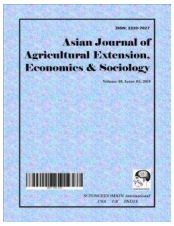

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Technical Efficiency of Women Self Help Groups (SHG) Generating Poultry Activity in Amravati District of Maharashtra

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Authors' contributions

This work was carried out in collaboration between both authors. Author KDC designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Author MMK managed the analyses of the study and the literature searches. Both authors read and approved the final manuscript.

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ABSTRACT

Women are a vital part of the Indian economy and employment to build their empowerment by the provision of loans and financial services is an important aspect of any economy. Rural women of India have been benefited by the Self Help Groups (SHG). The SHG can approach any bank for availing loan facility to undertake any suitable earning activity. The loan is repaid out of the profits earned. A study was carried out for the year 2016-2017 for Amravati division, 50 SHGs, which were engaged in selected agriculture, poultry-based activity. The objectives for the study were to analyze the technical efficient self-help groups and identify the possible determinant of technical efficiency of self-help groups; Primary data was collected with the help of personal interview of self-help groups. Those Self-help groups were selected for the study which has activity in existence of at least 10 years, In poultry SHGs the elasticity of a cost per borrower and subsidy variables were a positively significant contribution in the gross loan. Negative Marginal value productivity of assets, Loan per

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member and net returns are determined to know the contribution in the gross loan Among selected SHGs, the variations in technical efficiency was 0.7632-0.9966. The study concludes that it is necessary to increase the assets and borrow per member for SHGs income generating activities which will be the make the SHGs members to increase the net income to refund, therefore assets, borrow per member and net returns are the possible determinant of the gross loan portfolio. The amount needs to be fixed according to the income generating activities and borrow per member increases contribute more to their family income.

Keywords: Self-help groups; technical efficiency; gross loan; subsidy; returns.

1. INTRODUCTION

In India, majority of the people live in the rural area and are engaged in agriculture, earning a subsistence wage. The provision of loans and financial services to the poor is an important aspect of the development agenda of any economy [1-3]. Upliftment of the poor by promoting self-employment and social security has for a long time been the concern of democratically elected Governments in countries like India [4,5]. India has been able to develop its own model of a microfinance organization in the form of savings and credit groups known as Self-Help-Groups (SHGs) which are bank linked. Rural women of India have been benefited by the Self Help Groups (SHG). The SHG can approach any bank for availing loan facility to undertake a suitable activity. The group loan is distributed among the members to run a small business [6,7,1]. The loan is repaid out of the profits earned. "Microfinance sector has grown rapidly over the past few decades. Nobel Laureate Muhammad Yunus is credited with laying the foundation of the modern Microfinance finance Institutions with the establishment of Grameen Bank, Bangladesh in 1976" [8-12]. Over the past two decades. Women SHGs which can have income generating activities from their savings and beneficiaries income to repay the loan, accelerating the socio-economic growth of the members and raising socio-economic status in society is the prime reason for members joining the SHG, SHGs borrowing systems are more responsive and efficient, SHGs performance using the economic analysis for the existent [13-16]. Ability and willingness of SHGs to maximize their gross loan portfolio to use the inputs like SHGs members and cost per borrower to produce, they facilitate the comparison across similar economic SHGs, measurement reveals variations in efficiencies among SHGs further analysis can be undertaken to identify the factors responsible for the variations and identification of such factors is valuable for policy formulation for improvement of SHGs efficiencies.

2. MATERIALS AND METHODS

The study on Technical efficiency of Self Help Groups Poultry activity in Amravati division of Maharashtra was undertaken with the following objectives.

- To ascertain the technical efficient self-help groups and to identify the possible determinant of technical efficiency of self-help groups.

The study was undertaken in rural areas self-help groups of Amravati division, which were engaged in selected agriculture based poultry activity. The five districts were selected for the study was Amravati, Akola, Washim, Buldhana and Yavatmal.

The data needed for the study was collected from SHGs members by personal interview method using pre-tested schedule for the purpose. Self help groups which are engaged in agriculture-based activities to analyse the technical efficiency, with respect to purpose wise relating to portfolio lending by SHG's providers, utilization pattern of borrowed funds by the Self help groups, loan availed and repayment, rate of interest, service charges and other costs involved in borrowings, cost and returns involved in each activities selected groups efficiency and identified the determinants of variations in efficiencies among SHGs. Total of 50 women SHGS has been selected agriculture-based activities and there 10 years existent in five districts of Amravati division for economic analysis.

2.1 Analysis of Data

To fulfill the specific objectives of the study, the data generated were subjected to statistical analysis using the following analytical tools and techniques.

In order To ascertain the technical efficient self-help groups and identify the possible determinant

of technical efficiency of self-help groups. Stochastic Frontier Model has been employed.

2.2 Stochastic Frontier Approach

Output oriented technical efficiency shows the firm's ability to obtain maximum output from a given amount of inputs. Technical inefficiency affects allocative efficiency and a negative cumulative effect on economic efficiency operates. Hence the concept of technical efficiency is important for the better performance of the economic units. Technical efficiency is measured by the distance a particular firm is from the production frontier. A firm that sits on the production frontier is said to be technically efficient. The concept of technical efficiency is important to firms because their profit depends highly upon their value of technical efficiency.

It is a method of economic modelling. It has its starting point in the stochastic production frontier models simultaneously introduced by Aigner et al. [17] and Meeusen and Van den Broeck [18]. It is a method of economic modelling. It has its starting point in the stochastic production frontier models simultaneously introduced by Aigner et al. [17] and Meeusen and Van den Broeck [18].

The production frontier model without random component can be written as:

$$y_i = f(x_i;\beta)\cdot TE_i$$

Where,

y_i is the observed scalar output of the producer i, $i=1,..I$, x_i is a vector of N inputs used by the producer i, $f(x_i, \beta)$ is the production frontier, and β is a vector of technology parameters to be estimated.

TE_i denotes the technical efficiency defined as the ratio of observed output to maximum feasible output. A stochastic component that describes random variables affecting the production process is added. The stochastic production frontier will become:

$$y_i = f(x_i;\beta)\cdot TE_i\cdot \exp\{v_i\}$$

We assume that TE_i is also a stochastic variable, with a specific distribution function, common to all producers.

We can also write it as an exponential.

$$TE_i = \exp\{-u_i\},$$

Where,

$u_i \geq 0$, since we required $TE_i \leq 1$.

Thus, we obtain the following equation:

$$y_i = f(x_i;\beta)\cdot \exp\{-u_i\}\cdot \exp\{v_i\}$$

The technical efficiency of i[th] firm at t[th] time period is given by

$$TE_{it} = exp\,(-U_{it}) = exp\,(-\,zit\,\delta - W_{it})$$

Now, if we also assume that $f(x_i, \beta)$ takes the log-linear Cobb-Douglas form, the model can be written as:

$$\ln y_i = \beta_0 + \sum_n \beta_n \ln x_{ni} + v_i - u_i$$

We have followed Battese and Corra (1977) specification for variance parameters.

$$\Sigma s^2 = \sigma v^2 + \sigma^2$$
$$\gamma = \sigma^2 / \sigma s^2$$

The value of γ lies between 0 and 1. Zero value of γ shows that the variance of the efficiency effects is zero and deviations from the frontier are entirely due to noise.

Value $\gamma = 1$ indicates that all deviations are due to technical efficiency.

For the output variable, we have taken the gross loan portfolio (measured in Rupees). cost per borrower (CPB), assets, borrow per member, net returns and subsidy are taken as input variables. All variable was measured in rupees.

2.3 Specification of Model

Stochastic frontier model of technical efficiency are given below:

$$\ln GLP_{it} = \beta_o + \beta_1\, LCPB_{it} + \beta_2\, LASSET_{it} + \beta_3\, LBPM_{it} + \beta_4\, LNR_{it} + \beta_5\, LSUB_{it} + V_{it} - U_{it}$$

Where,

ln natural logarithm (i.e. logarithm to the base e).

GLP_{it} represents all outstanding principals due for all outstanding members loans of i[th] SHGs at time period t.

$LCPB_{it}$ represents the logarithm of cost per borrower (operating expense/ Number of active borrowers) measured in Rupees of i^{th} SHGs at time period t.

$LASSETS_{it}$ represents the logarithm of the total of all net asset account of the i^{th} SHGs at t^{th} time period measured in Rupees.

$LBPM_{it}$ represents the logarithm of loan borrow per member of $^{i\ th}$ SHGs at time period t. measured in Rupees.

LNR_{it} represents the logarithm of net returns of i^{th} SHGs at time period t measured in Rupees.

$LSUB_{it}$ represents the logarithm of Subsidy taken by i^{th} SHGs at time period t, measured in Rupees
β_i Parameters to be estimated.

V_{it} is independent and identically random errors.

U_{it} is non- negative random variables.

2.4 Allocative Efficiency

Allocative efficiency refers to the ability and willingness of a firm to use these inputs optimally given the input prices. Allocative efficiency defined in terms of profit maximization, given the technology allocative efficiency refers to the achievement of optimum output so has to maximize a gross loan.

Allocative efficiency = GLP_0 / GLP_E

GLP_0 = Observed maximum gross loan portfolio among all selected SHGs.

GLP_E = Estimated loan or potential gross loan portfolio at the level of input used by SHGs who obtained the maximum gross loan.

2.5 Economic Efficiency

The measure of economic efficiency can be divided into two components *viz.,* technical efficiency, price or allocative efficiency. It is a combination of technical and allocative efficiency (EE=Technical efficiency × Allocative efficiency).

2.6 Marginal Valve Productivity (MVP)

The MVP was computed by multiplying the coefficients of the given resources with the ratio of the geometric mean of the output to the geometric mean of a given resource, for example, the MVP of Xi would be

$$MVP(xi) = bi \frac{\overline{Y}(GM)}{\overline{Xi}(GM)}$$

Given,

GM = represents the geometric mean
MVP = Marginal value productivity
bi = Is the corresponding elasticity of xi
$\overline{Xi}$ (Gm) is the geometric mean of the i^{th} resources
$\overline{Y}$ (GM) = Is the computed value at the geometric mean

2.7 Technical Efficiency of Poultry SHGs

Marginal likelihood estimates of the parameters of the production frontier in Table 1 shows the elasticity's of frontier gross loan portfolio with respect to cost per and subsidy were estimated at the means of input variables to be 0.5117 and0.1665 respectively. Given the specification of stochastic or Cobb Douglas frontier model results show that the elasticity of the mean value of the gross loan was estimated to be an increasing function of cost per borrower and a subsidy, this both variables positively significant contribution in the gross loan its indicates that these variables to help the loan refund [19-22]. Negative Marginal value of productivity of assets, borrow per member and net returns are determined to decrease the use of this variables and scope to increase this variable, the variable asset, borrow per member and net returns executed negative significant Contribution in determining the gross loan its indicates decline assets, borrow per member and thereby reduction in net returns, it's adversely affects the loan refund and hence the size of SHGs is limited and loan outstanding of SHGs borrower increases, in views of this it is necessary to increase the assets and borrow per member for SHGs income generating activities which will be the make the SHGs members to increase the net income to refund, therefore assets, borrow per member and net returns are the possible determinant of gross loan portfolio. The returns to scale parameters were found to be 0.4242 implying increase in the input variables would results in less than proportionate increase in the gross loan of the poultry SHGs [23,24].

The minimum and maximum efficiencies for all selected SHGs are presented in Table 3 based on estimated function technical efficiency of

individual SHGs has been estimated, the results indicate the variations in technical efficiency 0.7632-0.9966 across the individual poultry SHGs. The minimum technical efficiency in selected SHGs sample was 0.7632 (76.32%), while the maximum was 0.9966 (99.66%). The average technical efficiency for the entire sample of poultry SHGs is 0.9053 indicating 0.0947 (9.47%) inefficiency implies to there is scope to increase the gross loan portfolio. prevails an allocative inefficiency to the extent of 39%among average SHGs in comparison with the SHGs who obtain the maximum gross loan. The allocative efficiency 0.6072 (60.72%), which indicates the allocative inefficiency is 0.3928 (39.28%) it can be from that there was scope to increasing poultry SHGs loan and the 0.5542 (55.42%) is economic efficiency and it found to 0.4458 (44.58%) economically inefficient poultry SHGs indicating which have scope to improve the economic efficiency.

Frequency distribution of selected sample efficiency of SHGs poultry activities was presented in Table 4, in technical efficiency from all 50 SHGs majority of 15 SHGs were ranged between 0.95-1 efficiency level followed by 14 SHGs were ranges between 0.90-0.95 technical efficiency, 8 SHGs comes under the range 0.80.85 and only 2 SHGs ranges 0.75-80 respectively, technical efficiencies of majority of poultry SHGs were higher because low cost of borrowing of loan, increasing variations in technical efficiency estimates is indicating the some of the SHGs use their resources inefficiently in SHGs loan process but majority of SHGs use their resources efficiently. In allocative efficiencies majority of 11 SHGs ranges between

Table 1. Maximum likelihood estimates of the stochastic frontier production function of Poultry SHGs

Sr. no.	Explanatory variables	βi	Coefficient	St. error
1	Constant	β0	3.8841	0.1826
2	Log cost per borrower	β1	0.5117***	0.0779
3	Log assets	β2	-0.0607**	0.0228
4	Log borrow per member	β3	-0.0789*	0.0424
5	Log net return	β4	-0.1144***	0.0438
6	Log subsidy	β5	0.1665***	0.0349
Log-likelihood			71.03	
		R^2	0.8444*	
		γ	0.9997	0.0018
		σ^2	0.0060	0.0020
Average Technical efficiency		0.9053		

**** significance at 1%, ** significance at 5%, * significance at 10%*

Table 2. Marginal value productivity of poultry SHGs

Sr. No.	Variables	MVP
1	Cost per borrower	21.4472
2	Assets	-0.2285
3	Borrow per member	-0.7372
4	Net return	-0.1185
5	Subsidy	0.4219

Table 3. Efficiency distribution of poultry SHGs

Efficiencies	Efficiency level
Technical efficiency	0.9053
Allocative efficiency	0.6072
Economic efficiency	0.5542
Maximum Technical efficiency among selected SHGs	0.9966
Minimum Technical efficiency among selected SHGs	0.7632

Table 4. Frequency distribution of sample efficiency of poultry SHGs

Sr. no.	Efficiency index	No. of SHGs		
		Technical efficiency	Allocative efficiency	Economic efficiency
1	0.15-0.20	-	-	-
2	0.20-0.25	-	-	-
3	0.25-0.30	-	1	9
4	0.30-0.35	-	11	3
5	0.35-0.40	-	1	2
6	0.40-0.45	-	1	2
7	0.45-0.50	-	3	3
8	0.50-0.55	-	1	
9	0.55-0.60	-	1	8
10	0.60-0.65	-	8	5
11	0.65-0.70	-	10	5
12	0.70-0.75	-	4	7
13	0.75-0.80	2	1	2
14	0.80-0.85	8	9	3
15	0.85-0.90	11	3	
16	0.90-0.95	14		
17	0.95-1.00	15	1	1

0.30-0.35, followed by 10 SHGs were ranges between 0.65-0.70, 9 SHGs ranges between 0.0.80-0.85, 8 SHGs ranges in 0.60-0.55, 4 SHGs ranges in 0.70-0.75, 3 SHGs from both ranges 0.45-0.50 and 0.85-0.90, 1 SHGs allocative efficiency from each range 0.25-30, 0.35-0.40,0.40-0.45, 0.50-0.55,0.75-0.80, 0.95-1.00, respectively, wide variations in allocative efficiency not proper allocation of resources and more scope to improve allocation of resources of poultry SHGs. In economic efficiencies majority of 9 SHGs ranges between 0.25-0.30, followed by 8 SHGs ranges between 0.55-0.60, 7 SHGs ranges between 0.70-0.75,5 SHGs from both ranges 0.60-0.65 and 0.70-0.75, 3 SHGs economic efficiency from each range 0.30-35, 0.45-0.50 and 0.80-0.85 and 2 SHGs economic efficiency from each ranges 0.35-0.40, 0.40-0.45, 0.75-0.80 and one SHGs ranges between 0.95-1.00, respectively. The wide variations in economic efficiency are indicating to which have more scope to improve the economic efficiency of poultry SHGs.

1. In poultry SHGs the elasticity of the mean value of the gross loan was estimated to be an increasing function of cost per borrower and a subsidy, this both variables positively significant contribution in the gross loan.
2. Negative Marginal value productivity of assets, borrow per member and net returns are determined to decrease the use of these variables and scope to increase this variable, the variable asset, borrow per member and net returns executed negative significant contribution in determining the gross loan its indicates decline assets, borrow per member and thereby reduction in net returns, its adversely affects the loan refund.
3. The average technical efficiency was 0.9053, the average allocative efficiency was 0.6072 and average economic efficiency was 0.5542.

3. CONCLUSIONS

In views of this it is necessary to increase the assets and borrow per member for SHGs income generating activities which will be the make the SHGs members to increase the net income to refund, therefore assets, borrow per member and net returns are the possible determinant of the gross loan portfolio. The amount needs to be fixed according to the income generating activities and borrow per member increases contribute more to their family income.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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