NIGERIAN AGRICULTURAL JOURNAL
ISSN: 0300-368X
Volume 55 Number 1, April 2024 Pg. 152-160
Available online at: http://www.ajol.info/index.php/naj
https://www.naj.asn.org.ng

Technical Efficiency of Snail Production in Rivers State, Nigeria

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Abstract

This study investigated the technical efficiency of snail farming in Rivers State, Nigeria. A multistage sampling procedure was used to select the one hundred and twenty (120) snail farmers in five local government areas (LGA) from the three agricultural zones in Rivers State, Nigeria. Primary data were collected using questionnaires and personal interviews. Data collected were analyzed using descriptive statistics, cost and returns analysis, multiple regression analysis, and stochastic frontier production function. Snail farming was profitable in the study area with a Total Revenue (TR) of ₦1,344,856.50. They had a Net Farm Income of ₦758,391.74 per selling season. The factors influencing the net return of snail farmers in the study area were age, education, farming experience, cooperative society, access to credit, and stock size. Technical efficiency distribution of snail farming was computed from frontier 4.1 MLE/Survey Data, 2021 with a mean of 0.798. The result showed that of most snail farmers, about 75.8% were operating between the technical efficiency ranges of 70%-100%. Snail farmers can increase their output by improving their technical efficiency level. This study recommends that the government or the extension workers should sensitize snail farmers concerning the right use of input combinations which can help improve the technical efficiency level of snail farming in the study area; The policymakers should create an awareness for the training of youths and the unemployed on snail farming which is a lucrative business when the technical knowledge is put in place.
Keywords: Technical Efficiency, Profitability, Snail Farming, Nigeria

Introduction

Snails are micro livestock and micro livestock are small body-sized domesticated animals raised by many farmers for economic purposes. Micro livestock according to Okon and Ibom (2010) refers to small-size domesticated animals requiring minimum space for rearing, which includes; grass cutters, rabbits, guinea pigs, quail, and snails. Onodigo, *et al.,* (2019) and Asheye, *et al.,* (2017) noted that snail meat can be used to reduce malnutrition problems. Snail meat is rich in protein, iron, calcium, magnesium, and potassium. It is an important source of protein in the human diet and a source of income to farmers (Nnodim & Ekpo, 2019). Snail farming is important because of the benefits derived from the snails. Protein content from snail meat is rich in all essential amino acids such as Lysine, Leucine, arginine and tryptophan. Snail meat is high in protein content (37 - 51%) compared to guinea pig (20.3%), poultry (18.3%), fish (18%), cattle (17.5%), sheep (16.4%) and swine (14.5%). Iron content (45 - 59 mg/kg), low in fat (0.05 - 0.08%), sodium and cholesterol level (Ahaotu *et al*., 2019). According to Offer (2018), snails supply as much as 70% of animal protein in snail farming areas, and they supply minerals such as iron and calcium in the diets of people. The amount of minerals in others, such as in beef samples, 53.00mg/100g calcium and 24.05mg/100g phosphorous is much lower than it is present in snail meat (Zira *et al.,* 2016).

Economically, snail provides a source of food and income for both men and women, and it has important social and cultural position in communities. Olufemi (2019) stated that snail farming is capable of providing economic empowerment, self-employment, and development to rural areas. According to Onodigo, *et al.* (2019), snail farming is a practical and profitable business venture that is yet to be fully explored in Nigeria and Africa as a whole. It is economically efficient which can be referred to as productive or overall efficiency, which is a combination of technical and allocative efficiency when profit maximization is considered. Technical efficiency entails the production of maximum output given the level of inputs used (Ugwumba, 2011). Allocative efficiency is using available inputs in optimal proportion, giving the respective prices in production (Ugwumba, 2010).

Low productivity in snail farming is mainly due to the inefficient use of scarce resources by the snail farmers, resulting in low efficiency of production and low output of snails, which leads to low profit levels of the snail farmers. Because of this, the study investigated the technical efficiency of snail farming in Rivers State, Nigeria. The specific objectives of this study were to: describe the socio-economic characteristics of the snail farmers with technical efficiency; estimate the cost and returns and the net farm income of snail farming; determine the factors that influence the net return of snail farming; determine the level of technical efficiency of snail farmers; estimate the determinants of technical efficiency of snail farmers; and identify the constraint facing snail farming.

Methodology

This study was conducted in Rivers State, Nigeria. The State is located within latitudes 4°45′N and 4°75′N of the equator and longitudes 6°50′E and 6°83′E of Greenwich Meridian. The state has an estimated population of 9,567,892 with an area of 21,850 sq. km (National Bureau of Statistics, 2019). Rivers State is bounded in the South by the Atlantic Ocean, to the North by Imo and Abia State, to the East by Akwa Ibom State and to the West by Bayelsa and Delta States. A multistage sampling procedure was employed to select the respondents for this study. In the first stage, six (6) Local Government Areas (LGAs) were purposively selected from the three agricultural zones in Rivers State based on the snail farming activities in those areas. The selected Local Government Areas were Abua/Odua, Ahoada East, Asari/Tori, Ogba-Egbema-Ndoni, Oyigbo, and Ikwerre of Rivers State. In the second stage, five (5) snail farming communities were purposively selected from each of the six local government areas. This gave a total of thirty (30) communities. In the third stage, four (4) snail farmers, both small and large-scale snail farmers, were randomly selected from each of the thirty (30) communities. This gave a total of one hundred and twenty (120) snail farmers as the respondents, and that was the sample size for this study. Primary data were collected from 120 respondents by administering questionnaires and by interviewing the farmers.

Data Analysis

Cost and Returns

The costs and returns analysis presented below was used in the analysis.

NR = TR–TC … (1)

TR = Q x P …… (2)

TC = TFC + TVC ….. (3)

RI = NR/TC ....(4)

Where,

NR = Net Return on snail produced (N).

TR = Total Revenue from snail (N).

TC = Total Cost of snail (N).

TFC = Total fixed cost (N).

TVC = Total variable cost (N).

Q = Quantity of snails produced in kg.

P = Price of snail per kilogram (N).

R_i = Return on capital invested in snail (N).

Regression Analysis

The implicit regression equation is given as:

$Y = f(X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8, X_9, X_{10})$ …… (5)

Where,

Y = Net returns from snail production (N)

X_1 = Age (years)

X_2 = Sex (male=1, female=0)

X_3 = Marital Status (married=1, others=0)

X_4 = Household Size (numbers)

X_5 = Educational level (years)

X_6 = Farming experience (years)

X_7 = Access to credit (yes=1, no=0)

X_8 = Cooperative society (yes=1, no=0)

X_9 = Extension contact (yes=1, no=0)

X_{10} = Stock size (numbers)

ei = error term.

Stochastic Frontier Production Function

The Cobb Douglas functional form using the stochastic frontier production function was used to estimate the production function of snail farming in the study area. The functional form of this model was used in estimating the level of technical efficiency in the Cobb-Douglas type (Bravo-Ureta and Evenson, 1994) which is;

$Ln\,Y_i = \beta_0+\beta_1 LnX_1+\beta_2 LnX_2+\beta_3 LnX_3+\beta_4 LnX_4+\beta_5 LnX_5+\beta_6 LnX_6+\beta_7 LnX_7+V_i-U_i$...... (6)

Where,

Ln = represents the natural logarithm

The subscript $_i$ represents i^{th} sample farmer

Y_i = Output of snail (kg)

X_1 = Cost of hatching (N)

X_2 = Cost of feed (N)

X_3 = Cost of watering (N)

X_4 = Cost of pesticide (N)

X_5 = Capital (N)

X_6 = Cost of labour (N)

X_7 = Stock size (numbers)

β_0 = Intercept

$\beta_1 - \beta_5$ = Coefficients estimated

Determinants of Technical Efficiency

To determine factors contributing to the observed technical efficiency in snail farming, the following model is formulated and estimated with the stochastic frontier model in a single stage maximum likelihood estimation procedure.

$U_i = \delta_0+\delta_1 Z_1+\delta_2 Z_2+\delta_3 Z_3+\delta_4 Z_4+\delta_5 Z_5+\delta_6 Z_6+\delta_7 Z_7$........ (7)

Where,

U_i = is the technical efficiency of the i^{th} farmer

Z_1 = Farmers age (years)

Z_2 = Farmers level of education (years)

Z_3 = Sex (male=1, female=0)

Z_4 = Number of extension contacts (yes=1, no=0)

Z_5 = Household size (number)

Z_6 = Farming experience (years)

Z_7 = Cooperative membership (yes=1, no=0)

δ_0 and δ_1, δ_2 ..... δ_7 are regression parameters to be estimated. It is expected that δ_1, δ_2, δ_3, δ_5, δ_6, and δ_7 to be positive (i.e. >0) and δ_4 negative (i.e. <0).

Results and Discussion

Socioeconomic characteristics of the snail farmers with their level of efficiency in the study area

The result in Table 1 shows that 50% of the snail farmers' age ranged from 40 to 49 years had the highest average efficiency and the mean age was 41.09 years. This implies that most of the snail farmers were within their active and productive age. This corresponds with Ahmadu and Ojogho (2012) that snail farmers are relatively young, and they might be active in the snail farming business. About 74.2% of the respondents had a household size ranging from 4 to 7 persons, with a mean of about 5 persons. This implies that most of the snail farmers maintain a moderate household size for the supply of family labour which helps to reduce the cost of production and increase profit. This finding corroborates Aderounmu *et al.,* (2019) that household size in snail marketing helps to increase income and reduce production costs. The snail farmers with large household sizes of 8 to 11 people had the highest efficiency level of 0.836. This implies efficiency of snail production increases with household size. The efficiency 0.809 of female snail farmers was higher than the male 0.793, and 32.5% of the snail farmers were females while 67.5% were males. This finding corresponds with Onuigbo, (2015) that snail production is predominantly practiced by male folks. About 66.7% were married. This implies that married people were more involved in snail farming, which helped to add to their household income and improve their standard of living. This corresponds with Okonta *et al.,* (2021) that married people are involved in snail marketing more in the study area to boost their household income and improve their standard of living. The result also shows that 54.2%, 60.8% and 83.3 had no access to credit, were not members of the cooperative society, and had no contact with extension agents respectively. About 61.7% of the respondents had spent 13–19 years in school, had the highest efficiency of 0.810, and the mean years spent in school was 13.83 years spent in school. This implies that the most snail farmers were literate. This result agrees with Olayinka (2015) that highly educated people are involved in poultry production, and it helped the poultry farmers to be highly productive and technically efficient. Furthermore, 78.3% of the respondents had up to 1–7 years of farming experience. This finding corresponds with that of Aminu *et al.,* (2020) that snail farming is relatively recent in their study area. The mean stock size was 4455.62 snails in the study area.

Cost and Returns

Table 2 reveals the average total cost, total revenue, net farm income, and the benefit-cost ratio (BCR) were ₦586,464.77, ₦1,344,856.50, ₦758,391.74 and 1.29 respectively. This implies that snail farming is a profitable business in the study area, and the benefit cost ratio (BCR) of 1.29 implies that for every ₦1 invested in snail farming, there is a return of ₦1.29. This result corresponds with a previous finding by Munonye and Moses (2019) that snail farming is a profitable business. Results also agrees with Okonta *et al.,* (2021) which reveals that snail marketing is profitable with a BCR greater than one.

Factors that Influence the Net Return of Snail Farming

Table 3 revealed that the semi-log model was selected as the lead equation because it is the best-fit model. The coefficient of multiple determination (R^2) value is 0.755, which implies that 76% of the variation in the dependent variables has been explained by the independent variables included in the model. The coefficient of age was positively significant at a 1% level. This implies that age has a direct relationship with net farm income in snail production. The result is expected because age is a significant variable that connotes maturity and the ability to make difficult decisions in snail farming, thus the direct relationship between the age of the snail farmers and the net farm income. The coefficient of farming experience was positively significant at a 1% level. This result is expected because experience over time is a key factor for a better understanding of business and an efficient decision-making process that improves the performance of a business (Efedua and Ugochukwu, 2021). Therefore, the direct relationship between the net farm income of the farming experience of the snail farmers was expected. The coefficients of access to credit, cooperative societies, and stock size were positive and significant. The result suggests that access to credit, cooperative membership and stock size had a direct relationship with the net farm income in snail production. The result corroborates Adinya and Ibekwe (2010) who established that farming experience and stock size have a positive influence on the output of snail production. The coefficient of education was positively significant at a 5% level. This result is expected because a higher literate level helps to understand and apply innovations that have been taught for efficient production.

Technical Efficiency

The result in Table 4 shows the technical efficiency of the snail farmers. The mean technical efficiency of the snail farmers was 0.798 and 76% of the snail farmers were operating between the technical efficiency ranges of 0.70-1. This result implies that most of the farmers in the study area were technically efficient. About 16% of snail farmers had technical efficiency that ranged from 0.40-0.69, while 8% of snail farmers had technical efficiency that ranged from 0.10-0.39. This also suggests that there is an opportunity for increasing snail output and improving their technical efficiency level in the study area. The technical efficiency result agrees with Ohajianya *et al.,* (2013) who noted that there is always an opportunity to improve.

Determinants of Technical Efficiency

The result in Table 5 shows that the estimate of sigma square is 2.751, and it is statistically significant at 5% level. It indicates a good fit and correctness of the specified distribution assumptions of the composite error term. The coefficient of cost of hatching was negative (-1.170) and signified that the ₦1 increase in the cost of hatching decreases the technical efficiency of the farmers by -1.170. It implies that the technical efficiency of the farmers is being increased as the cost of hatching decreases and vice versa. Technical knowledge is needed for hatching and when the snail farmers have no technical knowledge of hatching, they spend more on technical services. This result disagrees with that of Zilli (2015) who says the negative sign indicates that inefficiency is reduced as the hatchability of poultry eggs increases. The cost of feeding was positive (0.019) and signified that the ₦1 increase in the cost of feeding increases the technical efficiency of the snail farmers by 0.019. This result is expected because an increase in the feed of snails would attract more cost and the more the snails were fed the better their growth, thus the technical efficiency of the farmers would increase. This is in line with the findings of (Zira, *et al.*, 2020) who reported that feeding cost represents a substantial portion of the production cost in snail farming. The cost of watering was negative (-0.081) and signified that the ₦1 increase in the cost of watering decreases the technical efficiency of the snail farmers by -0.018. This implies that the technical efficiency of the farmer is being increased as the cost of watering decreases. An adequate increase in watering of the snail pen and giving the snail's water will keep the snails hydrated and improve their growth. Water helps to keep the snails hydrated, especially during the dry and hot season. It also makes their environment humid. When the snail environment is too dry and hot, the snails go into aestivation and may die in the process. The cost of pesticide was positive (0.968) and signified that the ₦1 increase in the cost of pesticide will increase the technical efficiency of the snail farmers by 0.968. This implies that if pests and diseases are controlled and prevented, it increases the technical efficiency of the snail farmers, thereby decreasing the mortality rate of the snails. The use of pesticides is to prevent the snails from being attacked by pests and predators. The quality and quantity of pesticides used to disinfect the space before and after stocking increases the output of snail production in the study area. Pesticides should be used appropriately as well as the right quantity should be mixed. Ohajianya, *et al.* (2013) obtained similar results on the cost of drugs and medication for poultry production that is positive. This dependability on pesticide and other agrochemical inputs should be used in an environmentally friendly manner to ensure sustainability without compromising future interests (Obianefo, *et al.* 2021). The study did not agree with that of Hasnain, *et al.* (2015) that a ₦1 increase in the cost of pesticide may decrease output. Capital was positive (1.469) and signified that in every 1% increase in capital increases the technical efficiency of the snail farmer by 1.469%. This implies that an increase in the capital invested in snail farming will lead to an increase in their profits and output of snails produced and vice versa, thereby increasing the farmer's technical efficiency. The cost of labour was negative (-1.897) and signified that the ₦1 increase in the cost of labour decreases the technical efficiency of the snail farmer by -1.897. This implies that the technical efficiency of the farmer is being increased as the cost of labour decreases and vice versa. The lower the cost of labour used in snail farming, the higher the income generated, and the higher the cost of labour used, the lower the income generated. Most snail farmers in the study area used family labour to reduce the cost of production and increase profit. Family labour had a positive effect on their efficiency. This result is in agreement with Adewale & Belewu (2022) that the negative coefficient of labour cost implies that the higher the labour cost incurred in snail farming, the lower the revenue generated and vice versa. Labour can be minimized to improve technical efficiency.

The stock size was positive (1.648) and signified that every 1% increase in stock size increases the technical efficiency of the snail farmer by 1.648. This implies that the technical efficiency of the snail farmers' increases as their stock size increases. Stock size is an important factor that determines the profitability of the farmer. This is in agreement with Nwachukwu and Onyenweaku (2007), and Ezeh *et al.* (2012) that the larger the stock size the more the snail farmer will be technically efficient. The result of the efficiency factors of snail farming in Table 4.14 showed that the snail farmers coefficients of age Z1, educational level Z2, and sex Z3 were statistically significant at 5%, extension service Z4, and household size Z5. Experience Z6 is not statistically significant, and cooperative membership Z7 was statistically significant at 5% 1%. They all had an influence on the technical efficiency of snail farming. The result of the efficiency factors revealed that the age of the snail farmers was positive and statistically significant at 5% and had a coefficient of 1.988. This implies that an increase in the age of the snail farmer leads to an increase in the technical efficiency of the snail farmer. Both the younger and the older snail farmers can be technically efficient because snail farming is not as tedious as other livestock farming. Education had a positive influence on the technical efficiency of snail farmers in the study area, and it is in agreement with the a priori expectation. It is statistically significant at 5%. This implies that education significantly influences the technical efficiency of snail farming. Snail farmers who can read and write and can learn fast through vocation and training can be technically efficient. This result agrees with Ume *et al.,* (2018) that the level of technical efficiency increases with an increase in their level of education. Household size had a positive influence on the technical efficiency of snail farmers in the study area, and it is statistically significant at 10%. This implies that large household size helps to reduce labour costs, and it is profitable, which helps snail farming to be technically efficient. This result is in agreement with Ezeh *et al.,* (2012) which states that larger households utilizes family labour to reduce labour costs and creates an opportunity for improved technical efficiency. Experience had a positive influence on the technical efficiency of snail farmers in the study area but it is not statistically significant. This implies that the snail farmers who have more years of snail farming experience are more technically efficient compared to the snail farmers with less experience. It is revealed that experienced farmers have the technical knowledge, and they could embrace easier innovations given to them (Ewuziem, *et al*., 2009). Sex, extension service, and cooperative membership had a negative influence on the technical efficiency of snail farmers, and they are statistically significant at 5%, 10% and 1% respectively. Inadequate extension visits and not being a cooperative member made some snail farmers technically inefficient because they did not have access and information to incentives, innovations, training and other things that are relevant to snail farming. This implies that extension visits and cooperative membership will increase technical efficiency because it can enhance the snail farmers' access to credit, and adequate information and as a medium to exchange ideas that can improve their snail farming activities. This corresponds with the findings of Ojokojo (2016) that an increase in cooperative participation and extension contact reduces technical and economic inefficiency.

Constraints Facing Snail Farming

Table 6 revealed that there are some constraints militating against the technical efficiency of snail farming in the study area. These factors include; poor access to adequate information, problems of diseases and pests, effects of harsh weather condition, inadequate farm records, low financial capacity, low technical knowledge, poor transportation network, poor access to supporting programmes. Insufficient extension contacts, insufficient knowledge to credit, inadequate collateral security, and inadequate inputs. These were among the major concerns of snail farming in the study area.

Conclusion

In conclusion, snail farming in the study area was technically efficient and profitable and had a significant contribution to the income status of the snail farmers. The use of family labour helped them to minimize cost and minimize input to get a maximum output, thereby making snail farming to be technically efficient. The technical efficiency of snail farming in the study area indicated that snail farmers were operating between the technical efficiency ranges of 70% - 100%, and it indicated that snail farming in the study area is technically efficient. This study recommends that the government or the extension workers should sensitize snail farmers concerning the right use of input combinations, which can help improve the technical efficiency of snail farming in the study area. The policymakers should also create an educative awareness for the training of youths and the unemployed on snail farming, which is a lucrative business when the technical knowledge is put in place.

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Table 1: Distribution of Snail Farmers based on their Socio-economic Characteristics

Variables	Frequency	Percentage	Mean Efficiency
Age			
20 – 29	16	15.8	0.709
30 – 39	21	17.5	0.739
40 – 49	60	50	0.869
50 – 59	20	16.7	0.731
Mean	41.09		
Household size			
0 – 3	20	16.7	0.701
4 – 7	89	74.2	0.813
8 – 11	11	9.2	0.8359
Mean	5		
Sex			
Female	39	32.5	0.809
Male	81	67.5	0.793
Marital status			
Single	26	21.7	
Married	80	66.7	
Widow	14	11.6	
Access to credit			
No	65	54.2	
Yes	55	45.8	
Cooperative membership			
No	73	60.8	0.685
Yes	47	39.2	0.821
Extension contact			
No	100	83.3	0.782
Yes	20	16.7	0.817
Education			
1 – 6	5	4.2	0.610
7 – 12	41	34.2	0.799
13 – 19	74	61.7	0.810
Mean	13.83		
Farming experience			
1 – 7	94	78.3	0.811
8 – 14	25	20.8	0.746
15 – 21	1	0.8	0.871
Mean	6.31		
Stock size			
1 – 2000	14	11.7	
2001 – 4000	30	25	
4001 – 6000	62	51.7	
6001 – 8000	10	8.3	
8001 – 10000	4	3.3	
Mean	4455.62		
Total	**120**	**100**	

Source: Field Survey Data, 2021

Table 2: Cost and Returns of Snail Farming in the Study Area

Variables	Average Amount (₦)
Sale (R)	1,344,856.50
Variable costs	
Hatching	167804.86
Cost of feed	60886.58
Water	47682.59
Pesticide	16939.53
Labour	155517.46
Total Variable Costs (TVC)	448831.03
Fixed Costs	
Rent	105872.11
Equipment	31761.63
Total Fixed Costs (TFC)	137633.74
Total Costs (TC)	586464.77
Net Farm Income (R – TC)	758,391.74
BCR	1.29

Source: Field Survey Data, 2021

Table 3: Regression Analysis Result on Factors that Influence the Net Return of Snail Farming in the Study Area

Variable	Linear	Exponential	Semi log+	Double log
(Constant)	65327.07	12.32***	-1146128.01***	10.167***
	(1.207)	(122.436)	(-6.137)	(34.299)
Age	2410.09**	0.004**	153435.88***	0.235***
	(2.512)	(2.025)	(3.382)	(3.257)
Sex	12605.47	-0.005	24492.26	0.015
	(0.824)	(-0.184)	(1.329)	(.511)
Marital status	27000.44	0.051	31648.08	.042
	(1.584)	(1.607)	(1.427)	(1.200)
Household size	2866.17	0.014*	1064.01	.070*
	(0.658)	(1.773)	(0.041)	(1.716)
Education	10843.80***	0.023***	119470.25**	0.257***
	(3.103)	(3.617)	(2.517)	(3.410)
Farming Exp.	8009.85***	0.009*	88783.86***	0.132***
	(2.917)	(1.759)	(3.900)	(3.667)
Access to Credit	38032.81**	0.051	58025.36**	0.067*
	(1.859)	(1.342)	(2.353)	(1.714)
Coop. Society	42430.52**	0.051	68647.65***	0.085**
	(2.186)	(1.402)	(2.954)	(2.297)
Ext. Contact	-1607.74	0.028	-21262.144	-0.006
	(-0.088)	(0.833)	(-0.955)	(-.166)
Stock Size	49.84***	7.746E-005	84678.87***	0.148***
	(10.715)	(8.961)	(6.833)	(7.538)
R^2	**0.830**	**0.784**	**0.755**	**0.773**
F statistics	**53.381*** **	**39.656*** **	**33.006*** **	**36.471*** **

Field survey data, 2021, *significant at 10%, **significant at 5%, ***significant at 1%, figu res in parenthesis are t-values

Table 4 Technical Efficiency Distribution of Snail Farming

Efficiencies	Frequency	Percentage
0.10 – 0.39	10	8.3
0.40 – 0.69	19	15.8
0.70 – 1	91	75.8
Total	120	100.0
Mean	0.798	

Source: Computed from Frontier 4.1 MLE/Survey Data, 2021

Table 5: Estimation of the Cobb Douglas Stochastic Production Function of the Determinants of Technical Efficiency of Snail Farming

Variables	Estimate	Std. Error	z value	Pr(>|z|)
Production Factors				
Constant	0.994	0.125	7.941***	0.000
Cost of hatching	-1.170	0.007	-162.040***	0.000
Cost of feed	0.019	0.003	7.284***	0.000
Cost of watering	-0.081	0.005	-15.126***	0.000
Cost of pesticide	0.968	0.004	219.250***	0.000
Capital	1.469	0.019	76.150***	0.000
Cost of labour	-1.897	0.028	-68.663***	0.000
Stock size	1.648	0.020	82.661***	0.000
Efficiency Factors				
Z_(Intercept)	-1.755	0.582	-3.013***	0.003
Age	0.094	0.047	1.988**	0.047
Educational level	1.801	0.617	2.922**	0.003
Sex	-1.004	0.421	-2.387**	0.017
Extension service	-0.425	0.223	-1.906*	0.057
Household size	0.273	0.156	1.758*	0.079
Experience	0.120	0.282	0.426	0.670
Cooperative membership	-4.561	1.308	-3.488***	0.000
Sigma Square	2.751	1.296	2.123**	0.034
Gamma	1.000	0.000	5.7×10^{6}***	000
Log Likelihood	35.155			
LR test (Chi-square)	115.82***			

Source: Computed from field data using Frontier version 4.1 (2019). Field survey data (2021). * Significant at 1%, ** significant at 5%, * significant at 10%**

Table 6: Constraints Facing Snail Farming

Variables	Mean
Poor access to adequate information	3.22
The problem of diseases and pests	2.74
Effect of harsh weather condition	2.96
Inadequate farm records	2.83
Unstable market	2.06
Low financial capacity	2.88
Inadequate proper farmland ownership	1.95
Age	1.64
Low technical knowledge	2.72
High mortality rate	1.62
Poor transportation network	3.13
Low patronage	1.77
Poor access to supporting programmes	2.91
Inadequate extension contacts	3.06
Insufficient knowledge of credit	3.28
Inadequate collateral security	3.10
Inadequate inputs	2.39
Involvement of farmers	1.72
Grand mean = 2.55	

Source: Field Survey Data, 2021