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Use of Fertilisers and their Impact on Agricultural Production in Sampla C.D. Block, Rohtak District (Haryana)

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ABSTRACT

Present study examines the use of fertilisers and their impact on agricultural production in Sampla C.D. Block, Rohtak District, Haryana. Agriculture in the region is heavily dependent on chemical fertilisers, making it essential to assess their role in enhancing yields, farmers' awareness, and long-term sustainability. Primary data were collected through a structured questionnaire survey of 80 farmers, evenly distributed across four scattered villages in the block. The study highlights that wheat, paddy, mustard, vegetables, and fodder are the main crops, with urea and DAP being the most widely used fertilisers. Farmers generally apply fertilisers once or twice during a crop season, and expenditure on fertiliser inputs is steadily increasing.

Findings reveal that most respondents attribute more than 25% of yield improvement to fertiliser use, though yields have largely remained stable over the past five years. However, issues such as limited awareness of harmful effects, infrequent soil testing, and occasional crop failures due to the use of incorrect or adulterated fertilisers were observed. While fertilisers are considered vital to productivity, nearly half of farmers reported increased input requirements, with some reporting a decline in soil fertility.

Keywords: Fertilisers, Agricultural Production, Soil Fertility, Farmer Awareness, Sampla C.D. Block

INTRODUCTION

Agriculture remains the backbone of rural livelihoods in Haryana, with districts like Rohtak playing a pivotal role in sustaining food production and economic stability. Within Rohtak, the Sampla C.D. Block, characterised by its semi-arid climate, fertile alluvial soils, and access to canal and groundwater irrigation, offers a microcosm for examining the evolving dynamics of agricultural inputs, particularly fertilisers. The intensification of agriculture in this region, driven by the Green Revolution and subsequent policy interventions, has led to a marked increase in the use of chemical fertilisers to boost crop yields and meet growing food demands (Rani & Dhull, 2024).

Fertilisers, especially nitrogen (N), phosphorus (P), and potassium (K), are essential for enhancing soil fertility and crop productivity. However, their indiscriminate use has raised concerns about long-term soil health, environmental sustainability, and economic viability. In Haryana, the consumption of fertilisers has shown both growth and instability over the past three decades, with nitrogen-based fertilisers, such as urea, dominating the input landscape (Sharma et al., 2023). This imbalance in NPK ratios has been linked to declining soil quality, reduced nutrient efficiency, and diminishing returns on agricultural output.

Sampla C.D. Block, with its diverse cropping patterns, primarily consisting of wheat, mustard, and paddy, has witnessed a steady rise in fertiliser application, often without adequate soil testing or institutional guidance. Studies conducted in the Rohtak district reveal that while fertilisers have contributed to short-term yield gains, they have also altered soil physicochemical properties. For instance, Goyata et al. (2023), found that agricultural soils in Rohtak exhibit a slightly alkaline nature, low phosphorus levels, and moderate organic carbon content, suggesting a need for more balanced and site-specific fertiliser strategies. The long-term use of chemical fertilisers has been shown to affect soil density, structure, and microbial activity, thereby influencing the sustainability of agricultural systems.

Despite the availability of extension services and government subsidies, many farmers in Sampla C.D. continue to rely on conventional fertiliser practices, often guided by dealer recommendations rather than scientific assessments. This

disconnect between policy intent and ground realities underscores the importance of localised studies that integrate farmer perceptions, institutional support, and empirical data. Moreover, the lack of regular soil testing and awareness about balanced fertiliser use further exacerbates the problem, leading to nutrient leaching, soil acidification, and reduced crop resilience.

The present study seeks to bridge this gap by systematically analysing the types, quantities, and impacts of fertiliser use in Sampla C.D. Block. Through a combination of primary surveys, soil sample analysis, and secondary data review, the research aims to assess how fertiliser practices influence agricultural productivity and soil health. It also explores the role of institutional mechanisms, such as subsidies, extension services, and soil testing labs, in shaping farmer behaviour and promoting sustainable agriculture. By focusing on Sampla C.D. Block, this study contributes to the broader discourse on input optimisation and agroecological resilience in Haryana. It aligns with national priorities on sustainable agriculture and offers actionable insights for policymakers, researchers, and practitioners working at the intersection of agronomy, rural development, and environmental management. Ultimately, the study advocates a more nuanced, participatory approach to fertiliser use, balancing productivity goals with ecological integrity and farmer empowerment.

SIGNIFICANCE OF THE STUDY

The present study is significant because it highlights the relationships among fertiliser application, crop yield, and soil health. By analysing farmers' practices, perceptions, and outcomes, the study provides valuable insights into both the benefits and risks of fertiliser use. The findings will assist policymakers, agricultural extension agencies, and farmers in adopting balanced fertiliser practices to improve productivity while ensuring long-term soil fertility and environmental sustainability. Moreover, the study contributes to understanding local-level agricultural challenges, which can guide region-specific interventions.

LITERATURE REVIEW

Chand and Pavithra (2021), conducted a comprehensive analysis of fertiliser use across Indian states, revealing significant deviations from the recommended NPK ratio of 4:2:1. Their study found that while nitrogen use has surged disproportionately, phosphorus and potassium remain underutilised in most regions. This imbalance is attributed to policy distortions such as urea subsidies and inadequate promotion of balanced nutrient application. The authors argue that correcting these imbalances is essential for sustaining crop productivity and soil health across India.
Shukla et al. (2022), explored the broader implications of fertiliser use in Indian agriculture, highlighting its environmental and health consequences. The study emphasises that excessive nitrogen application contributes to low nutrient use efficiency (15–30%) and increased nitrous oxide emissions. It also notes that imbalanced fertiliser use leads to eutrophication, biodiversity loss, and soil degradation. The authors advocate for integrated nutrient management and policy reforms to promote sustainable fertiliser practices.

Goyata et al. (2023), conducted a field-based study in Rohtak district, analysing the physicochemical properties of agricultural soils under intensive fertiliser use. Their findings indicate that the region's soils are moderately alkaline, with low phosphorus and organic carbon levels. The study underscores the need for balanced fertiliser application and regular soil testing to prevent long-term degradation and maintain productivity.

Mishra et al. (2019), evaluated the implementation of India's Soil Health Card (SHC) scheme, which aims to promote balanced fertiliser use through crop-specific recommendations. The study found limited adoption among farmers due to inadequate extension support and low trust in institutional advice. It recommends redesigning the SHC delivery model and integrating digital tools to improve farmer engagement and compliance. While macro-level studies on fertiliser use in Haryana exist, there is a notable absence of micro-level research focused on Sampla C.D. Block. Existing literature tends to generalise the Rohtak district without accounting for village-level variability in soil types, cropping patterns, and institutional access. This gap underscores the need for localised studies that integrate farmer perceptions, soil data, and policy analysis to inform sustainable fertiliser practices in Sampla C.D.

OBJECTIVES OF THE STUDY

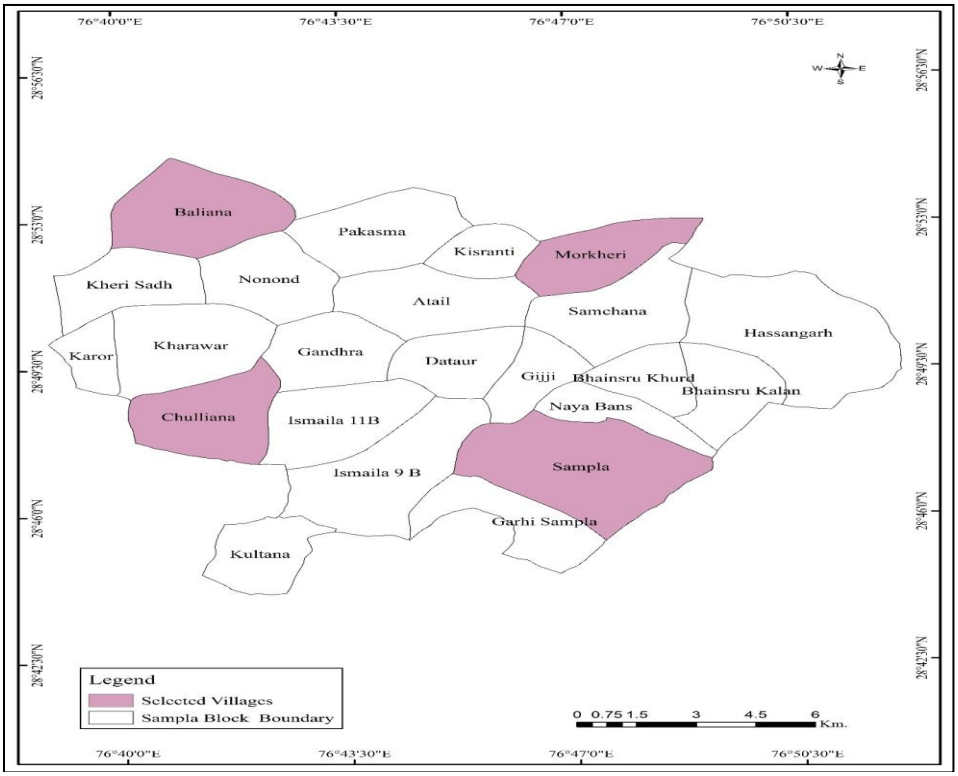
Following were the objectives of the present study:

i. To assess the trend of agricultural yield in relation to fertiliser use
ii. To evaluate the consequences of fertiliser use on crops
iii. To analyse the changes in fertiliser usage patterns over time
iv. To study the impact of fertilisers on soil fertility and sustainability

STUDY AREA

The present study was conducted in Sampla C.D. Block, located in Rohtak District, Haryana, India. Sampla C.D. lies between 28°43' N to 28°56' N latitude and 76°35' E to 76°55' E longitude, forming part of the fertile Indo-Gangetic alluvial plain. The block is well-connected by road and rail networks, with the town of Sampla C.D. Block is situated on National Highway 9, which links Delhi and Rohtak.

Map 1: Location of Selected Villages



Source: Prepared by Research Scholar with the help of Arc-GIS

Agriculture is the dominant occupation, supported by canal irrigation from the Western Yamuna Canal system and extensive use of tubewells. The region experiences a semi-arid climate with hot summers, a monsoon-dominated rainfall pattern, and cool winters. The major crops grown include wheat, paddy, mustard, vegetables, and fodder, reflecting both subsistence and market-oriented farming. Fertilisers play a central role in sustaining productivity in this intensively cultivated area. For the study, four villages scattered across the block were selected to provide a representative understanding of farming practices and fertiliser use.

METHODOLOGY

The present study is based on primary data collected through a structured questionnaire survey. A total of 80 respondents were selected, all of whom are directly engaged in farming activities. To ensure proper representation, four villages scattered across the Sampla C.D. block were purposively selected, with 20 farmers from each village forming the sample.

The questionnaire was designed to capture farmers' awareness, practices, and perceptions related to fertiliser use, its impact on crop yield, soil fertility, pest incidence, and overall agricultural production. Both closed-ended and multiple-choice questions were included to facilitate responses and quantitative analysis.
Data collection was conducted through personal interviews with respondents in their respective villages, ensuring accurate and clear responses. The collected data were tabulated, classified, and analysed using simple statistical tools such as percentages and frequency distribution to identify patterns and draw meaningful conclusions.

This methodological approach provided a reliable understanding of the role and impact of fertilisers on agricultural practices in the study area while incorporating farmers' experiences and opinions at the grassroots level.

FINDINGS

The cropping pattern in Sampla C.D. Block shows that wheat is the dominant crop, cultivated by 76 respondents, accounting for 95% of the farmers. Paddy is also a significant crop, with 42 respondents (52.5%) reporting its cultivation, followed closely by fodder with 41 respondents (51.3%).

Table 1: Agricultural Pattern of Sampla C.D. Block

Sr. No.	Cropping	Response	No. of Respondents	%
1	Main Crops Grown: Select all that apply	Wheat	76	95
		Paddy	42	52.5
		Mustard	38	47.5
		Vegitables	23	28.8
		Fodder	41	51.3
2	Years of Farming Experience	>10 Years	16	20
		11-20years	27	33.8
		21-30Years	31	38.8
		<30Years	6	7.5
3	Sources of Irrigation	Canal	24	30
		Tubwell	47	58.8
		Rainfed	1	1.3
		other	8	10
4	Do you use fertilisers in your field?	Yes	80	100
		No	0	0
	If yes, which types of fertilisers do you use?	Urea	72	90
		DAP	58	72.5
		MOP (Potash)	33	41.3
		SSP	31	38.8
		Micronutrients (Zinc, Sulphur, etc)	36	45
		Biofertilisers	29	36.3
		Organic Manure	30	37.6
5	Frequency of Fertiliser Application in a Crop Season	Once	38	47.5
		Twice	22	27.5
		Thrice	13	16.3
		More than Three times	7	8.8
6	Annual expenditure on fertilisers (per acre)	>10000 Rs	64	80
		10000-25000 Rs	16	20
		25001-50000 Rs	0	0
		<50000 Rs	0	0

Source: Prepared by Research Scholar from the data collected during the primary survey

Mustard is grown by 38 respondents (47.5%), while vegetables are cultivated by 23 respondents (28.8%), reflecting crop diversification beyond traditional cereals. In terms of farming experience, most respondents fall into the mid-experience category: 31 farmers (38.8%) have 21–30 years of experience, followed by 27 farmers (33.8%) with 11–20 years of experience. 16 farmers (20%) reported less than 10 years of experience, and only 6 (7.5%) had more than 30 years, indicating that the farming community is composed primarily of middle-aged, experienced farmers. Regarding irrigation sources, tubewells dominate with 47 respondents (58.8%), followed by canals with 24 respondents (30%). A small share of

farmers (8 respondents, 10%) depend on other sources, while only 1 farmer (1.3%) relies solely on rainfed conditions, highlighting the region's dependence on groundwater irrigation.

The survey revealed that all respondents (100%) use fertilisers, indicating complete dependence on external inputs. Among fertiliser types, urea is the most widely used, reported by 72 farmers (90%), followed by DAP, used by 58 farmers (72.5%). Micronutrients are adopted by 36 respondents (45%), while 33 (41.3%) and 31 (38.8%) farmers use MOP and SSP, respectively. Organic inputs also play a role, with 30 farmers (37.5%) applying organic manure and 29 farmers (36.3%) using biofertilisers, indicating that a section of farmers practice integrated nutrient management. The frequency of fertiliser application shows variation: 38 farmers (47.5%) apply fertilisers once per season, 22 farmers (27.5%) twice, 13 farmers (16.3%) thrice, and only 7 farmers (8.8%) more than three times, suggesting that most farmers prefer limited applications rather than multiple splits. On the cost side, the majority (64 respondents, 80%) reported annual fertiliser expenditure of more than ₹10,000 per acre, while 16 respondents (20%) spent between ₹10,000 and ₹25,000. None of the respondents reported expenditures exceeding ₹25,000, indicating a moderate yet significant investment in chemical fertilisers at the farm level.

Table 2: Awareness Regarding Use of Fertilisers Among Farmers

Sr. No.	Awareness	Response	No. of Respondents	%
1	Who advises you on fertiliser use?	Self Decision	32	40
		Dealer/Shopkeeper	38	47.5
		Government Agriculture Officer	3	3.8
		Progressive Farmers	7	8.8
2	Have you ever conducted a soil test before fertiliser	Yes	53	66.3
		No	27	33.8
	If Yes, do you follow soil test recommendations?	Always	8	15.1
		Sometimes	13	24.5
		Never	32	60.4
3	Aware of the harmful effects of the overuse of fertilisers:	High	6	7.5
		Moderate	23	28.8
		Low	38	47.5
		No Awareness	13	16.3

Source: Prepared by Research Scholar from the data collected during the primary survey

The data on farmers' awareness of fertiliser use reveal important insights into decision-making and knowledge levels in Sampla C.D. Block. A majority of the farmers (38 respondents, 47.5%) reported relying on dealers or shopkeepers for advice on fertiliser use, while 32 respondents (40%) made self-decisions based on their own experience or observation. Only a small proportion consult progressive farmers (7 respondents, 8.8%) or government agriculture officers (3 respondents, 3.8%), showing limited reliance on formal agricultural extension services. Regarding soil testing, 53 farmers (66.3%) reported conducting a soil test before applying fertilisers, while 27 respondents (33.8%) had never undergone such testing. However, the adoption of soil-test-based recommendations remains weak: among those who had their soil tested, only 8 farmers (15.1%) reported always following the recommendations, 13 farmers (24.5%) followed them sometimes, while a majority of 32 farmers (60.4%) admitted that they never followed the given recommendations. This reflects a significant gap between soil testing and its practical application.

Regarding awareness of the harmful effects of fertiliser overuse, most farmers showed low levels of awareness, with 38 respondents (47.5%) falling into this category. A moderate level of awareness was reported by 23 respondents (28.8%), while only 6 respondents (7.5%) demonstrated a high level of awareness of the negative consequences, including soil degradation, pest attacks, and groundwater pollution. Alarmingly, 13 respondents (16.3%) reported no awareness at all, highlighting the urgent need for awareness campaigns and extension efforts. Overall, the findings suggest that while soil testing has reached a fair number of farmers, its benefits are underutilised, and reliance on private dealers for fertiliser advice is far stronger than on formal agricultural institutions.

The analysis of fertiliser impacts on agriculture in Sampla C.D. Block shows mixed outcomes. Regarding yield trends over the last five years, nearly half of the farmers (49 respondents, 61.3%) reported that their yields have remained stable, while 24 farmers (30%) observed an increase in yields. Only 7 farmers (8.8%) reported a decline, indicating that although fertilisers help sustain production, dramatic improvements are not universal. When asked about the estimated contribution of fertilisers to yield improvement, an overwhelming majority (72 respondents, 90%) believed that fertilisers contributed to yields by more than 25%, while only 7 farmers (8.8%) estimated the impact in the 25–50% range, and a single farmer (1.3%) perceived it between 51–75%. This reflects the central role fertilisers play in crop productivity according to farmer perceptions.

Table 3: Use of Fertilisers and their Impact on Agriculture

Sr. No.	Impacts on Agriculture	Response	No. of Respondents	%
1	Yield Trend Over Last 5 Years:	Increasing	24	30
		Stable	49	61.3
		Declining	7	8.8
2	Estimated contribution of fertiliser to yield improvement:	>25%	72	90
		25-50%	7	8.8
		51-75%	1	1.3
		<75%	0	0
3	After fertiliser use, have you noticed higher pest/disease	Yes	4	5
		No	24	30
		Sometimes	14	17.5
		Not Aware	38	47.5
4	Any crop failures due to over-/under-fertilisation?	Yes	13	16.3
		No	67	83.8
5	Any crop failures due to wrong/adulterated fertiliser use	Yes	16	20
		No	64	80
6	Has fertiliser input increased in the last 5 years	Yes	47	58.8
		No	33	41.3
7	Impact of fertilisers on soil fertility	Improved	14	17.5
		Declined	18	22.5
		No Change	26	32.5
		Don't Know	22	27.5

Source: Prepared by Research Scholar from the data collected during the primary survey

On pest and disease incidence, 38 respondents (47.5%) admitted they were not aware of the link between fertiliser use and pest/disease attacks, while 24 respondents (30%) said they had not experienced such issues. At the same time, 14 farmers (17.5%) reported observing pest/disease problems sometimes, and only 4 farmers (5%) directly attributed higher incidence to fertiliser application. Concerning crop failures, 13 respondents (16.3%) acknowledged losses due to over- or under-fertilisation, while a larger proportion, 67 respondents (83.8%), reported no such failures. However, adulterated or wrong fertilisers were reported as a problem by 16 farmers (20%), which highlights the challenge of ensuring quality control in input supply chains.

When asked about fertiliser consumption trends, 47 farmers (58.8%) reported that their fertiliser use had increased in the last five years, while 33 respondents (41.3%) indicated no change, reflecting a general intensification of input dependency. As for soil fertility, farmer perceptions were divided: 26 respondents (32.5%) reported no change, 18 farmers (22.5%) perceived a decline, and 14 farmers (17.5%) believed fertility had improved. Notably, 22 respondents (27.5%) stated they did not know about the impact, which reflects low awareness regarding long-term soil health. Overall, while fertilisers are clearly associated with maintaining or increasing crop yields, concerns related to rising input use, adulteration, pest effects, and declining soil health also emerged from the farmers' responses.

CONCLUSION

The study reveals that fertilisers play a crucial role in sustaining agricultural production in Sampla C.D. block, with most farmers relying heavily on chemical inputs such as urea and DAP. While yields have largely remained stable, the continuous rise in fertiliser usage and costs reflects growing dependence. Awareness of soil health and the harmful impacts of overuse is limited, and only a small number of farmers regularly follow soil test recommendations. Although fertilisers have improved productivity, concerns about soil fertility decline and pest incidence highlight the need for balanced application, integrated nutrient management, and farmer education to ensure sustainable agricultural practices.

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