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Analysing agronomical practices in the Rupnagar district of Punjab, India: A comparative study

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Abstract

Nearly half of India's work force is employed in agriculture, which accounts for 20.2% of the country's GDP and makes a significant economic contribution. This research focuses on the distinct farming methods used in the Rupnagar District of Punjab, also referred to as the "Granary of India." We explore the complex connection that determines the future of agriculture in the region between agronomic practices and crop productivity. 150 farmers are interviewed over a period of six different villages in this study with the goal of understanding their farming practices and their socioeconomic status. The results show that wheat and paddy are widely farmed, with sugarcane, maize, barseem, and sorghum enhancing the variety of crops. Problems like uneven fertilizer application and weed resistance highlight the necessity of precise treatments. Seed treatment preferences are impacted by knowledge and resources, with 79.3% preferring hybrid seeds. The overuse of urea and DAP in fertilizer methods indicates the need for balanced fertilization techniques. The importance of tube wells for irrigation is highlighted, underscoring the necessity of sustainable water management. The Wheat-Paddy paradigm dominates crop patterns, which presents problems including insect infestation and weed resistance. While rice varieties that prioritize grain quality continue to be harvested manually, the harvesting of cereal crops is streamlined by combine harvesters. In order to conserve water, the study's conclusions advocate for crop diversity, direct-seeded rice techniques, increased knowledge of soil testing, and balanced fertilizer use. For the agricultural community of Rupnagar, this change holds potential for greater production, resilience, and financial well-being while combining innovation and tradition for a sustainable future.

Keywords: Agronomic practices, farmer, production, crop, land

Introduction

India's agricultural history dates back to the Neolithic era and is an essential aspect of the country's historical and modern foundations. This sector has not only kept the country going, but it has also been significant in building its socioeconomic structure. According to the Indian Economic Survey for 2020-21, the agricultural sector employed over 50% of India's labour force and made for a considerable 20.2% of the nation's GDP. Although these figures demonstrate the industry's ongoing significance, in order to fully understand the subtle differences in agricultural contributions, it is important to go further into each region.

India implemented major policy changes aimed at achieving food grain self-sufficiency. The first step toward increasing production was the adoption of higher yielding, disease-resistant varieties of wheat together with improved agricultural practices. Leading India's green revolution and known as the nation's breadbasket which is the state of Punjab.

Punjab, also referred to as the "Land of the Five Rivers," has a special place in Indian agriculture. These prosperous regions have been called the "Food Basket of the Country" and the "Granary of India." Punjab has supplied 40 percent of the country's rice and 50-70% of its wheat for the last 20 years. Additionally, it supplies around 60% of the overall food grain supply to the central pool in addition to meeting its own food grain demands.

During the early years of the Green Revolution, the economy thrived. The Green Revolution helped India's economy as a whole by significantly increasing the state's agricultural output in Punjab, where it was originally implemented. Punjab produced 70% of the nation's food grains by 1970, and farmer incomes increased by more than 70%. (Sandhu *et al.* 2014) ^[7]

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The study and technique of growing and utilizing plants through agriculture for food, fuel, fibre, chemicals, leisure, or land preservation is known as agronomy. Plant physiology, soil science, meteorology, and plant genetics studies are now all included in agronomy. It is the application of a number of scientific disciplines, economics, ecology, and earth science.

In order to maintain the sustainability of the food chain, agricultural technology is essential. One of the best examples of how technology, regardless of size, has changed agricultural output is the Green Revolution. Among the many benefits of this revolution are higher yields, less poverty, improved food availability, infrastructural development, and lower food prices.

(Mc Cullough *et al.* 2012)^[4]

This research focuses on the survey that has been conducted in Rupnagar District of Punjab, which has an interesting agricultural environment with hot summers and freezing winters due to its arid climate. The soils of the district, which range from loam to silty clay loam, are perfect for growing a wide variety of crops, including as vegetables, wheat, maize, rice, sugarcane, and sorghum. With an average of 775.6 mm of rainfall per year, the area presents both unique potential and problems for agricultural practises. The purpose of the research is to explain the complex relationship that exists in the Rupnagar District between crop productivity and agronomic practises. We hope to learn more about the common practises used by the farmers in the area and how they affect crop yields, which will be important information for the future of agriculture in the area.

Materials and Methods

The research was carried out in Punjab, India, particularly in the Rupnagar district. For the purpose of this research, six individual

villages—Choti Mandauli, Rattanagarh, Bhadwali, Bari Mandauli, and Bhatari were selected. Random sampling was used to select 150 farmers in total for interviews. Twenty-two respondents from Choti Mandauli, fifteen from Ramgarh Manda, twenty-eight from Rattanagarh, twenty-five from Bhadwali, twenty-seven from Bari Mandauli, and thirty-three from Bhatari were included in this sample. Interviews were carried out as part of the research with the selected farmers to find out more about their socioeconomic status and the all year long farming practices they implement. These interviews were conducted on the fields or in the houses of the farmers. A standardized questionnaire was designed for the interviews in order to inquire about every aspect of the farming methods used by the farmers. After the respondents' data was obtained, it was arranged and subjected to the proper statistical techniques, which included percentage calculations and the use of graphical displays like pie charts and bar graphs to convey the results.

Results and Discussion

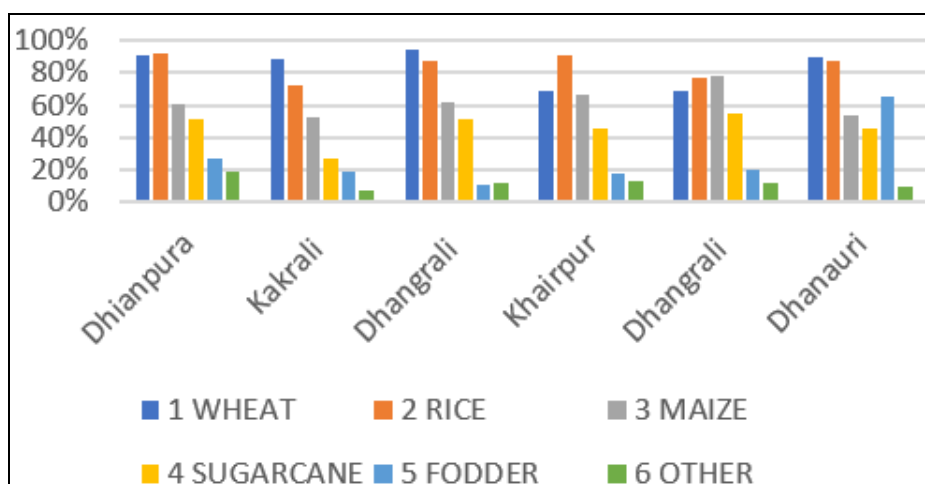
Crops Cultivated by Farmers throughout the Year

The information obtained suggests that every farmer in the research region grows wheat, and that almost all of the respondents 100% cultivate paddy crops on their farms. In addition, about 42% of the farmers plant sugarcane in addition to these main crops, and about 54% grow maize as a secondary crop

Moreover, the area is distinguished by the noteworthy production of two primary fodder crops that are unique to each season: berseem and sorghum. About 32.6% of the respondents grow berseem as a fodder crop in their fields, whereas about 41.3% of them grow sorghum.

Major Crops Grown in Different Villages

S. no.	Parameter	Dhianpura	Kakrali	Dhangrali	Khairpur	Dhangrali	Dhanauri
1	WHEAT	91%	89%	94%	69%	69%	90%
2	RICE	92%	72%	87%	91%	77%	88%
3	MAIZE	61%	53%	62%	67%	78%	54%
4	SUGARCANE	51%	27%	51%	45%	55%	45%
5	FODDER	27%	19%	10%	18%	20%	65%
6	OTHER	19%	07%	11%	13%	12%	09%



Major Crops Grown in Different Villages

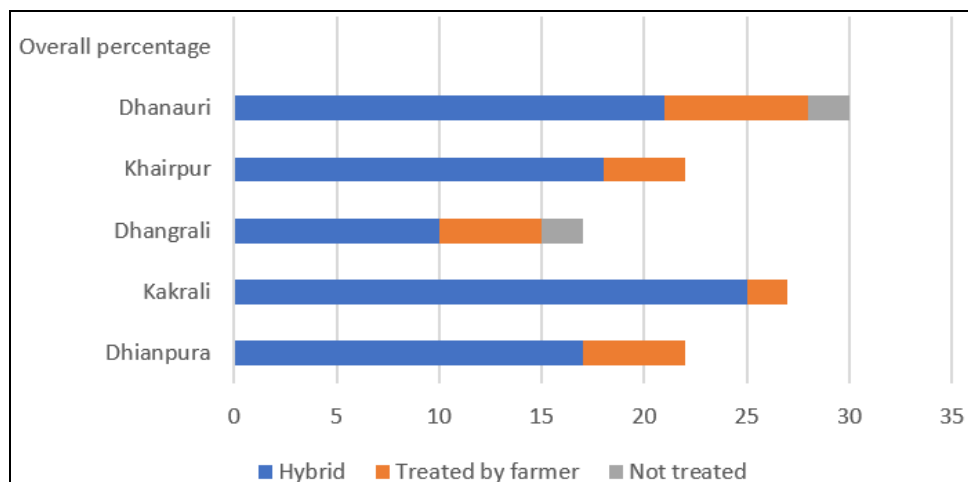
Seed Treatment Practices among Survey Respondents

The selection of whether or not to use seed treatment in agriculture depends on a number of variables, including knowledge and land holdings. Large-scale and marginal farmers choose to use chemicals or hybrid seeds, whereas farmers with

limited land and skill frequently skip seed treatment. With their better yields, hybrid seeds are chosen by the majority, 79.3% of them. 16.6% of individuals treat their own seeds, which may indicate experience or a preference for standard methods. Among farmers, only 0.03% do not treat their seeds.

Seed treatment practices which are followed by the farmers of Ropnagar district

Method	Dhianpura	Kakrali	Dhangrali	Khairpur	Dhanauri	Overall percentage
Hybrid	17	25	10	18	21	91[75.83%]
Treated by farmer	5	2	5	4	7	23[19.16%]
Not treated	0	0	2	0	2	4[3.33%]



Seed treatment practices

Irrigation Practices

The study focuses on rice and wheat, two major crops, in the context of irrigation systems in the Rupnagar District.

Tube wells and Flood irrigation are the main source of irrigation used in rice farming. The rice fields in the area are kept at the ideal moisture levels by the frequent and constant irrigation schedules used by the farmers. Additionally, the critical period of rice irrigation falls on the first planting, indicating the need of

water management strategies at this critical point.

In case of wheat cultivation, tube wells continue to be the main irrigation source. Farmers irrigate wheat four to five times during its growth cycle, paying particular attention to the developmental stage that begins to emerge between 20 and 21 days after sowing (DAS). This specific irrigation approach meets the crop's development needs and shows an extensive knowledge of water management techniques in wheat farming.

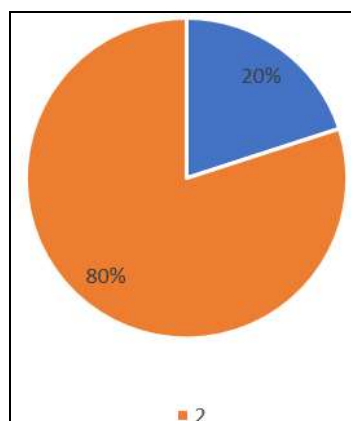
Crop	Method of irrigation	No. of irrigation	Stage/DAS
Paddy	Tubewell	10 to 25 times	At an interval of 20 DAS
Wheat	Tubewell	4-6 times	20-25 DAS

Approaches of Harvesting

According to data obtained, farmers generally favor using combine harvesters to harvest cereal crops, particularly wheat and paddy. The efficiency of combine harvesters, which save time and do not require a lot of physical effort, is the reason behind this choice. Notably, nearly 80% of respondents prefer combine harvesters for certain cereal crops, while just 20% prefer manual harvesting.

It's essential to note that farmers clearly prefer hand harvesting when it comes to paddy agriculture, especially for types like Basmati 1121, 1509, etc. Such varieties are preferred because of

their long, thin grains. Farmers choose the careful method of hand harvesting in order to preserve grain quality since they are aware that mechanized harvesting may cause harm to the grains. This knowledge of harvesting techniques shows the increasing dependence on combine harvesters for efficiency. It also emphasizes the careful consideration that goes into selecting manual harvesting for certain crops with distinctive grain properties. These kinds of things fall in with the larger idea of maximizing farming methods for preservation of quality and output.



Methods of Harvesting

Conclusion

Our thorough investigation of the agricultural land in Punjab's Rupnagar District reveals a range of farming methods, challenges, and opportunities. Examining the many facets of this agricultural tapestry reveals several important facts that impact our understanding of the current state of affairs and offer predictions for the future of farming in this region.

A diverse range of crops cover the agricultural landscape of Rupnagar. Wheat and paddy, the two principal cereal crops, are very important and deeply ingrained in the region's history. Together with these primary crops, the area's vast array of farming techniques is highlighted and agricultural diversity is increased by the addition of sugarcane, maize, barseem, and sorghum.

A startling pattern emerges from our research: the data and resources Farmers' decisions about seed treatment are influenced by the knowledge and tools at their disposal. Only 16.6% treat their own seeds, but the majority (79.3%) use hybrid seeds for improved yields. Surprisingly, only 0.03% of seeds are not treated. These decisions highlight how crucial it is to have the knowledge and resources necessary to steer agricultural operations towards increased sustainability and production.

A closer look at fertiliser techniques reveals notable trends. It seems that urea and DAP fertilisers are being utilised excessively, whereas potassium fertilisers are receiving insufficient attention. This is a potential area for intervention and education to promote the more sustainable and balanced use of fertiliser.

Tube wells become the irrigation industry's lifeblood, sustaining scorched fields of wheat and rice. In the fields, one can witness the extensive use of flood irrigation, which is the outcome of customs derived from regional farming traditions. The utilisation of tube wells highlights the need for sustainable water management strategies to guarantee this vital resource's long-term supply. It will take strategic water conservation measures to keep agriculture viable in this changing climate. Effective laws and neighbourhood initiatives can play a big role in guaranteeing prudent water use and preserving this essential resource for coming generations. Rice and wheat fields burned with heat. The widespread use of flood irrigation in the fields is a result of practices drawn from local farming traditions. The use of tube wells emphasises the necessity of sustainable water management plans to ensure the long-term availability of this essential resource. In light of the changing climate, agriculture will require calculated water conservation strategies to be sustainable. Enacting sensible legislation and launching community-based programs can be important steps towards ensuring responsible water consumption and protecting this vital resource for future generations.

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