

# International Journal of Statistics and Applied Mathematics

ISSN: 2456-1452  
Maths 2023; SP-8(5): 344-347  
© 2023 Stats & Maths  
<https://www.mathsjournal.com>  
Received: 03-08-2023  
Accepted: 10-09-2023

**Sunil Kumar Jakhar**  
M.Sc. Scholar, Teaching  
Assistant Institute of  
Agricultural Science  
Bundelkhand University, Jhansi-  
Uttar Pradesh, India

**Dr. Naveen Kumar**  
Teaching Assistant Institute of  
Agricultural Science  
Bundelkhand University, Jhansi-  
Uttar Pradesh, India

**Dr. Shishir Kumar Singh**  
Assistant Professor Department  
of Agricultural Economics,  
Institute of Agricultural  
Sciences, Bundelkhand  
University, Jhansi- Uttar  
Pradesh, India

**Dr. Ajay Singh**  
Teaching Assistant Institute of  
Agricultural Science  
Bundelkhand University, Jhansi-  
Uttar Pradesh, India

**Kalpesh Upadhyay**  
M.Sc. Scholar, Teaching  
Assistant Institute of  
Agricultural Science  
Bundelkhand University, Jhansi-  
Uttar Pradesh, India

**Manish Choudhary**  
M.Sc. Scholar, Teaching  
Assistant Institute of  
Agricultural Science  
Bundelkhand University, Jhansi-  
Uttar Pradesh, India

**Corresponding Author:**  
**Sunil Kumar Jakhar**  
M.Sc. Scholar, Teaching  
Assistant Institute of  
Agricultural Science  
Bundelkhand University, Jhansi-  
Uttar Pradesh, India

## Effects of technical advancements on Uttar Pradesh farm profitability and production

**Sunil Kumar Jakhar, Dr. Naveen Kumar, Dr. Shishir Kumar Singh, Dr. Ajay Singh, Kalpesh Upadhyay and Manish Choudhary**

### Abstract

The viability of the agricultural business is significantly influenced by its profitability. This study's goal was to evaluate the effects of more advanced technical interventions in comparison to the farming methods used by local farmers in the Krishi Vigyan Kendra-adopted villages in the state of Uttar Pradesh. The Uttar Pradesh district of Jhansi was chosen for the study, and information was gathered, processed, and conclusions were made there. The data collection and analysis employed in the study served to determine the profitability of farm units, and the CACP cost concept was used to determine the profitability of the primary crops in the cropping pattern. The findings showed that the primary crops of the sample respondents were wheat. Farmers who used enhanced technology provided by Krishi Vigyan Kendra reported average net profits of Rs. 41080 per hectare for wheat, respectively, whereas farmers who embraced indigenous technology reported profits of Rs. 30,709 per hectare. The return on investment for wheat was Rs. 2.15 for respondents who had been adopted, compared to Rs. 1.81 for respondents who had not been adopted.

**Keywords:** Farm productivity, profitability, indigenous technology, improved technology

### Introduction

Agriculture is an important sector of the Indian economy. The under-utilization of available crop-raising techniques by farmers is one of several factors contributing to the low productivity of Indian agriculture. Farmers in India become less technically efficient as a result. Increased yield is necessary to improve Indian farmers' productivity. Productivity can only be expanded to a certain point due to the Indian farms' limited resource availability. Policymakers made various attempts to ease resource restrictions in order to close the gap between the levels of potential and actual yield. Simply increasing crop productivity could not be sufficient because it might not result in the necessary rise in farm profit.

The Indian Council for Agricultural Research (ICAR) and its affiliated institutions established Krishi Vigyan Kendra (KVK) agricultural extension centres at the district level to offer different forms of farm support to the agricultural sector. On the recommendation of the Mehta committee, the first KVK was created in Puducherry (Pondicherry) in 1974 as a pilot project. KVKs offer a range of agricultural support services, including training, education, and the dissemination of technology to farmers. Farm Science Center, also known as Krishi Vigyan Kendra, offers solutions to agricultural and associated issues as they arise for local farmers in that area.

The goal of the current study is to assess the technical, allocative, and financial efficiency of farmers who grow wheat in rural Jhansi District, Uttar Pradesh, using cost DEA models and profit DEA models, respectively. Evaluate the effectiveness of decision-making processes (DMUs). Although DEA is closely related to the economics production theory, utilized in operations management for benchmarking, where a set of measures is chosen to measure the effectiveness of manufacturing and service.

It is first important to have a specific definition of productivity and then a productivity index number formula that is consistent with this definition in order to be able to objectively quantify the components of productivity increase. Total factor productivity (TFP) is the ratio of aggregate output to aggregate input in multiple-output, multiple-input enterprises.

**Materials and Methods**

The findings of this study are supported by primary data, which were gathered from adopted and non-adopted farmers in Uttar Pradesh Jhansi district. For the purpose of gathering data on several already decided areas of farming, farmers were chosen at random. There were 60 farmers in the sample size of farmers, 30 of whom used more advanced technology and the remaining 30 farmers used more traditional technology. The research was conducted from 2021 to 2022.

Primary data on all physical inputs used by respondents in the production process for various farm enterprises were gathered at various points in time. Information about market pricing for the inputs bought and the prices of the output sold by farmers. Since output price data on crops cultivated for subsistence farming were not available, only those agricultural enterprises that are a part of commercial agriculture were taken into account for data gathering. According to the methodology utilized in Meena *et al.* (2016)'s study, the assessment of profitability after costs and returns has been completed.

The cost of cultivation of crops were worked out by using various cost concepts defined below:

Cost A1: It includes all actual expenses incurred in the production, where-

1. Value of hired human labour
2. Value of hired and owned bullock labour
3. Value of hired and owned machine labour
4. Value of seed (both farm seed and purchased)
5. Value of manures and fertilizers
6. Depreciation
7. Irrigation charges
8. Land revenue
9. Interest on working capital
10. Miscellaneous Expenses.
  - Cost A2: Cost A1 + rent paid for leased-in land
  - Cost B1: Cost A1 + interest on fixed capital
  - Cost B2: Cost B1 + rental value of owned land + rent for leased in land
  - Cost C1: Cost B1 + imputed value of family labour
  - Cost C2: Cost B2 + imputed value of family labour
  - Cost C3: Cost C2 + 10 per cent of cost C2 as management cost.

**Cost of production**

$$\text{Cost of production per quintal} = \frac{\text{Total cost} - \text{Value of by product}}{\text{Quantity of main product}}$$

**ii) Income measures:** Following income measures were calculated

Gross income: It is the total value of main product.  $GI = (Qm \times Pm)$

Where, GI = Gross income Qm = Quantity of main product  
Pm = Price of main product

Returns over variable cost (RVC):  $RVC = \text{Gross income} - \text{Cost A}_1$

Farm business income (FBI):  $FBI = \text{Gross income} - \text{Cost A}_2$

Farm labour income (FLI) or returns to family labour:  $FLI = \text{Gross income} - \text{Cost B}_2$

Net income (NI):  $NI = \text{Gross income} - \text{Cost C}_2$

Returns to management RM =  $\text{Gross income} - \text{Cost C}_3$

$$\text{Returns per rupee (RPR)} RPR = \frac{\text{Gross income per hectare}}{\text{Cost C}_2 \text{ per hectare}}$$

Income over cost A2+ FL=  $\text{Gross income} - (\text{cost A}_2 + \text{FL})$ .

**Result and Discussion**

The Data on agricultural and economic productivity as a result of various technology interventions showed that wheat crop productivity and profitability had significantly increased when compared to the farming methods used by local farmers.

**Cost of Wheat Cultivation**

Cost incurred on different items for cultivation of wheat due to improved Technological interventions and Farmers traditional practices has been Table 1.

**Table 1:** Total, variable and fixed cost (Unit: Rs./ha) in Wheat cultivation.

S.NO	Particulars	Adopted	Non-Adopted	% Difference
1	Human labour (Hired)	2423.47 (6.08)	3395.28 (9.11)	-28.6
2	Family labour	278.56 (0.78)	450.09 (1.19)	-38.22
	Total human labour	2702.03 (7.06)	3846.17 (9.26)	-29.00
3	Machine labour (Hired)	1596.14 (4.52)	1732.03 (4.59)	-7.85
4	Machine labour (Owned)	1011.35 (2.86)	1316.66 (3.49)	-23.17
A	Total Operational Cost	5309.52 (15.5)	6895.14 (18.30)	-23.00
1	Seed	4196.56 (11.89)	5211.03 (13.83)	-19.47
2	Fertilizer	4368.26 (12.38)	4560.23 (12.10)	-4.21
3	Irrigation	900.98 (2.55)	699.80 (1.85)	28.07
B	Total Material Cost	9465.81 (26.83)	10471.7 (27.79)	-9.06
C	Interest on working capital @10%	593.38 (1.68)	715.85 (1.89)	-17.00
	Variable cost (A+B+C)	15368.07 (43.57)	18082.7 (47.99)	-15.00
D	Land Revenue	12.05 (0.35)	12.05 (0.33)	0.00
E	Depreciation @10%	307.35 (0.87)	324.57 (0.86)	-0.52
F	Interest on fixed capital @12%	1159.00 (3.28)	1148.00 (3.04)	0.95
G	Rental value of owned land	18423 (52.23)	18108 (48.06)	1.73
	Fixed cost (D+E+F+G)	19902 (56.42)	19594 (52.00)	1.57
	Total Cost (VC+FC)	35270 (100)	37676 (100)	-6.38

(Figures in parenthesis show the per cent to the total cost)

According to the information in Table 1, improved technological interventions and farmers' traditional practises resulted in total costs of Rs. 35270.00 and Rs. 37676.00, respectively. In comparison to non-adopted responders, the former's overall cost was shown to be lower by 6.38 percent. For respondents who reported using improved technology, the proportion of variable and fixed costs was found to be 43.57 percent and 56.42 percent, respectively, and for respondents who reported not using improved technology, it was 47.99 percent and 52.0 percent. In comparison to non-adopted respondents, it was discovered that the variable cost was 15.00% less and the fixed cost was 1.57% more for respondents who had embraced improved technology. The overall operational cost was 15.5% for those who had used upgraded technology against 18.30% for those who had

not. For respondents who had not embraced new technology, the material cost was found to be 27.79%, compared to 26.83% for those who did. When compared to respondents who did not use enhanced technology, the material cost was 9.06% lower for the former. This is explained by the fact that respondents historically invested more in fertilizer (12.38% and 12.10%), followed by seed (11.89% and 13.83%), and irrigation (2.55% and 1.85%), depending on whether they had adopted or rejected new technology.

### Cost Concepts in wheat Cultivation

The details regarding costs incurred on different parameters in wheat crop cultivation due to improved technology and farmers' traditional practices were recorded and the same have been summarized in Table 2.

**Table 2:** Cost of wheat farming as a result of advancements in technology and farming methods (Rs./ha).

Particulars	Improved Technology	Farmers Practices	% Difference
Cost A1	15410.02(40.05)	17968.24(43.05)	-14.02
Cost A2	15410.00(40.05)	17968.26(43.05)	-14.02
Cost B1	16569.14(43.07)	19117.19(46.03)	-13.03
Cost B2	34992.34(90.82)	37225.51(90.23)	-5.09
Cost C1	16847.07(43.79)	19568.09(47.43)	-13.09
Cost C2	35270.89(91.68)	37676.41(91.33)	-6.38
Cost C3	38467.95(100)	41252.06(100)	-6.75
Cost of Production (Rs/q)	418.23	383.39	-15.09

(Figures in parenthesis show the per cent to the cost C3)

According to the data in Table 2, the average total cost for respondents who used improved technology and non-adopted respondents was determined to be respectively Rs. 38467.05 and Rs. 41252.06, which is cheaper by 6.75 percent in the case of respondents who used improved technology. The price for A1 and A2 also followed a similar pattern, coming in at Rs. 30820.02 and Rs. 35936.05, respectively, per hectare. In the cases of respondents who used improved technology and non-respondents, the cost of production was discovered to be Rs. 418.23 and Rs. 383.39 per quintal, respectively. A similar

pattern was seen in the cost of production, which was found to be 15.09% lower for respondents who reported using Improved Technology than for respondents who did not.

### Profitability and income measures for Wheat production

The data on different cost and income parameters as influenced by improved technology interventions and farmer's practices were analyzed and the same have been summarized in Table 3.

**Table 3:** Production (q/ha) and profitability (Rs/ha) of wheat crop cultivation due to improved technology.

Particulars	Improved Technology Adopted	Farmers traditional Practices	Difference %
Yield of Main product (q/ha)	49.83	46.51	7.01
Price of Main Product (Rs./q)	1735	1735	0
Value of Main Product (Rs./ha)	86455.64	80694.86	7.01
Quantity of By product	74.07	69.26	7.08
Value of By Product	21818.62	21240.02	2.72
Gross Income (Rs./ha)	108274.26	101935.06	6.21
<b>Income Measures</b>			
Return over Variable Cost (Rs./ha)	92864.24	85249.19	4.79
Farm Business Income (Rs./ha)	92864.24	85249.19	4.79
Family Labour Income (Rs./ha)	73281.92	6699.92	9.03
Net income (Rs./ha)	73003.37	66541.02	6.43
Income over A2+FL (Rs./ha)	87960.73	83598.25	9.07
Return to Management	69806.31	62964.79	10.86
Returns Per Rupee	2.97	2.74	8.39

The information in Table 3 indicates that among respondents who employed Improved Technology and non-respondents, the yield of the primary product was judged to be 49.83 q/ha and 46.51 q/ha, respectively. This was 7.01 percent higher in the earlier situation. The cost of the main item was Rs. 1735 per quintal. Hectares earned gross income of Rs.108274.26 and Rs.101935.06 and net income of Rs.73003.37 and Rs.66541.02, respectively, due to respondents employing Improved Technology and non-adopted respondents. Income over A2 + family work was determined to be Rs. 87960.73

and Rs. 83598.25 per hectare in the cases of respondents who had implemented improved technology and those who had not, respectively. This represents a decrease of 9.07% in the former compared to the latter. The returns obtained as a result of farmers' practises and improved technology adoption were Rs. 69806.31 and Rs. 62964.79 per hectare, respectively. The same pattern was seen in terms of return on investment per rupee, with values of Rs. 2.97 and Rs. 2.74 being recorded.

## Conclusion

The key conclusions of this study are that farmers who adopted modern technology over traditional farming methods experienced increases in yield, gross income, net income, family labour income, return to management, and return per rupee invested of 7.01%, 6.21%, 6.43%, 10.86%, and 8.39%, respectively. In order to maximize productivity and profitability, it is advocated that modern developments in wheat crop cultivation be favoured over farmers' traditional agricultural practises.

## References

1. Asiwai BL, Balai LR, Akhtar J, Asiwai RC. Role of KVK in Enhancing the Productivity and Profitability of Moong Bean through FLDs in Sikar District of Rajasthan. 2015;10(3):221-225.
2. Singh K, Peshin R, Saini SK. Evaluation of the Agricultural Vocational Training Programmes Conducted by the KrishiVigyan Kendra (Farm Science Centres) in Punjab. Journal of Agriculture and Rural Development in the Tropics and Subtropics. 2010;111(2):65-77
3. Verma AK, Ahirwar RF & Thakur US. Cost of cultivation and resource use Efficiency of major *rabi* crops in vidisha district of Madhya Pradesh. Economic Affairs. 2016;61(2):231.
4. Gautam D, Kumar A, Prakash A, Pandey DC. An economic efficiency of Soybean production in Malwa region of Madhya Pradesh. IJCS. 2018;6(2):636-639.
5. Pandey Sneha, Shrivastava Ashutosh, Patel Mamta, Parte Jwala. An analysis of farm profitability of KVK adopted and non- adopted farmers in Chhattisgarh, Indian Journal of Economics and Development. 2021;(17):164-169.