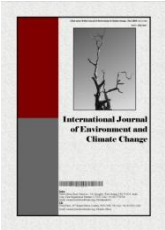

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Impact of Groundnut Seed Subsidy on Farm Efficiency in Ananthapuramu District of Andhra Pradesh, India

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Governments used seed subsidy as an incentive to encourage crop diversification and use of high yielding varieties. In present study, an attempt has been made to study farm efficiency of groundnut seed subsidy in Ananthapuramu district of Andhra Pradesh. For this purpose, two mandals (Kanaganapalli, Gudibanda) were selected based on highest number of subsidy benefited farmers. The data pertains for the year 2021 kharif season for 64 seed subsidy beneficiary and 136 non-beneficiary farmers. The data was collected from each respondent through personal interviews with the help of structured schedules. Data Envelopment Analysis (DEA) was employed to analyze technical efficiency and scale efficiency of the farmers. For better comparison, all the farmers were divided into two categories viz. subsidized and non-subsidized and propensity score matching is also used. The empirical results observed that the overall mean Variable Returns to Scale (VRS) efficiency was 0.760, Constant Returns to Scale (CRS) efficiency was 0.70. The positive impact of seed subsidy is visible, as seed subsidy beneficiary farmers mean VRS efficiency was 0.916 which

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is greater than non-subsidized farmer's i.e. 0.716. The variation is because of high input costs incurred to the non-subsidized farmers. The regression results also indicates that seed subsidy is positive influence on efficiency (VRS), efficiency (CRS) and scale efficiency to the extent of up to 20% increase in efficiency. Yet it has also been noticed that farmers still rely on non-subsidized sources for their seed requirement, because they could not meet the conditions of availing seed subsidy from the Andhra Pradesh state government.

Keywords: Mean efficiency; technical efficiency; VRS.

1. INTRODUCTION

Historically governments across the world incentivise the farmers to adopt high yielding varieties (HYVs) and also encourage crop diversification. Most of the green revolution technologies based on use of high yielding varieties. Incentivising farmers to use HYV seeds for wider adoption of better seeds and also for crop diversification. State and central governments are incentivising use of HYV seeds of pulses, oil seeds and paddy etc., over the years. India has a thriving seed market. The seed industry has grown with Indian agriculture over the years. Indian farmers have gone a long way since the tradition of preserving seeds from previous crops. Today, the Indian seed industry is the world's fifth largest seed market, accounting for 4.4 percent of the worldwide seed market. Recent legislative improvements and government support have accelerated the development of this business. The private seed sector has a significant impact on the Indian seed business. However, in case of pulses and oilseeds, still government is playing a major role in seed production and distribution, as the private sector is not much interested in high-volume and low profit business. However, there are not many studies which examined the impact of seed subsidy on farm efficiency, income and profitability [1]. To enhance budgetary allocations under seed subsidy programme, it is now imperative to assess whether seed subsidy contributed to increase in efficiency, incomes and profits to the farmers [2]. Keeping in view of huge budget allocated every year and government expenditure on seed distribution especially groundnut to farmers, the present paper examined the on-farm efficiency of groundnut seed subsidy in Ananthapuramu district of Andhra Pradesh. The specific objectives of the study are to assess the costs, incomes, profitability, technical efficiency and scale efficiency of the seed-subsidy beneficiary farmers and non-beneficiary farmers of groundnut in Anantapur districts of Andhra Pradesh. The study also quantifies impact of seed subsidy on efficiency through regression analysis. Similar study was done by Anand [3] on Stakeholders' opinion on agricultural subsidies and their impact in Punjab and Hemming *et al*. [4].

2. METHODOLOGY

Ananthapuramu district was purposively selected for the research study as it is predominant in Groundnut cultivation; it is having distinction of highest groundnut seed subsidy distribution to the district in Andhra Pradesh and also India. In the district seed industry is thriving with all kinds of seeds farmers are using for groundnut, there is a co-existence private seed, government supplied subsidized seed, farmer-to-farmer exchange and own seed. In the district, purposively selected two mandals viz., Kanaganapalli and Gudibanda as in these mandals almost 95% area is under groundnut and all kinds of seed is available and active. Two villages were randomly selected from each mandal. The list of all groundnut farmers were taken from the local agricultural officers and 34 farmers non-subsidy and 16 farmers for subsidy category are selected randomly from each village and accordingly, 50 farmers were selected from each village. Thus, 200 farmers were selected i.e., 136 non-subsidy farmers and 64 subsidy farmers. Primary as well as secondary data were collected for the study on issues like variety of seed, source of seed, cost, returns, oil content, yield attributes etc. Well-structured pre-tested schedules were used for the collection of primary data from farmers. For cost of cultivation, Cost-A2 plus family labour was taken according to CACP cost estimates methodology. Returns were calculated over cost A2+FL. Data Envelopment Analysis was employed to analyze the data and arrive at valid conclusions. The variables considered for the DEA are: output variable is total yield production (measured in Quintals/ hectare) while the input variables are seed, insecticides, weedicides, fym, fungicides, dap, urea, mop, ssp, complex, zinc (measured in Quintals /hectare). Regression analysis was used to quantify the impact of seed subsidy on various farm efficiency parameters. (Begum et al. [5], Fan et al. [6]).

3. RESULTS AND DISCUSSION

Farm size is an important component that influences the scale and efficiency of production as well as farm family income. Table 1 shows the sample distribution of farmers by farm size category of groundnut farmers. Out of 136 non-subsidized farmers, 6 (5%) farmers are medium farmers with land holding of >2hectares, 79 (58%) farmers are small farmers with land holding of 1 to 2 hectares and 51 (37%) are marginal farmers with land holding of less than 1 hectare. In subsidized category 40 small farmers (62.5%) and 24 (37.5%) marginal farmers. In the study villages, small and medium size category farmers are predominant, negligible number are belongs to large category.

The overall profitability of the seed subsidy beneficiary farmers was Rs.32,265/ha, whereas for non-beneficiary farmers it was just Rs.19,386/ha. The highest returns were observed among small-scale seed subsidy beneficiary farmers (Rs.46,620/ha), whereas the same category farmers profitability was just Rs.18,730 among non-beneficiaries. It indicates that small beneficiary farmers can use complimentary inputs like fertilizers and pesticides in recommended quantity, compared to marginal farmers, hence are able reap benefits of HYV-subsidised seeds. In case of non-subsidized farmers average income for marginal farmers is more. The variation is because of high input costs incurred to the non-subsidized farmers. Yet it has also been noticed that farmers still rely on non-subsidized sources for their seed requirement, because they could not meet the conditions of availing seed subsidy from the Andhra Pradesh state government.

In this study, input-oriented DEA model was used to assess how much inputs can be reduced to produce the same level of output? A summary of efficiency estimates obtained from the DEA model is presented in Fig. 1.

The summary of efficiency estimates for all the farmers data on total yield indicates that for the VRS and CRS models, the mean technical efficiencies are 0.76 and 0.71 respectively and the corresponding standard deviations are 0.28 and 0.31 indicating the presence of considerable variation among the farmers. In order to better understand the variations in agricultural efficiency of 200 farmers has been divided into two groups 136 non-subsidy farmers and 64 subsidy farmers. Such an analysis would help examine difference in efficiencies due to the subsidy. The results of the DEA estimation for the two categories are presented in Fig. 2.

Fig. 2 indicates that the productive efficiency of groundnut farmers is significantly higher in case of subsidized farmers where the mean VRS efficiency at 0.916 than that of non-subsidized farmers VRS efficiency (0.716). Further, the median score in the subsidized was higher at 0.96 as compared to 0.91 for the corresponding non-subsidized farmers. It appears that the subsidy farmers have registered an improvement in efficiency from the productivity and efficiency standpoint. Similarly, the research findings were in correspondence with the studies of Asadullah and Rahman [7], Zhu and Lansik [8], Salunkhe and Deshmuk [9] and Khumbakar and Lien [10].

An in-depth analysis of the efficiency can be obtained from the frequency distribution of technical efficiency scores for each of the two categories (Table 3).

It can be observed that for subsidized farmers, the overall efficiency scores are better in which the efficiency levels have not been less than 0.5. The subsidized farmers are able to use subsidized seeds efficiently and also they are able to use other inputs like fertilizers, pesticides, labour more efficiently than non-subsidised farmers. The results of CRS indicates that for 40 farmers (62.5%) from a total of 64 subsidized farmers considered the technical efficiency range between 0.56-0.99. With the remaining 42% farmers reached maximum possible efficiency (that is 100 per cent) under the VRS. In contrast, the non-subsidized farmers have recorded relatively less performance in groundnut cultivation evidenced by only 38% farmers reporting a technical efficiency level of 100% under the VRS.

A graphical presentation of the efficiencies achieved for farmer of the non-subsidized and subsidized farmers is presented in Fig. 3.

An analysis of the efficiency scores shows that efficiency in groundnut cultivation among subsided farmers compared to non-subsidized farmers. About 15% of the non-subsidized farmers having efficiency less than 0.27, which is very low, while another 14% farmers showed efficiency score between 0.26 to 0.48.

On the other hand, a significant majority (51.6%) of the subsidized farmers have reported higher efficiency scores above 0.954 indicating good efficiency in input-based efficiency indicators.

Table 1. Type of farmers in the selected respondents

Particulars	Non-subsidized		Subsidized	
	No. of respondents	Share, %	No. of respondents	Share, %
Marginal farmers(<1hectare)	51	37	24	37.5
Small farmers (1-2hectares)	79	58	40	62.5
Medium farmers (>2 hectares)	6	5	0	0
Total	**136**	**100**	**64**	**100**

Table 2. Particulars of total cost of cultivation, returns, income per hectare of both subsidized and nonsubsidized farmers

Particulars	Subsided farmers			Non-subsided farmers			
	Marginal	Small	Total	Marginal	Small	Medium	Total
Total costs (A2+FL) /ha.	50560	37080	42135	38432.5	36210	38066	37125
Total returns/ha.	58900	83700	74400	59675	54940	50316	56512
net income/ha.	8340	46620	32265	21242	18730	12249	19386
B-C ratio	1.165	2.257	1.8475	1.553	1.517	1.322	1.522
Profitability(%) over cost	16.5	125.7	84.75	55.3	51.7	32.2	52.2

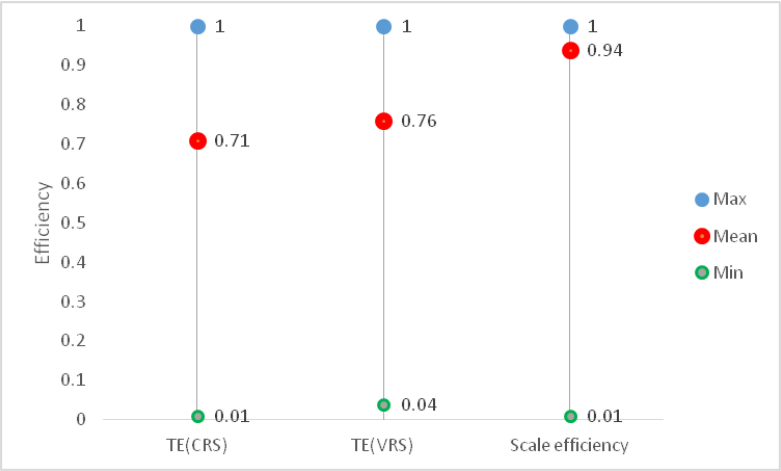

Fig. 1. Summary of technical efficiency

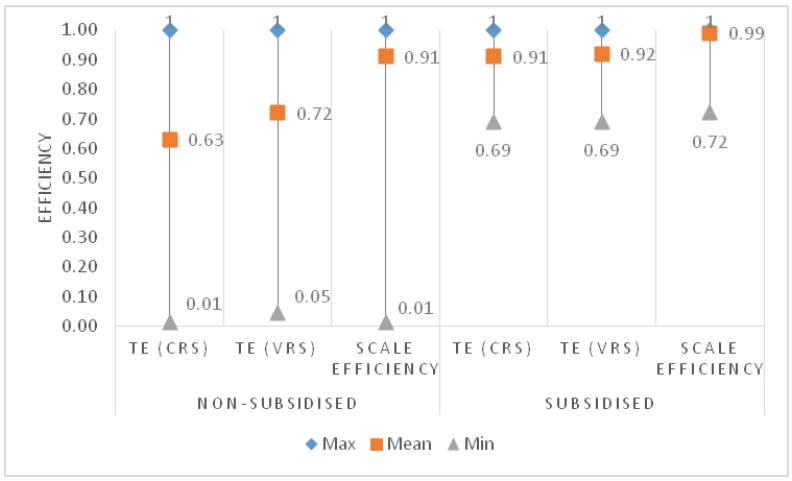

Fig. 2. Efficiency of groundnut production with and without seed subsidy

Table 3. Frequency distribution of technical efficiency – DEA models

	Non-subsidy		Subsidy	
Efficiency Range	**CRS DEA**	**VRS DEA**	**CRS DEA**	**VRS DEA**
0.01-0.099	9(7%)	6(4%)	0	0
0.1-0.55	45(33%)	37(27%)	0	0
0.56-0.99	50(37%)	42(31%)	40(62.5%)	37(58%)
1	32(24%)	51(38%)	24(37.5%)	27(42%)

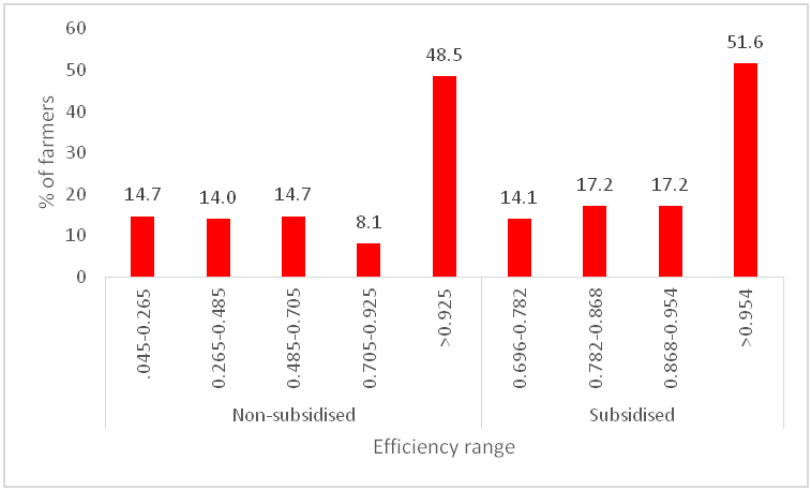

Fig. 3. VRS efficiency: Non-subsidized and subsidized farmers

Table 4. Regression analysis with various efficiency indicators as dependent variables

Variable	**Efficiency (CRS)**		**Efficiency (VRS)**		**Scale efficiency**	
	B	**T**	**B**	**T**	**B**	**T**
Constant	0.586	8.6	0.811	12.4	0.743	16.3
Subsidy (subsidy=1; non-subsidy=0)	0.293*	6.8	0.243*	5.9	0.058*	2.0
land of farmer in ha.	0.034	0.4	-0.148*	-2.0	0.208*	4.0
R2	0.193		0.142		0.104	
Number of observations	200		200		200	

The lowest efficiency reported among subsidized farmers is 0.696, which is significantly higher than majority of the non-subsidised farmers. These results are similar with the findings of Mathur et al. [11] who studied on efficiency of food grain production in India using DEA and SFA and differed with the findings of Howes and Murgai [12], Latruffe et al. [13], Minviel and Latruffe [14] and Tan et al. [15].

3.1 Impact of Subsidy Seed on Efficiency (Regression Results)

Although tabular analysis gives good picture about the impact of subsidy seed on farm efficiency, in this section a regression analysis was done to assess the impact of subsidy seed on farmers efficiency and results were presented in Table 4. Three separate regression equations were run with efficiency (CRS), efficiency (VRS) and scale efficiency as dependent variable and subsidy dummy (subsidy farmer=1; non-subsidy farmer=0) and land in hectare as explanatory variables. For all efficiency indicators, subsidy seed having positive influence, subsidy farmers have 29% higher efficiency (CRS) than non-subsidy farmers, similarly they have 25% higher efficiency (VRS) and they also have higher scale efficiency. Acreage under groundnut is having positive influence on scale efficiency, that is scale efficiency increased by 20% with an increase in one hectare under groundnut.

The above results are in accordance with results of Klumper and Qaim [16], Malik and Pazir [17], Nasrin et al. [18], Penchrova [19], Salunkhe [20], Staniszewski and Borychowski [21] and Zampa and Bojnec [22].

4. CONCLUSION

The subsidies are important components of agricultural policies of any country. The seed subsidies incentivize farmers to use HYV seeds and also help in crop diversification and farm profitability and efficiency. However, in the recent years, there are no much studies on impact of seed subsidy on farmers' incomes and efficiency. Hence, this study has made a comparative analysis of farm incomes and efficiency between the subsidized and nonsubsidized farmers of groundnut crop in Ananthapuramu district for the period 2021 kharif season. The paper used stratified random sampling framework to collect data from 64 seed subsidy beneficiary farmers and 136 non-beneficiary farmers. The usual cost concepts like Cost A2 plus Family Labour, net returns over cost A2+FL, Data Envelopment Analysis (DEA) derived technical efficiency under constant and variable returns to scale and scale efficiency were calculated. A regression analysis was done to quantify the impact of seed subsidy on various efficiency indicators. The DEA results indicated to the presence of considerable variation in efficiency in farming operations between seed subsidy beneficiary and non-beneficiary farmers. For the total farmers the mean efficiency achieved under CRS and VRS models was 0.70 and 0.760 respectively. The analysis of efficiency under the DEA model for the two categories, non-subsidized and subsidized indicated that a significant higher efficiency in cultivation for subsidy beneficiary farmers compared to non-beneficiary farmers. According to input-based efficiency (DEA-VRS) model the efficiency for subsidized farmers is 0.916, for non-subsidized farmers 0.716 and CRS model for subsidized farmers is 0.910 and for non-subsidized farmers 0.636. Problems faced by the farmers was, delay in supply of subsidy seed & limited quantity of supply (subsidized seed supply is limited for only acre acre, in spite of farmers cultivate ground nut on more land). Hence, farmers still rely on non-subsidized sources for their seed requirement, because they could not meet the conditions of availing seed subsidy from the Andhra Pradesh state government. Since it is suggested that needed quantity of seed if provided to farmers under the subsidy gives the fruitful results.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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