Assessing the Impact of the Wheat Variety 'Phule Samadhan' and the Role of Digital Agricultural Extension

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ABSTRACT

The present study was conducted to assess the impact of the Mahatma Phule Krishi Vidyapeeth (MPKV), Rahuri released wheat variety Phule Samadhan on wheat growers in Nashik district of Maharashtra and to identify the role of digital agricultural extension in improving its adoption. An ex-post facto research design was followed. A total of 140 wheat growers were selected through multistage sampling, including 70 farmers cultivating Phule Samadhan and 70 farmers growing other wheat varieties. Data were collected through personal interviews using a structured interview schedule and analysed using frequency, percentage, and Pearson's correlation coefficient.

The results showed that farmers cultivating Phule Samadhan obtained higher wheat yield and farm income than those growing other varieties. About 24.28 per cent of Phule Samadhan growers achieved high yield compared with only 5.72 per cent of other variety growers, while 55.70 per cent of Phule Samadhan growers belonged to the high-income category compared with 17.14 per cent of other growers. Farming experience, landholding, annual income, area under wheat cultivation, and market orientation showed a positive and significant relationship with yield and income, whereas age and education had no significant relationship. The major constraints reported by farmers were non-availability of quality seed, lack of technical knowledge, high cost of cultivation, labour shortage, and water scarcity. The study suggests that digital agricultural extension services such as mobile-based advisories, digital seed distribution, irrigation scheduling alerts, and online custom hiring platforms can help address these constraints and promote wider adoption of Phule Samadhan. The findings indicate that integrating improved wheat varieties with digital extension services can enhance wheat productivity and farmers' income in Maharashtra.

Keywords: Phule Samadhan, wheat, impact assessment, digital agricultural extension, yield, farm income, Maharashtra.

INTRODUCTION

Wheat (Triticum aestivum L.) is one of the most important food crops in India and plays a major role in ensuring food security and improving farmers' income. Mahatma Phule Krishi Vidyapeeth (MPKV), Rahuri has developed several improved wheat varieties, including Phule Samadhan, which is known for its high yield and suitability to the agro-climatic conditions of Maharashtra. However, the actual performance of this variety depends on its adoption by farmers and proper crop management.

At the same time, digital agricultural extension services such as mobile advisories, weather updates, digital seed information, and irrigation guidance are helping farmers adopt improved technologies and make better farming decisions. However, very little information is available on the impact of Phule Samadhan under farmers' field conditions and the role of digital extension in solving farmers' problems. Therefore, the present study was conducted to assess the impact of the MPKV-released wheat variety Phule Samadhan on farmers' yield and income, study the relationship between selected socio-economic characteristics and its impact, and identify the major constraints faced by wheat growers along with suitable digital agricultural extension interventions in Nashik

district of Maharashtra with the following objectives

Objectives

1. To study the profile of Phule Samadhan wheat growers.
2. To assess the impact of university-released wheat variety Phule Samadhan on yield and income of farmers.
3. To study the relationship between selected profile characteristics of Phule Samadhan growers and the impact of the variety, with implications for digital agricultural extension.

METHODOLOGY

The present study was conducted in Nashik district of Maharashtra to assess the impact of the MPKV-released wheat variety Phule Samadhan and its implications for digital agricultural extension during the year 2022-23. An ex-post facto research design was adopted. Niphad and Yeola tehsils were purposively selected due to the wider cultivation of the Phule Samadhan variety. From ten selected villages, a total of 140 wheat growers were selected through a multistage sampling procedure, comprising 70 growers of Phule Samadhan and 70 growers cultivating other wheat varieties.

Primary data were collected through personal interviews using a pre-tested structured interview schedule. The impact of the variety was assessed by comparing the yield and farm income of Phule Samadhan growers with those cultivating other wheat varieties. Data on socio-economic characteristics, production constraints, and digital extension needs were also collected. The data were analysed using frequency, percentage, and Pearson's correlation coefficient to examine the relationship between selected profile characteristics and the impact of the variety.

RESULTS AND DISCUSSION

The distribution of wheat growers based on Socio-economic Profile is presented in Table 1.

Table 1
Socio-economic Profile of Respondents

Sl. No.	Characteristic	Category	Phule Samadhan (n=70)	Other Varieties (n=70)
1	Age	Young (<35 yrs)	17 (24.28 %)	17 (24.28 %)
		Middle (36–55 yrs)	41 (58.57 %)	44 (62.87 %)
		Old (>55 yrs)	12 (17.15 %)	09 (12.85 %)
2	Education	Up to Secondary (Up to 10th)	46 (65.72 %)	43 (61.43 %)
		Higher Secondary (11th to 12th)	17 (24.28 %)	15 (21.43 %)
		Graduate & above	07 (10.00 %)	12 (17.14 %)
3	Farming Experience	Low (<16 yrs)	22 (31.43 %)	21 (30.00 %)
		Medium (17–24 yrs)	43 (61.43 %)	40 (57.15 %)
		High (>25 yrs)	05 (17.14 %)	09 (12.85 %)
4	Land holding	Marginal (<1 ha)	44 (62.85 %)	47 (67.14 %)
		Small (1–2 ha)	14 (20.00 %)	11 (15.72 %)
		Medium (2 -4 ha)	05 (7.15 %)	08 (11.42 %)
		Large (> 4 ha)	07 (10.00 %)	04 (5.72 %)
5	Annual Income	Low (Upto Rs. 7,49,536)	07 (10.00 %)	11 (15.72 %)
		Medium (Rs.7,49,537 to Rs. 9,79,506)	35 (50.00 %)	38 (54.28 %)
		High (Rs. 9,79,507 and above)	28 (40.00 %)	21 (30.00 %)
6	Area under wheat crop	Small (Up to 0.63 ha)	30 (42.85 %)	36 (51.44 %)
		Medium (0.64 to 1.08 ha)	24 (34.28 %)	24 (34.28 %)
		Large (More than 1.09 ha)	16 (22.87 %)	10 (14.28 %)

7	crop productivity (q/ha)	Lessthan recommendation (Upto 41)	31 (44.28 %)	51 (72.86 %)
		Recommended (41.01to 46.12)	33 (47.14 %)	17 (24.28 %)
		More than recommendation (46.13and above)	06 (8.58 %)	02 (2.86 %)
8	Market orientation	Poor (Up to 4)	11 (15.72 %)	07 (10.00 %)
		Average (5 to 6)	42 (60.00 %)	43 (61.43 %)
		Excellent (7 and above)	17 (24.28 %)	20 (28.57 %)

1. Socio-Economic Profile of Respondents

Socio-economic Profile of Respondents

The results revealed that the majority of the respondents in both groups belonged to the middle-age category (36–55 years), accounting for 58.57 per cent of Phule Samadhan growers and 62.87 per cent of growers cultivating other wheat varieties. (Singh et al. 2024). Regarding education, most respondents had attained education up to the secondary level, representing 65.72 per cent of Phule Samadhan growers and 61.43 per cent of growers of other varieties, followed by higher secondary education.(Patil et al. 2017; Mishra et al. 2025)

The majority of the respondents possessed medium farming experience (17–24 years), comprising 61.43 per cent of Phule Samadhan growers and 57.15 per cent of growers of other varieties. With respect to landholding, marginal farmers (<1 ha) constituted the largest proportion in both groups (62.85% and 67.14%, respectively), indicating the predominance of smallholder farming in the study area. (Patil and Gaikwad, 2021; Patil &Chengappa, 2022 and Mishra et al. 2025)

In terms of annual income, half (50.00%) of the Phule Samadhan growers and 54.28 per cent of growers of other varieties belonged to the medium income category (₹7,49,537–₹9,79,506). Similarly, the majority of respondents cultivated wheat on a relatively small area (up to 0.63 ha), accounting for 42.85 per cent of Phule Samadhan growers and 51.44 per cent of growers of other varieties.

A notable difference was observed in crop productivity. Nearly half (47.14%) of the Phule Samadhan growers achieved the recommended productivity level (41.01–46.12 q ha^{-1}), whereas 72.86 per cent of growers cultivating other varieties recorded productivity below the recommended level. Moreover, 8.58 per cent of Phule Samadhan growers obtained yields above the recommended level compared with only 2.86 per cent of growers of other varieties, indicating the comparatively superior productivity performance of the Phule Samadhan variety.

Regarding market orientation, the majority of respondents exhibited an average level of market orientation, accounting for 60.00 per cent of Phule Samadhan growers and 61.43 per cent of growers cultivating other varieties.

2. Impact of Phule Samadhan Wheat Variety

The distribution of the respondent wheat growers by their yield and income is presented in Table 2.

Table 2.
Distribution of the wheat growers according to their yield and income

Impact Indicator	Category	Phule Samadhan (n=70)	Other Varieties (n=70)
Yield	Low (Upto 38.50qt/ha)	19 (27.14 %)	40 (57.14 %)
	Medium (38.51 qt/ha to 43.25 qt/ha)	34 (48.57 %)	26 (37.14 %)
	High (43.26 qt/ha and above)	17 (24.28 %)	04 (05.72 %)
Income	Low (Up to Rs. 90,248)	04 (05.72 %)	25 (35.71 %)
	Medium (Rs. 90,249 to Rs. 99,363)	27 (38.57 %)	33 (47.15 %)
	High (Rs. 99,364 and above)	39 (55.70 %)	12 (17.14 %)

Impact of Phule Samadhan Wheat Variety

Yield: The results revealed that 48.57 per cent of the Phule Samadhan growers belonged to the medium yield category (38.51–43.25 qt/ha), followed by 27.14 per cent in the low and 24.28 per cent in the high yield category. In contrast, the majority (57.14%) of growers cultivating other wheat varieties were concentrated in the low yield category, while only 37.14 per cent and 5.72 per cent belonged to the medium and high yield categories, respectively. The proportion of farmers achieving high yield was considerably greater among Phule Samadhan growers (24.28%) than among growers of other wheat varieties (5.72%).(Kumar, 2021; Assaye, 2022;Holmukhe et al. 2024 andHolmukhe and Kadam, 2024)

Income: A similar trend was observed with respect to income. More than half (55.70%) of the Phule Samadhan growers belonged to the high-income category (₹99,364 and above), whereas only 17.14 per cent of growers of other wheat varieties were in this category. Conversely, 35.71 per cent of growers of other varieties belonged to the low-income category compared to only 5.72 per cent of Phule Samadhan growers. The medium-income category comprised 38.57 per cent of Phule Samadhan growers and 47.15 per cent of growers of other varieties. (Zakari et al. 2023; Holmukhe et al. 2024 andHolmukhe& Kadam, 2024;)

3. Correlation Between Profile Characteristics and Impact

The correlation coefficient (r) between independent variables and impact on the farmers is presented in Table 3 as below

Sr. No.	Profile Factor	Correlation coefficient for Yield ('r' value)	Correlation coefficient for Income ('r' value)
1.	Age	0.01^{NS}	-0.02^{NS}
2.	Education	-0.14^{NS}	-0.07^{NS}
3.	Farming experience	0.167*	0.17*
4.	Landholding	0.27**	0.18*
5.	Annualincome	0.21**	0.19*
6.	AreaunderWheatcrop	0.41**	0.32**
7.	Marketorientation	0.22**	0.30**

Note: * 0.05 level of significance, ** 0.01 level of significance, NS = Non-significant

Correlation between Profile Characteristics and Impact of Phule Samadhan Wheat Variety

The analysis revealed that age (r = 0.01 for yield and r = –0.02 for income) and education (r = –0.14 for yield and r = –0.07 for income) exhibited non-significant relationships with both yield and income, indicating that these variables had no measurable influence on the impact of the variety. (Patil et al. 2017, Zakari et al. 2023))

In contrast, farming experience showed a positive and significant association with both yield (r = 0.167, p< 0.05) and income (r = 0.17, p< 0.05), suggesting that experienced farmers derived greater benefits from the improved variety. Landholding was positively associated with yield (r = 0.27, p< 0.01) and income (r = 0.18, p< 0.05), indicating that farmers with larger operational holdings achieved relatively higher productivity and income. Similarly, annual income exhibited a positive and significant relationship with yield (r = 0.21, p< 0.01) and income (r = 0.19, p< 0.05), reflecting the greater capacity of financially better-off farmers to adopt recommended production practices.

The area under wheat cultivation showed a highly significant positive relationship with both yield (r = 0.41, p< 0.01) and income (r = 0.32, p< 0.01), indicating that farmers cultivating larger wheat areas obtained greater economic benefits. Likewise, market orientation was positively and significantly associated with yield (r = 0.22, p< 0.01) and income (r = 0.30, p< 0.01), suggesting that market-oriented farmers realized higher returns from the adoption of the Phule Samadhan variety. (Assaye, 2022)

Table 4.
Distribution of the wheat growers according to their constraints faced by the respondentsand Digital Extension Perspective

Sr. No.	Constraints	Digital Extension Solution	Phule Samadhan respondents (N=70)		Other respondents (N=70)	
			No.	%	No.	%
1.	Unavailability of Phule Samadhan seeds	Digital seed distribution portals	10	14.28	64	91.42
2.	Lack of technical knowledge about crop planning according to soil type and mid -season correction	Mobile-based advisories and training	55	78.57	56	80.00
3.	Per unit cost of production is more	Guidance on cost - effective practices	52	74.28	51	72.85
4.	Non availability and cost effective of labour at proper time	Online mechanization /custom hiring platforms	48	68.57	50	71.42
5.	Water scarcity at critical growth stages affects yield of crop	Mobile alerts for irrigation scheduling	43	61.42	44	65.71

Table 4 shows the major constraints faced by wheat growers cultivating Phule Samadhan and other wheat varieties. The biggest problem reported by growers of other varieties was the non-availability of Phule Samadhan seed (91.42%), indicating a high demand for the improved variety. Lack of technical Knowledge on crop planning and crop management was another major constraint, reported by about 79–80 per cent of respondents. High cost of cultivation (72–74%), labour shortage (69–71%), and water scarcity during critical crop stages (61–66%) were also important problems faced by farmers.

The findings indicate that digital agricultural extension can help overcome these constraints through digital seed distribution, mobile-based crop advisories, online farmer training, custom hiring services, and irrigation scheduling alerts. These digital services can improve farmers' access to quality inputs, timely technical guidance, and better crop management, leading to higher wheat productivity and income.

CONCLUSION

The study concludes that the MPKV-released wheat variety Phule Samadhan has a positive impact on wheat production by improving both yield and farm income compared to other wheat varieties under farmers' field conditions. Farmers with greater farming experience, larger landholdings, higher annual income, larger area under wheat cultivation, and better market orientation benefited more from the adoption of the variety. However, constraints such as limited availability of quality seed, inadequate technical knowledge, high cost of cultivation, labour shortage, and water scarcity continue to affect its wider adoption.

Therefore, timely availability of certified Phule Samadhan seed, along with strengthened digital agricultural extension services such as mobile-based crop advisories, weather and irrigation alerts, online training programmes, and custom hiring platforms, is recommended to improve adoption, enhance wheat productivity, and increase farmers' income on a sustainable basis.

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