Journal of Agriculture, Biology and Applied Statistics
Vol. 1, No. 1, 2022, pp. 63-67

URL : www.arfjournals.com
https://doi.org/10.46791/jabas.2022.v01i01.05

A DEA Analysis of Farm Efficiency of KVK Adopted and Non- Adopted Farms in Khargone District of Madhya Pradesh

Sachin Yadav[1] and Gourav Kumar Vani[2]
[1]*M.Sc. Student, Department of Agricultural Economics and F.M., JNKVV, Jabalpur*
[2]*Assistant Professor, Department of Agricultural Economics and F.M., JNKVV, Jabalpur*

To cite this article

Sachin Yadav & Gourav Kumar Vani. (2022). A DEA Analysis of Farm Efficiency of KVK Adopted and Non-Adopted Farms in Khargone District of Madhya Pradesh. *Journal of Agriculture, Biology and Applied Statistics*. Vol. 1, No. 1, pp. 63-67.

Abstract: The study was conducted in Khargone district of Madhya Pradesh state in India. Primary data was collected from farms on various aspects pertaining to farm operations. Farms were divided into two groups, adopted and non-adopted by KVK. The study examined the technical, allocative, and economic and scale efficiency of the adopted and non-adopted farms estimated using data envelopment analysis. This study measured the average level of technical efficiency (vrs), scale efficiency and economic efficiency in kharif season were 0.597, 3.194 and 0.801 for adopted farms and 0.576, 2.268 and 0.737 for non-adopted farms, respectively. The average level of technical efficiency(vrs), scale efficiency and economic efficiency in rabi season were 0.67, 5.22 and 1.40 for adopted farms and 0.73, 2.60 and 1.29 for non-adopted farms, respectively. No significant difference was found in the mean efficiency score of adopted non-adopted famers except for technical and scale efficiency in rabi season. The major policy implication includes increasing farm mechanisation to sustain scale efficiency and rationalization of input use in kharif season.

Introduction

The farm is an economic unit for which cost and returns are worked out. Sustainability of farm profitability is the basis for continuation of farming business. Profitability of the farm business must go hand in hand with efficiency of the business. Indian farms are known to be resource poor and this constraint forces farms operate below efficiency frontier. The task outlined for policy maker at this juncture is to help release these constraints faced by farms so as to enable them to be on the efficiency frontier. Among many agents of the government, The Krishi Vigyan Kendra (KVK), are the ones which take technology and improved practices from lab to land. The up gradation of farm's technology would release

Article History Received : 03 April 2022; Revised : 25 April 2022; Accepted : 19 May 2022; Published : 30 June 2022

the technology constraint. Adoption of recommended technologies would lead to greater technical efficiency of the farm unit. However, this may not enable farms reap the greatest possible profits; for increasing technical efficiency has no assurance in enhancing farm profitability. Thus, economic and allocative efficiencies need to be examined for farms to find out factors which affect efficiencies.

Further, KVKs are adopting farms for diffusion of recommended technologies and innovative farm practices. The success of such adoption needs to be examined in terms of difference between farm efficiency of adopted and non-adopted farms. The outcome of such an exercise would help specifically KVKs in improving upon what has already been achieved and in general the farms and policy makers. Some of the previous studies conducted in the similar directions include but not limited to producitvity analysis of rice farmers in norther Ghana by Abdulai & Huffman (2000) and Anang , Bäckman & Rezitis (2016), productivity and profitability analysis of various horticultural crops in Punjab, Pakistan by Bakhsh (2007) and productivity analysis of farms in Jammu and Kashmir, India by Bhatt & Bhat (2014).

With this background, following objectives were framed for the study:

1. Estimation of various efficiency measures for adopted and non-adopted farm.
2. To examine the difference between various efficiency scores of adopted and non adopted farms.
3. To suggest policy measures based on findings of the study.

Methodology

Study area/Data collection

The Khargone district of Madhya Pradesh was selected purposely selected on account of investigator being well acquainted with the area and time & resources being the major limitations. The Khargone district comprises of nine blocks namely the Bhikangoan, Jhirnya, Gogawan, Kasrawad, Segaon, Bhagwanpura, Khargone, Mandaleshwar, Maheshwar. The Gowadi, Ghughariyakhedi, and Devalgaon villages from Gogawan block of the district were purposively selected. The study was based on collection of primary data from at least 45 adopted farms by the KVK and 45 non-adopted farms present in the study area. The non-adopted farms were selected from vicinity of adopted farms so as to minimize the difference in various characteristics of farm & farmers & the environment faced by them thereof.

Data was collected through a pre-tested well designed interview schedule through personal face to face interview from sample farmer. The primary data was collected on all physical inputs applied by farmer in the production process for various enterprises on the farm. The data on prices of inputs purchased from markets and prices of output realized by farms from the market were collected.

Method of Analysis

The DEA method is a non-parametric approach to measurement of efficiency. It does not assume a production function like Stochastic Frontier Analysis does. However, neither of the two can be said as better to the other. DEA consists in preparing an efficient frontier with which to compare the inputs and outputs of the DMUs. It uses a linear programming formuation. In the terminology of DEA, a farm is a "Decision Making Unit" (DMU). Farrell had introduced the concept of relative efficiency in which the efficiency of a particular decision making unit (DMU) which can be compared with another DMU. Farrell identified three types of efficiency, technical efficiency, allocative efficiency/price efficiency, and economic efficiency/overall efficiency. The input oriented technical efficiency under constant and variable return to scale was examined by Data Envelopment Analysis (DEA) using R software using Bechmark package (R Core Team, 2019). Using the same package, economic efficiency scores were calculated using cost minimizing DEA framework.

Scale efficiency was computed as ratio of technical efficiency under assumption of variable returns to scale (VRS) to constant returns to scale (CRS). Allocative efficiency was obtained by dividing the economic efficiency of the sample farm by the corresponding technical efficiency. To find significance of difference between mean efficiency scores of adopted and non-adopted farms, two sample t-test with unequal variance was used.

Results and Discussion

Distribution of adopted and non-adopted farms across various efficiency range in kharif season

The distribution of adopted and non-adopted farms in to various efficiency ranges in the kharif season in table 1. Only one farm who was non-adopted by KVK had technical efficiency score between 0.9 to 1.0 under CRS assumption while seven adopted and six non-adopted farms were in this efficiency range. Large proportion of farms had low technical as well economic efficiency. Except for small proportion of farms, all farms operated with increasing returns to scale as indicated by scores greater than one. Large porportion of farms were found to be allocatively efficient as indicated by mean score greater than one. There was no signficant difference in mean efficiency score on any of the four measures between adopted and non-adopted farms.

Distribution of adopted and non-adopted farms across various efficiency range in rabi season

The distribution of adopted and non-adopted farms in to various efficiency ranges in the rabi season in table 2. Large proportion of farms had low technical efficiency but had high economic efficiency. Farms were found to be scale as well as price efficient as indicated by scale and allocative efficiency score greater than one. There was no signficant difference

Table 1: Efficiency range of farms in kharif season and signficance of difference in mean efficiency scores

Efficiency range	*Technical efficiency (CRS)*		*Technical efficiency (VRS)*		*Scale efficiency*		*Economic efficiency*		*Allocative efficiency*	
	Adopted	*Non-adopted*	*Adopted*	*Non-adopted*	*Adopted*	*Non-adopted*	*Adopted*	*Non-adopted*	*Adopted*	*Non-adopted*
0 to 0.1	15 (33.33)	10 (22.22)	-	-	-	-	-	1 (2.22)	-	-
0.1 to 0.5	15 (33.34)	17 (37.77)	19(42.22)	14 (31.11)	-	-	12(26.66)	14 (31.11)	-	4 (8.89)
0.5to 0.7	9 (20.00)	12 (26.67)	7 (15.56)	10 (22.22)	-	-	9 (20.00)	5 (11.11)	4 (8.89)	2 (4.44)
0.7to 0.8	3 (6.67)	3 (6.67)	8 (17.78)	6 (13.33)	-	1 (2.22)	3 (6.67)	4 (8.89)	2 (4.44)	1 (2.22)
0.8 to 0.9	3 (6.67)	2 (4.44)	4 (8.89)	6 (13.33)	-	-	8 (17.78)	7 (15.56)	4 (8.89)	7 (15.56)
0.9 to 1	-	1 (2.22)	7 (15.56)	6 (13.33)	1 (2.22)	1 (2.22)	6 (13.33)	9 (20)	4 (8.89)	5 (11.11)
>1 to <2	-	-	-	2 (4.4)	25 (55.56)	29 (64.44)	7 (15.56)	5 (11.11)	20 (44.44)	19 (42.22)
>2	-	-	-	1 (2.22)	19 (42.22)	14 (31.11)	-	-	11 (24.44)	7 (15.56)
Total	45 (100)	45 (100)	45 (100)	45 (100)	45(100)	45 (100)	45 (100)	45 (100)	45 (100)	45 (100)
Mean	0.37	0.42	0.6	0.58	3.19	2.27	0.8	0.74	1.52	1.4
t-test statistic	-0.91	0.41	1.6	0.68	0.61					

Note: Figure in bracket show the percentage to total farms, t-cricital value at 5% level of significance was 1.987

Table 2: Efficiency range of farms in rabi season and signficance of difference in mean efficiency scores

Efficiency range	*Technical efficiency (CRS)*		*Technical efficiency (VRS)*		*Scale efficiency*		*Economic efficiency*		*Allocative efficiency*	
	Adopted	*Non-adopted*	*Adopted*	*Non-adopted*	*Adopted*	*Non-adopted*	*Adopted*	*Non adopted*	*Adopted*	*Non-adopted*
0 to 0.1	10 (35.71)	8 (26.67)	-	-	-	-	-	-	-	-
0.1 to 0.5	13 (46.43)	1 (3.33)	8 (28.57)	4 (13.33)	-	-	-	1 (3.33)	-	-
0.5to 0.7	1 (3.57)	7 (23.33)	7 (25)	1 (3.33)	-	-	4 (14.29)	4 (13.33)	-	-
0.7to 0.8	4 (14.29)	9 (30)	4 (14.29)	14 (46.67)	-	-	6 (21.43)	8 (26.67)	1 (3.57)	2 (6.67)
0.8 to 0.9	-	4 (13.33)	5 (17.86)	9 (30)	-	1 (3.33)	6 (21.43)	12 (40)	2 (7.14)	2 (6.67)
0.9 to 1	-	1 (3.33)	4 (14.29)	2 (6.67)	-	15 (53.33)	12 (42.86)	5 (16.67)	7 (25)	14 (46.67)
>1 to <2	-	-	-	-	6 (21.43)	5 (16.67)	-	-	14 (50)	7 (23.33)

in mean efficiency score on technical efficiency (CRS), economic and allocative efficiency between adopted and non-adopted farms. There was signficant difference in technical efficiency (VRS) and scale efficiency between adopted and non-adopted farms.

Conclusion

The findings of the study highlighted the low input use efficiency in both kharif and rabi season across adopted and non-adopted farms. Efforts must be made to rationlize the input use and recommended package of pratice should be made available to farms. This weakness reflects large gap in what farmers should practice and what KVK had recommended. All farms were scale efficient and hence, it is recommended that using greater mechanisation and automation technology, farm managers should increase size of farms. Thus farms can reap increasing returns to scale in long run. Economic efficiency and allocative efficiencies were high in both seasons meaning that farms were not only succeeded in minimizing the cost but also used relative prices in decision making as suggested by economic theory.

Referennces

Abdulai, A., & Huffman, W. (2000). Structural adjustment and economic efficiency of rice farmers in northern Ghana. *Economic Development and Cultural Change*, *48*(3), 503-520.

Anang, B. T., Bäckman, S., & Rezitis, A. (2016). Does farm size matter? Investigating scale efficiency of peasant rice farmers in northern Ghana. *Economics Bulletin, 36*(4), 2275-2290.

Bakhsh, K. (2007). An analysis of technical efficiency and profitability of growing potato, carrot, radish and bitter gourd: A case study of Pakistani Punjab. Unpublished Ph.D. Dissertation, Department of Farm Management,

Bhatt, M. S., & Bhat, S. A. (2014). Technical efficiency and farm size productivity micro level evidence from jammu & kashmir. *International Journal of Food and Agricultural Economics (IJFAEC), 2*(1128-2016-92057), 27.

R Core Team. (2019). "R: A Language and Environment for Statistical Computing." https://www.R-project.org/.