaken to scrutinize the prevalent agronomic practices among 45 farmers residing in seven villages within the eastern region of Punjab, India. An extensive survey employing a structured questionnaire was conducted to gather data on pivotal parameters, encompassing cropping patterns, seed management, nutrient application, irrigation, crop protection measures, harvesting techniques, and yield levels. The findings reveal a predominant wheat-paddy cropping system, with 86.7% of farmers cultivating wheat and 77.8% cultivating paddy. Notable deviations from recommended practices were observed, with 77.1% of farmers applying a higher-than-recommended seed rate for wheat and only 6.7% employing soil-test-based nutrient management. Although 82.2% of farmers utilize a combination of organic and inorganic fertilizers, the absence of soil testing suggests a tendency towards imbalanced application. Tubewells served as the primary source of irrigation, while flood irrigation was universally adopted. Despite the high level of mechanization in harvesting, challenges in weed management, particularly the control of *Phalaris minor* in wheat, continue to pose significant obstacles across the region. The study concludes that while farmers have successfully adopted high-yielding varieties and mechanization, there is an urgent need for extension services to facilitate the adoption of balanced fertilizer use and integrated weed management strategies. These measures are essential for ensuring the long-term sustainability and profitability of wheat production.

Keywords: Agronomic practices, Punjab, nutrient management, crop protection, yield analysis

Introduction

Agriculture stands as a pivotal sector within the Indian economy, significantly contributing to the nation's Gross Domestic Product (GDP) and serving as the primary source of livelihood for approximately 58 percent of the population (*Indian Agriculture Sector, Farming in India* | IBEF, n.d.). Agriculture stands as a pivotal sector within the Indian economy, significantly contributing to the nation's Gross Domestic Product (GDP) and serving as the primary source of livelihood for approximately 58 percent of the population (Gulati & Juneja, 2022). Punjab, frequently referred to as the "Food Bowl of India," has garnered widespread recognition for its contribution to India's food self-sufficiency through the Green Revolution (Saunders, *et al.*, 2012) ^[9]. However, this success has also driven a long-term shift from crop diversification to a more resource-intensive mono-cropping system (Ahmed, *et al.*, 2024) ^[10]. Studies have identified the wheat-paddy rotation as the most economically stable pattern for farmers, driven by technological improvements, high returns, and an assured Minimum Support Price (MSP) through government procurement (J. Singh *et al.*, 2021). While providing economic security, this shift has also led to significant environmental repercussions, including groundwater decline and soil degradation from intensive fertilizer use, creating the context for the present study (Rhodes, 2014).

SAS Nagar (Mohali), Fatehgarh Sahib, and Rupnagar, a significant agricultural hub within this state, serves as a microcosm of the opportunities and challenges encountered by Punjabi farmers. The villages selected for this study—Barouli, Fatehpur Jattan, Kishanpura, Nogawan, Doomcheri, Dholan Majra, and Thablan—represent the region's intensive wheat-paddy cropping system. Consequently, an investigation into the on-ground agronomic practices within these

specific communities is crucial to comprehend the adoption rates of contemporary technologies and identify persistent disparities between recommended and actual farm operations.

The primary objective of any farmer is to optimize yield per unit area, which is significantly influenced by effective crop management, commonly referred to as agronomic or cultural practices. These practices encompass all on-farm operations, encompassing land preparation, sowing, harvesting, and storage (Abhishek *et al.*, 2023) ^[1]. The agronomic practices employed by a farmer serve as a direct reflection of their knowledge, experience, and adoption of scientific recommendations. This study endeavors to document and analyze the agronomic practices currently implemented by farmers in selected villages of Punjab, thereby assessing their adherence to scientifically recommended practices for essential inputs.

Objectives

- To investigate the prevalent agronomic practices (cropping patterns, nutrient management, crop protection, etc.) employed by the respondent farmers.
- To analyze the collected data in order to identify the prevalent challenges and deviations from recommended agricultural practices.

2. 2. Materials and Methods

A comprehensive study was conducted in seven selected villages across three districts in eastern Punjab: Barouli (SAS Nagar); Fatehpur Jattan, Thablan, Kishanpura, and Nogawan (Fatehgarh Sahib); and Doom Chheri and Dholan Majra (Rupnagar). The study employed an extensive interview method to collect data from farmers. A comprehensive questionnaire served as the foundation for the interviews, encompassing all facets of agronomic practices for the primary crops cultivated throughout the year.

A total of 45 farmers were selected through random sampling for the interview process. The collected data underwent meticulous compilation, classification, and analysis utilizing descriptive statistics, primarily calculating averages and percentages to interpret the findings and draw definitive conclusions. The primary data for this analysis was exclusively sourced from the survey conducted by the author and meticulously compiled in the provided spreadsheet.

3. Results and discussion

3.1 Major Crops Grown The study revealed that the predominant cropping pattern across the seven surveyed villages is the **wheat-paddy rotation**.

- **Wheat and Paddy:** An analysis of the 45 respondent farmers shows that, overall, 86.7% cultivated wheat and 77.8% cultivated paddy/rice, confirming this dual-crop system as the primary land use pattern. This observation aligns with findings from previous regional studies (H. Singh *et al.*, 2022). However, the village-wise data reveals significant variations. For instance, the cultivation of paddy was universal (100%) among farmers in Fatehpur Jattan but was significantly lower in Barouli at 44.4%.
- **Fodder Crops:** Maize and other fodder crops were also widely grown to support livestock, with an overall cultivation rate of 46.7% for maize and 37.8% for other fodders like jowar and sorghum. The cultivation of fodder was particularly high in Dholan Majra (80%).
- **Other Crops:** ICrop diversification was limited. Sugarcane was grown by 26.7% of the total farmers, with notable cultivation in Barouli (44.4%), Fatehpur Jattan (44.4%), and Dholan Majra (40%). Vegetables were the least common, grown by only 11.1% of the respondents overall.

Table 1: Cropping pattern of the respondent farmers

Sr. No.	Crops Grown	Barouli (n=9)	Fatehpur Jattan (n=9)	Kishanpura (n=5)	Nogawan (n=5)	Doomcheri (n=5)	Dholan Majra (n=5)	Thablan (n=7)	Overall (n=45)
1	Wheat	88.9%	88.9%	100%	80%	80%	80%	85.7%	86.7%
2	Paddy / Rice	44.4%	100%	80%	80%	80%	80%	85.7%	77.8%
3	Maize	66.7%	33.3%	80%	40%	20%	40%	28.6%	46.7%
4	Fodder (Jowar / Sorghum)	55.6%	33.3%	40%	20%	20%	80%	28.6%	37.8%
5	Sugarcane	44.4%	44.4%	0%	0%	0%	40%	14.3%	26.7%
6	Vegetables	0%	0%	20%	0%	0%	40%	14.3%	11.1%

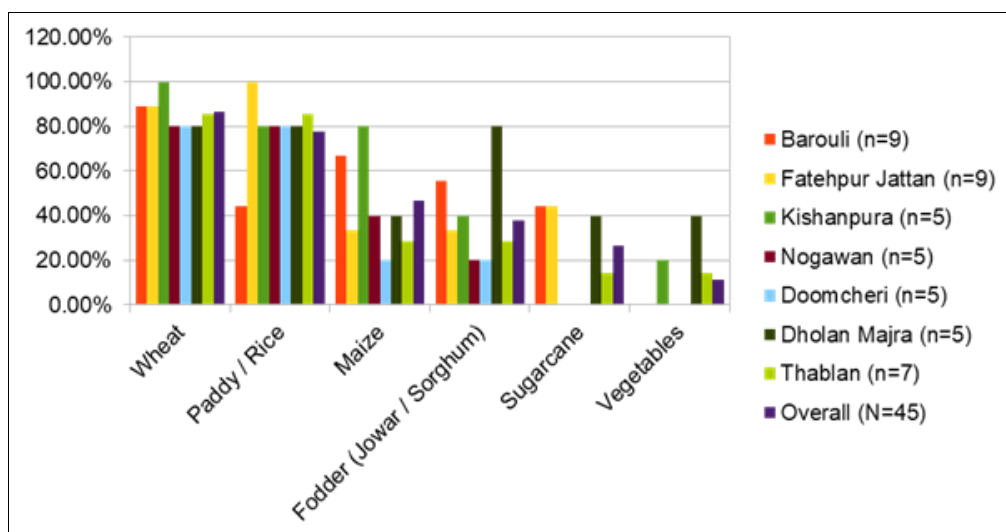


Fig 1: Crops grown by respondent farmers

3.2 Nutrient Management A critical finding of the study pertains to the application of fertilizers. Although farmers are utilizing nutrient inputs, the application is frequently imbalanced when compared to recommended dosages.

- **Fertilizer Use:** The majority of farmers employ both organic (FYM) and inorganic fertilizers (Urea, DAP).
- **Imbalanced Application:** There is a noticeable overemphasis on Nitrogenous (Urea) and Phosphatic (DAP) fertilizers, while Potassic (MOP) fertilizers are underutilized. This is a prevalent trend where farmers frequently apply more than the recommended doses of Nitrogen (N) and Phosphorus (P) in the expectation of

increased yields, disregarding the importance of Potassium (K) (G. Singh & Namuse, 2022) [5]. This practice can result in nutrient imbalances in the soil over time. This aligns with broader findings which show that such imbalances are responsible for lower nutrient utilization by crops, leading to environmental degradation, soil and water pollution (eutrophication), and increased greenhouse gas emissions (Shukla *et al.*, 2022) [4]. The recommended nitrogen (N), phosphorus (P), and potassium (K) ratios for wheat are (120N: 60P: 40K), while for paddy, they are (125N: 30P: 30K). (Punjab Agricultural University, 2024).

Table 2: Nutrient management strategies adopted by farmers

Sr. No.	Practice	Barouli (n=9)	Fatehpur Jattan (n=9)	Kishanpura (n=5)	Nogawan (n=5)	Doomcheri (n=5)	Dholan Majra (n=5)	Thablan (n=7)	Overall (N=45)
1	Organic & Inorganic	88.9%	66.7%	80.0%	100.0%	100.0%	80.0%	71.4%	82.2%
2	Organic (FYM only)	11.1%	22.2%	0.0%	0.0%	0.0%	20.0%	0.0%	8.9%
3	Based on Soil Tests	0.0%	0.0%	20.0%	0.0%	0.0%	0.0%	28.6%	6.7%
4	Inorganic Only	0.0%	11.1%	0.0%	0.0%	0.0%	0.0%	0.0%	2.2%

Table 2 presents data on nutrient management practices among farmers. Notably, 82.2% of farmers adopt an integrated approach, utilizing both organic and inorganic fertilizers. However, soil-test-based nutrient management, a scientifically recommended practice, is critically underutilized. This approach is observed in only a minority of farmers in Thablan (28.6%) and Kishanpura (20%), and it is entirely absent in the other five villages. This suggests that fertilizer application is largely based

on conventional wisdom rather than soil-specific needs.

3.3 Seed and Sowing

- **Seed Source:** Farmers obtain seeds from diverse sources, encompassing local markets (Morinda, Bassi Pathan), cooperative societies, and directly from agricultural universities such as Punjab Agricultural University (PAU).

Table 3: Sources of seed procurement by farmers

Seed Source	Barouli (n=9)	Fatehpur Jattan (n=9)	Kishanpura (n=5)	Nogawan (n=5)	Doomcheri (n=5)	Dholan Majra (n=5)	Thablan (n=7)	Overall (N=45)
Local Markets (overall)	56	78	100	80	60	40	57	67
— Bassi Pathan	33	22	40	—	—	40	14	29
— Morinda	—	56	20	20	40	—	—	24
— Kharar	—	—	60	40	—	—	—	11
— Ropar	—	—	40	40	—	—	—	7
— Ambala	—	—	—	—	—	—	14	2
— General Shop	22	—	20	40	20	—	43	20
University (PAU)	—	22	60	40	—	20	14	20
Farmer's Own Seed	11	—	—	20	—	—	—	4
Not Provided	11	—	—	60	40	—	—	18

As depicted in Table 3, farmers employ a diverse array of seed sources. Local markets, such as Bassi Pathan (28.9%) and Morinda (24.4%), emerged as the most prevalent commercial sources. Notably, a substantial portion of farmers sourced seeds directly from Punjab Agricultural University (PAU), a practice predominantly observed among farmers in Kishanpura (60.0%). This underscores the university's pivotal role in seed distribution.

Seed Rate: A tendency to employ a higher seed rate than recommended was observed, particularly for wheat. This is a prevalent phenomenon where farmers believe that increased plant density will lead to improved yields, frequently utilizing 5-10% more seed than the recommended amount (H. Singh *et al.*, 2022).

Table 4: Adherence to recommended seed rate for wheat

Sr. No.	Seed Rate Used	Barouli (n=6)	Fatehpur Jattan (n=7)	Kishanpura (n=3)	Nogawan (n=4)	Doomcheri (n=4)	Dholan Majra (n=4)	Thablan (n=4)	Overall (n=35)
1	Recommended	33.3%	57.1%	0.0%	25.0%	0.0%	25.0%	0.0%	22.9%
2	Above Recommended	66.7%	42.9%	100.0%	75.0%	100.0%	75.0%	100.0%	77.1%

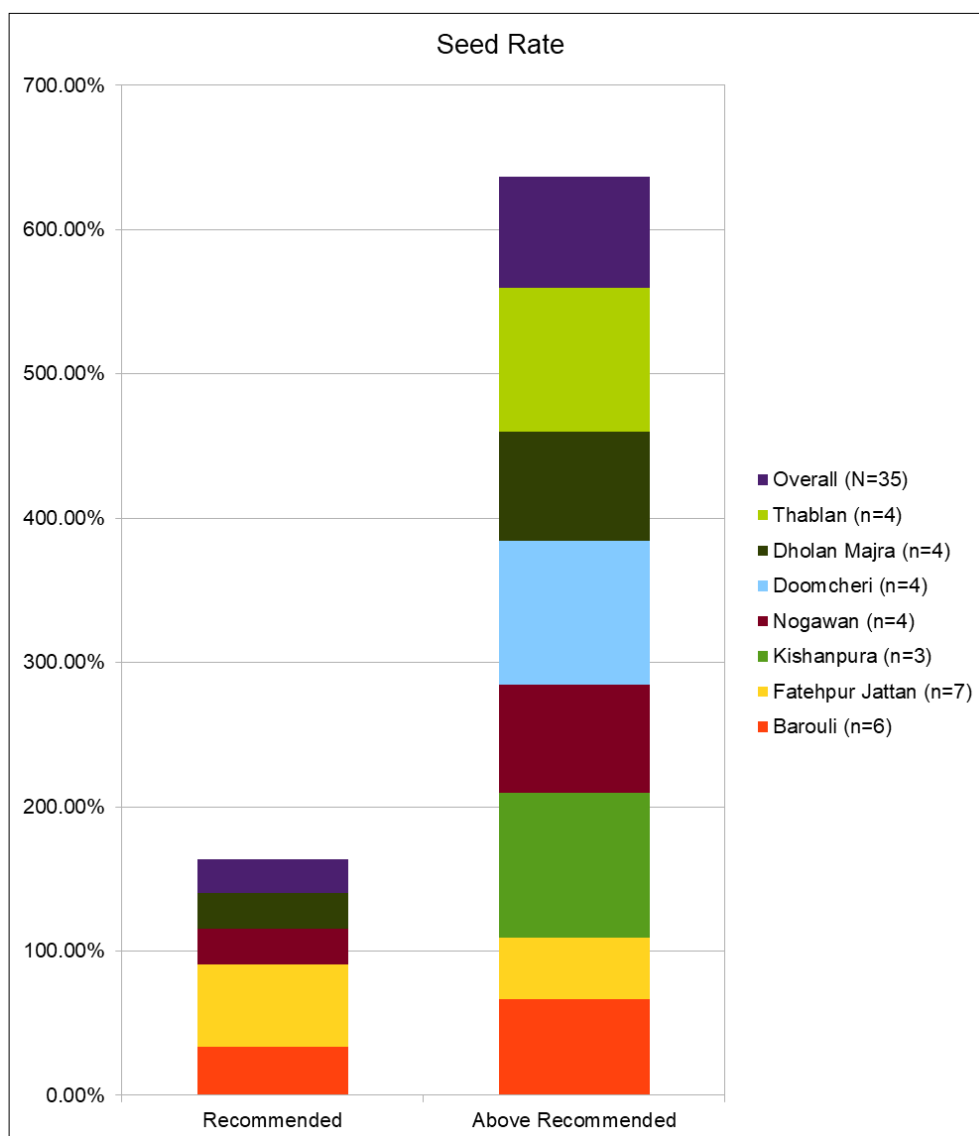


Fig 2: Seed Rate Used by Respondent Farmers for Wheat

As illustrated in Table 4, a significant majority of farmers (77.1% overall) employed a higher seed rate for wheat compared to the recommended per acre unit (PAU) dose. This practice of over-seeding was most prevalent in the villages of Kishanpura, Doomcheri, and Thablan, where 100% of the surveyed farmers applied an excess of seed beyond the recommended amount. Conversely, Fatehpur Jattan demonstrated the highest level of adherence, with 57.1% of farmers utilizing the recommended rate.

- Sowing Method:** Paddy cultivation predominantly employs mechanical methods such as seed drills, Super Seeders, or broadcasting. Transplanting remains the primary method for paddy cultivation. While transplanting remains a primary method for paddy, studies comparing it with Direct Seeded Rice (DSR) show nuanced results. For instance, research indicates that DSR can produce a significantly higher straw yield, while grain yield is often comparable or slightly higher in traditional puddled transplanted rice, with some studies finding no statistically significant difference in key yield factors between the two methods (Author, Year).

Table 5: Sowing methods employed by respondent farmers

Sowing Method	Barouli	Fatehpur Jattan	Kishanpura	Nogawan	Doomcheri	Dholan Majra	Thablan	Overall
Manual Methods	89%	78%	40%	100%	100%	80%	57%	76%
Broadcasting	89%	22%	40%	100%	100%	40%	29%	58%
Transplanting	22%	78%	40%	100%	20%	60%	57%	51%
Mechanized Methods	44%	67%	80%	0%	80%	60%	43%	53%
Drilling (incl. Zero Till)	22%	44%	20%	0%	40%	20%	14%	27%
Happy Seeder	0%	0%	60%	0%	60%	20%	29%	29%
Machine Sowing	33%	0%	0%	0%	0%	40%	14%	16%
Trench Planting	0%	56%	0%	0%	0%	0%	0%	11%
Line Sowing	0%	0%	60%	0%	0%	20%	0%	11%
Not Provided	11	—	—	60	40	—	—	18

Table 5 presents data on sowing methods, illustrating a combination of traditional and contemporary practices. Broadcasting (57.8%) and Transplanting (51.1%) continue to be the most prevalent methods overall. Notably, there is a significant adoption of modern, conservation-oriented machinery such as the Happy Seeder (28.9%). This practice is particularly prevalent in Kishanpura and Doomcheri. Fatehpur Jattan exhibits a high prevalence of Trench Planting (55.6%), a method that is less common in other surveyed villages.

3.4 Weed, Pest, and Disease Management

- **Weed Control:** *Phalaris minor* (Gulli danda) in wheat and *Echinochloa crus-galli* (Swank) in paddy were reported as the most problematic weeds, which is a persistent issue in the wheat-paddy system (G. Singh & Namuse, 2022) ^[5].

Herbicides are the primary method of control.

Table 6: Major Weed Categories Reported by Farmers

Major Weed Category	Percentage of Farmers Reporting
Broadleaf Weeds (e.g., Lambsquarter)	65.0%
Grassy Weeds (e.g., Phalaris minor, etc.)	58.0%
Sedges (e.g., Purple Nutsedge)	42.0%

The most frequently reported weeds by the 45 farmers were various grasses and broadleaf weeds, which are recognized as persistent challenges in the wheat-paddy system. As illustrated in Table 6, broadleaf weeds were reported by the highest percentage of farmers.

Table 7: Herbicides Used for Weed Control by Farmers

Herbicide	Barouli (n=9)	Fatehpur Jattan (n=9)	Kishanpura (n=5)	Nogawan (n=5)	Doomcheri (n=5)	Dholan Majra (n=5)	Thablan (n=7)	Overall (n=45)
Clodinafop	33.3%	0.0%	60.0%	20.0%	20.0%	0.0%	57.1%	40.0%
Bispyribac-sodium	0.0%	22.2%	20.0%	0.0%	40.0%	0.0%	28.6%	22.2%
Atrazine	55.6%	11.1%	0.0%	20.0%	0.0%	0.0%	14.3%	17.8%
Pendimethalin	0.0%	55.6%	0.0%	0.0%	0.0%	0.0%	14.3%	17.8%
Butachlor	11.1%	11.1%	40.0%	20.0%	0.0%	0.0%	0.0%	13.3%
Metribuzin	33.3%	0.0%	0.0%	0.0%	0.0%	0.0%	14.3%	13.3%
Sulfosulfuron	0.0%	22.2%	40.0%	0.0%	0.0%	0.0%	0.0%	8.9%
2,4-D	22.2%	11.1%	0.0%	0.0%	0.0%	0.0%	0.0%	8.9%
Glyphosate	0.0%	11.1%	0.0%	40.0%	20.0%	0.0%	0.0%	6.7%

As illustrated in Table 7, farmers utilize a diverse range of herbicides to control weed growth. Clodinafop emerged as the most commonly employed herbicide, accounting for 40.0% of the 45 farmers surveyed. Notably, there are distinct village-specific preferences: Atrazine usage was the highest in Barouli (55.6%), while Pendimethalin was the predominant choice in Fatehpur Jattan (55.6%). Furthermore, the utilization of Bispyribac-sodium was also significant, particularly in Doomcheri and Thablan.

- **Pest and Disease Control:** Rice, wheat, and other crops were affected by several pests and diseases. The most prevalent pests included stem borers, plant hoppers, and aphids. Major diseases that impacted rice and wheat were sheath blight and yellow rust, respectively. Farmers predominantly utilize chemical pesticides and fungicides for pest and disease control. Products such as Coragen and Nativo are widely employed, highlighting the widespread reliance on chemical plant protection measures. (Abhishek *et al.*, 2023) ^[1].

Table 8: Major Pests Observed by Farmers

Major Pest	Barouli (n=9)	Fatehpur Jattan (n=9)	Kishanpura (n=5)	Nogawan (n=5)	Doomcheri (n=5)	Dholan Majra (n=5)	Thablan (n=7)	Overall (N=45)
Borers	66.7%	77.8%	40.0%	80.0%	80.0%	60.0%	57.1%	60.0%
Aphids	44.4%	44.4%	60.0%	20.0%	80.0%	40.0%	14.3%	44.4%
Plant Hoppers	11.1%	11.1%	60.0%	20.0%	20.0%	0.0%	14.3%	24.4%
Caterpillars	0.0%	11.1%	0.0%	20.0%	0.0%	60.0%	28.6%	17.8%
Armyworm	11.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.2%
No Pests Reported	22.2%	11.1%	20.0%	0.0%	0.0%	0.0%	0.0%	8.9%

Table 8 presents survey data on pest incidence. Borer infestations, encompassing stem, top, and sundhi borers, were the most prevalent issue, reported by 60.0% of all farmers. Aphids and planthoppers also posed significant challenges, affecting 44.4% and 24.4% of farmers, respectively. Notably,

borer infestations were particularly high in Fatehpur Jattan (77.8%) and Nogawan (80.0%). Conversely, aphids were a major concern for a majority of farmers in Doomcheri (80.0%) and Kishanpura (60.0%).

Table 9: Major Pesticides Used by Farmers

Pesticide	Barouli (n=9)	Fatehpur Jattan (n=9)	Kishanpura (n=5)	Nogawan (n=5)	Doomcheri (n=5)	Dholan Majra (n=5)	Thablan (n=7)	Overall (N=45)
Not Specified	55.6%	44.4%	0.0%	60.0%	0.0%	20.0%	14.3%	35.6%
Chlorantraniliprole (Coragen)	11.1%	0.0%	20.0%	20.0%	20.0%	40.0%	42.9%	20.0%
Fipronil	0.0%	11.1%	20.0%	0.0%	60.0%	20.0%	14.3%	15.6%

Not Used	22.2%	11.1%	20.0%	0.0%	0.0%	0.0%	0.0%	8.9%
Imidacloprid	11.1%	0.0%	60.0%	0.0%	0.0%	0.0%	0.0%	8.9%
Sprays for Pests (General)	0.0%	33.3%	0.0%	0.0%	0.0%	0.0%	0.0%	6.7%
Pymetrozine (Chess)	0.0%	0.0%	20.0%	20.0%	20.0%	0.0%	0.0%	6.7%
Carbofuran	0.0%	11.1%	0.0%	0.0%	0.0%	0.0%	0.0%	2.2%
Chlorpyrifos	0.0%	11.1%	0.0%	0.0%	0.0%	0.0%	0.0%	2.2%
Quinalphos	0.0%	0.0%	0.0%	0.0%	20.0%	0.0%	0.0%	2.2%

As depicted in Table 9, a substantial portion of farmers (35.6%) failed to specify the chemical employed for pest control. Among the products that were mentioned, Chlorantraniliprole (Coragen) and Fipronil were the most frequently cited, utilized by 20.0%

and 15.6% of farmers, respectively. The application of Coragen was predominantly concentrated in Thablan and Dholan Majra, whereas Fipronil was a prevalent choice in Doomcheri.

Table 10: Major Diseases Observed by Farmers

Major Disease	Barouli (n=9)	Fatehpur Jattan (n=9)	Kishanpura (n=5)	Nogawan (n=5)	Doomcheri (n=5)	Dholan Majra (n=5)	Thablan (n=7)	Overall (N=45)
Yellow Rust	55.6%	55.6%	80.0%	60.0%	80.0%	20.0%	14.3%	51.1%
Sheath Blight	0.0%	66.7%	80.0%	60.0%	60.0%	0.0%	0.0%	37.8%
Red Rot	22.2%	44.4%	0.0%	0.0%	0.0%	0.0%	0.0%	13.3%
Blight Diseases	22.2%	11.1%	0.0%	20.0%	0.0%	20.0%	57.1%	20.0%
Blast	11.1%	22.2%	20.0%	0.0%	20.0%	0.0%	14.3%	15.6%
Smut Diseases	11.1%	22.2%	0.0%	0.0%	0.0%	0.0%	0.0%	8.9%
Leaf Spot	33.3%	0.0%	0.0%	0.0%	20.0%	0.0%	0.0%	11.1%
No Diseases Reported	0.0%	0.0%	0.0%	0.0%	0.0%	20.0%	0.0%	2.2%

Table 10 illustrates the prevalence of significant diseases among farmers. Yellow Rust emerged as the most prevalent disease, affecting 51.1% of all farmers and posing a substantial challenge in nearly every village. Sheath Blight also constituted a major concern, impacting 37.8% of farmers overall, with particularly

high incidence rates reported in Fatehpur Jattan (66.7%) and Kishanpura (80.0%). Other diseases, such as Red Rot and various Blights, were reported by a smaller but still significant percentage of the respondents.

Table 11: Disease Control Chemicals Used by Farmers

Fungicide	Barouli (n=9)	Fatehpur Jattan (n=9)	Kishanpura (n=5)	Nogawan (n=5)	Doomcheri (n=5)	Dholan Majra (n=5)	Thablan (n=7)	Overall (n=45)
Not Specified	44.4%	55.6%	20.0%	60.0%	20.0%	20.0%	14.3%	40.0%
Propiconazole	0.0%	11.1%	60.0%	0.0%	60.0%	40.0%	42.9%	26.7%
Carbendazim	0.0%	11.1%	20.0%	0.0%	20.0%	0.0%	14.3%	8.9%
Not Used	22.2%	11.1%	0.0%	0.0%	0.0%	20.0%	0.0%	8.9%
Metalaxyl (incl. Ridomil)	11.1%	11.1%	0.0%	20.0%	0.0%	0.0%	0.0%	6.7%
Fungicides Used (General)	0.0%	0.0%	0.0%	20.0%	0.0%	40.0%	14.3%	11.1%
Tebuconazole	0.0%	11.1%	0.0%	0.0%	0.0%	0.0%	0.0%	2.2%
Mancozeb	11.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.2%
Chlorothalonil	0.0%	11.1%	0.0%	0.0%	0.0%	0.0%	0.0%	2.2%

As elucidated in Table 11, Propiconazole emerged as the most extensively employed fungicide, administered by 26.7% of the farmers to mitigate diseases such as Yellow Rust. Notably, its utilization was notably elevated in Kishanpura (60.0%), Doomcheri (60.0%), and Thablan (42.9%). Furthermore, a substantial proportion of farmers (40.0% overall) refrained from specifying the chemical they utilized, suggesting a potential area for further investigation.

3.5 Harvesting and Yield

Harvesting: Harvesting is predominantly mechanized, with a

significant majority of farmers employing combine harvesters for both wheat and paddy cultivation, thereby optimizing time and labor efficiency.

Yield: The average yield reported by farmers for wheat ranged from 18 to 22 quintals per acre, while for common paddy, it was 25 to 30 quintals per acre. These yields signify the adoption of high-yielding varieties, yet they also underscore the challenges faced by farmers.

Table 12: Wheat Yield (q/acre)

Wheat Yield (q/acre)	Barouli (n=7)	Fatehpur Jattan (n=3)	Kishanpura (n=5)	Nogawan (n=4)	Doomcheri (n=2)	Dholan Majra (n=4)	Thablan (n=3)	Overall (n=28)
15–20 q	71.4%	66.7%	100.0%	100.0%	100.0%	75.0%	100.0%	85.7%
21–25 q	28.6%	33.3%	0.0%	0.0%	0.0%	25.0%	0.0%	14.3%
More than 25 q	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

As depicted in Table 12, the majority of farmers (85.7% overall) achieved a wheat yield within the range of 15-20 quintals per acre. In contrast, higher yields of 21-25 quintals per acre were

less prevalent, reported by only 14.3% of farmers overall. Notably, 100% of the farmers who provided data in Kishanpura, Nogawan, Doomcheri, and Thablan reported yields within the

15-20 quintal range, with no farmers in those villages achieving the higher bracket.

Wheat Yield (q/acre)	Overall (N=28)
15–20 q	85.7%
21–25 q	14.3%
More than 25 q	0.0%

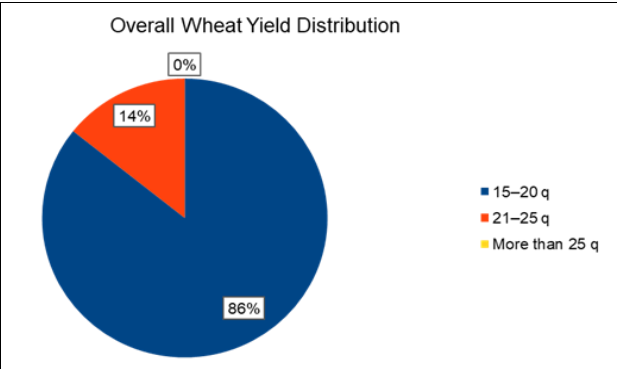


Table 13 presents data on paddy (rice) yield, highlighting the exceptional performance of the surveyed farmers. Notably, a substantial majority of farmers (53.3% overall) achieved a high

yield exceeding 25 quintals per acre. This remarkable performance was particularly evident in Fatehpur Jattan and Thablan, where over 75% of farmers were categorized within this top bracket. Conversely, Nogawan emerged as the sole village where a majority of farmers (60.0%) reported yields falling within the lowest range of 15-20 quintals per acre.

Paddy Yield (q/acre)	Overall (N=30)
15–20 q	13.3%
21–25 q	33.3%
More than 25 q	53.3%

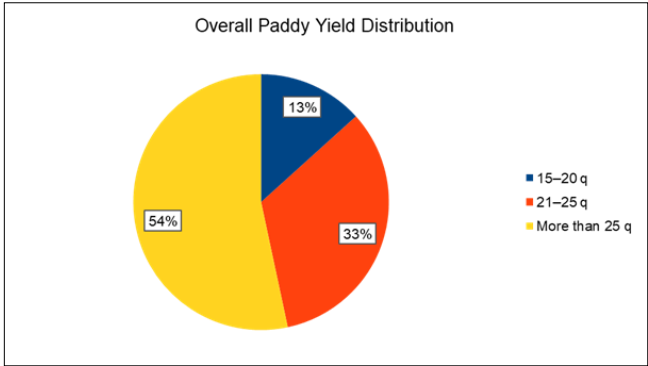


Table 13: Paddy Yield (q/acre)

Paddy Yield (q/acre)	Barouli (n=2)	Fatehpur Jattan (n=9)	Kishanpura (n=2)	Nogawan (n=5)	Doomcheri (n=5)	Dholan Majra (n=3)	Thablan (n=4)	Overall (N=30)
15–20 q	0.0%	0.0%	0.0%	60.0%	20.0%	0.0%	0.0%	13.3%
21–25 q	100.0%	22.2%	100.0%	20.0%	20.0%	33.3%	25.0%	33.3%
More than 25 q	0.0%	77.8%	0.0%	20.0%	60.0%	66.7%	75.0%	53.3%

4. Conclusion

This study successfully achieved its objectives by documenting the prevalent agronomic practices across seven villages in SAS Nagar, Punjab, and identifying critical deviations from scientific recommendations. While farmers have widely adopted modern inputs such as high-yielding varieties and mechanization, the persistent dominance of the wheat-paddy rotation continues to exert pressure on natural resources. The key findings reveal a critical disparity between recommended and actual practices, particularly in nutrient management and seed application. The imbalanced use of fertilizers and a tendency to over-seed wheat pose long-term threats to soil health and profitability. Although farmers are actively managing pests and weeds, a heavy reliance on chemical inputs is evident. Therefore, there is a clear and urgent need for enhanced agricultural extension services to promote the adoption of soil testing, balanced fertilization, and Integrated Pest Management (IPM) strategies. Future research could focus on the economic impact of these deviations and evaluate the effectiveness of targeted training programs in this region.

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