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Comparative Analysis of Rainfed and Dry Season Rice Farming in Value Chain Development Programme in Ayamelum Local Government Area-Anambra State

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Abstract: ***Nigeria agricultural sector rely heavily on rainfed farming system, this has seen a wide gap in the annual rice demand-supply trend in the country. Thus, the importance of the study on comparative analysis of rainfed and dry season rice farming in value chain development programme in Ayamelum Local Government Area, which focused primarily on socioeconomic characteristics, profitability, and challenges faced by rice farmers in the area cannot be overemphasized. The study used a multi-stage sampling technique to elicit information from 70 rainfed and 30 dry season rice farmers. Combination of statistical tools of the descriptive, budgetary model and inferential statistics of unequal variance t-test was utilized. The finding had a mean age was 47 years and 46 years for rainfed and dry season respectively. This suggests that dry season rice farmers are younger in the area. Also, the mean farming experience was found to be 11 years and 15 years, this equally suggest that dry season rice farmers are better experienced in the area. The mean farm size of 1.98ha for rainfed against 1.14ha for dry season rice farming suggests that more lands are available for rainfed rice farming. Furthermore, the difference in profit was ₦72,794.81 significant at t-value of 22.83**. Some of the challenges recorded by rain-fed rice farmers include; cattle menace, high cost of labour, and competition. The challenges recorded by dry season rice farmers include; high cost of pumping machine, more incidence of birds attack, and high cost of inputs. Evidently, dry season rice farming is more profitable.***

Keywords: Rainfed, Net returns, Benefit-cost ratio, Operational expenses

1. Introduction

According to the International Rice Research Institute (IRRI) (2013), rice is a staple food for more than 3.5 billion people in the world. Rice is an important cash crop in Nigeria that has been found to thrive under four main ecologies (rainfed upland, shallow swamp & inland valley swamp, irrigated lowland, and mangrove or tidal swamp ecology) suitable for different rice varieties (Imolehin and Wada, 2005:12).

United State Department of Agriculture (USDA) (2014), asserts that rice is one of the fastest growing commodities in Nigeria's food basket with likelihood of continued growth, increased demand for rice in Nigeria is attributed to rapid population growth, urbanization and people's preference for rice as convenience food (Akande, 2003; USDA, 2014).

Foyeku and Rice Millers, Importers and Distributors Association of Nigeria (RIMIDAN) (2019), opined than annual rice demand in Nigeria is 7 million tonnes of milled rice but paddy production as at December ending 2017 was 5 million tonnes. These 5 million tonnes represents about 56% milled rice, this suggests that rice farmers in Nigeria only contributed 2.5 million tonnes to the quantity demanded. Thus, a huge gap (4.5 million metric tonnes) exist in the demand-supply chain in Nigeria and the deficit is bridged by importation. Despite the suitable ecology and edaphic rice environment for rice production, Nigeria is battling to attain self-sufficiency in rice production and supply (Imolihen and Wada, 2005).

Rice production in Nigeria is mainly in the hand of small-scale rice growers cultivating about 0.5 to 3 hectares, these small-scale farmers supply about 80% of rice produced in Nigeria (IRRI, 2013). Though, attempt to increase rice production in Nigeria, the federal government loaned out ₦43 billion through Anchor Borrowers Programme of the federal ministry of agriculture to 293,000 rice farmers which in turn produced rice that was sold at ₦193 billion (Ogbeh, 2018). This noble gesture of the federal government increased paddy output from 5 million tonnes in 2015 to 17 million tonnes in 2018. According to the Federal Ministry of Agriculture and Rural Development (FMARD, 2018), Nigeria will soon export her excess parboiled rice to Liberia, Ghana and Sierra Leone. This means that international market waits for rice farmers in Nigeria.

On the other hand, Anambra state alone demands 320,000mt of rice per annum (Anambra state Agricultural Development Programme (ADP, 2018). Thus, to meet this huge demand, Anambra state value chain development programme (ANSVCDP) encouraged rice farmers participating in the programme with the provision of tube-well, water pumping machine and dry season farm inputs at 50% subsidy. This will enable them to farm all year round.

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The need to expose the gain of dry season rice farming as against the rainfed cannot be overemphasized as several research authors have revealed in their study that irrigated rice farming is more profitable since only fewer farmers have the capacity to cultivate at this time. Babatunde et al (2016), assert that rice output under irrigation system has a wide gap with that of rainfed and the veritable profit from the enterprise can serve as a poverty alleviation programme to rural youths. Since Sani and Giroh (2014), suggests that younger farmers with a mean age of 46 years cultivating 1.96ha reported land, labour and agro-chemical as an important production factor under irrigation system, efforts should be directed at making such inputs factors available to the farmers.

Objective

The main aim of this study is to compare the net gain of rainfed and dry seasons rice farming in value chain development programme in Ayamelum local government area, Anambra state. specifically; the study tends to:

1) Identify the socioeconomic characteristics of rice farmers involved with rain-fed and dry season rice farming in the study area,
2) Estimate the profitability of rainfed and dry season rice farming in the study area,
3) Compare the difference in the profit of rainfed and dry season rice farming in the area, and
4) Observe the challenges facing rain-fed and dry season rice paddy farmers in the study area.

Hypotheses

There is no significant difference in the profit of rainfed and dry season rice farmers in the study area.

2. Research Methodology

The Study Area

The study was carried out in Ayamelum local government area, Anambra state. Anaku is the headquarter of the local government area. The 7 communities that make up Ayamelum local government area includes; Omor, Umueje, Omasi, Igbakwu, Umumbo, Anaku, and Ifite-Ogwari with a population of 158,152 (NPC, 2006). 2558 (1450 male and 1108 female) rice farmers are participating in the IFAD assisted Value Chain Development Programme in the area (Anambra state value chain database, 2019). Ayamelum is situated between Latitudes 6° 54'.95" N and Longitude 6°99'.38" E respectively, with an estimated land area of 598km^2 and density of 355.4/km^2.

Sampling Procedure and Method of Data Collection

List of participating rice farmers was made available by the Anambra state value chain development programme office and 100 farmers were drawn from the sample frame as the study representative. Multi-stage sampling technique was used to collect data from the 100 rice farmers separated by 70 rain-fed and 30 dry seasons rice farmers. Stage one: 2 villages were randomly selected from each of the 7 communities in the study area to make it 14 villages. Stage two: 5 rice farmers were randomly selected from the 14 villages to make it a total of 70 rain-fed rice farmers. Also, 3 communities (Omor, Umumbo, and Anaku) were purposely selected in the fourth stage because of the presence of irrigation water source like Anaku-ude spring that cut across the 3 selected communities. Furthermore, 2 villages were randomly selected to make it a total of 6 villages. Finally, 5 dry season rice farmers were randomly sampled to make it a total of 30 dry season rice farmers for the study.

3. Method of Data Analysis

A combination of analytical tools which includes; descriptive statistics, budgetary model and inferential statistics of unequal variance t-test were used. Objective 1, 3 and 4 were achieved with descriptive statistics. Objective 2 was achieved with a budgetary model. The model is presented below as:

A) Descriptive statistics for objective 1, 3 and 4 stated as;

$$\bar{X} = \sum \frac{FX}{n} \ldots\ldots Eqn.1$$

Where; $\bar{X}$ = mean, X = variable outcome, n = sample size, and F = frequency.

B) Budgetary model for objective 3 was stated as;

$$NG = TR - TC \ldots Eqn.2.1$$

$$TC = TFC + TVC \ldots.. Eqn.2.2$$

Where: NG = Net gain, TR = Total revenue, TC = Total cost, TFC = Total fixed cost, and TVC = Total variable cost.

C) Unequal variance t-test for hypothesis one was stated as;

$$t = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\left(\frac{S_1^2}{n_1} + \frac{S_2^2}{n_2}\right)}} \ldots.. Eqn.3$$

Where:

$\bar{X}_1$= Mean net gain for dry season rice paddy production

$\bar{X}_2$= Mean net gain for rain-fed rice paddy production

S_1^2= Variance of dry season net gain

S_2^2= Variance of rain-fed net gain

n_1 and n_2=30 and 70 sample size for dry season and rain-fed respectively

4. Results and Discussions

Socioeconomic characteristics of rice paddy farmers in the study area

The finding on socioeconomic characteristics in table 1 shows that the majority (58.57% and 66.67%) of the rice farmers in the rainfed and dry season were male respectively. the mean age for rainfed and dry season rice farmers was equally found to be 47 and 46 years respectively. This suggests that rice farmers in the programme are active and energetic. Most at times, experience comes with age, thus, the finding revealed a mean farming experience of 11 years for rainfed and 15 years for dry seasons rice farming.

The difference in farming experience could be as a result of technicalities involved in irrigated rice farming. This was further proven by their level of education. The majority (38.57%) of the rainfed farmers attended secondary school and the same with a majority (43.33%) of the dry season

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farmers but the difference in percentage is an indication that dry season rice farmers are more educated.

Furthermore, information on farm size shows that the mean farm size was 1.98 hectares for rainfed and 1.14 hectare for the dry season. This suggests that more land is available for rainfed rice farming than the dry season rice farming. Thus, to avert the paucity of land supply for irrigated rice farming, efforts should be directed into making more irrigable land available to the farmers.

Even the mean extension contacts of 2 time per cycle for rainfed and 3 times per cycle for dry seasons rice farming point to it that efforts are being directed to encourage off-season rice farming as a way out to surmount the demand-supply deficit highlighted in the study.

Table 1: Socioeconomic characteristics of rice paddy farmers in the area

Sn	Variable	Frequency		Percentage %		Mean	
		Main seasons (n = 70)	Dry season (n = 30)	Main	Dry	Main	Dry
1	Age:						
	≤ 30	4	1	5.71	3.33		
	31 – 40	14	10	20.00	33.33		
	41 – 50	9	12	12.86	40.00	47.47	46.23
	51 & above	43	7	61.43	23.33		
2	Level of education						
	Primary	20	5	28.57	16.67		
	Secondary	27	13	38.57	43.33		
	Tertiary	23	12	32.86	40.00		
3	Farming Experience						
	≤ 5	3	-	4.29	-		
	6 – 15	55	21	78.57	70.00	11.26	14.73
	16 – 25	12	7	17.14	23.33		
	26 & above	-	2	-	6.67		
4	Extension contact						
	≤ 1	11	8	15.71	26.67		
	2 – 3	51	12	72.86	40.00	2.14	2.60
	4 – 5	8	10	11.43	33.33		
	6 & above	-	-	-	-		
5	Farm size (ha)						
	≤ 1.9	35	25	50.00	83.33		
	2 – 3	25	4	35.71	13.33	1.98	1.14
	4 & above	10	1	14.29	3.33		

Source: Field Survey Data, May 2019.

Table 2: Estimation of the profitability of rainfed and dry season rice farming

Items	Rainfed				Dry Season			
	Quantity	Unit price (₦)	Amount (₦)	Value (₦)	Quantity	Unit price (₦)	Amount (₦)	Value (₦)
Revenue: Sales of paddy (kg)	9,155.71	110	1,007,128.57		5,830.00	130	757,900.00	
Yield/ha	4.624 tons				5.114 tons			
Variable cost:								
N.P.K Fertilizer (kg)	438.17	130	56962.10		219.63	140	30748.2	
Urea (kg)	200.50	140	28070.00		108.93	140	15250.2	
Seed (kg)	104.00	250	26000.00		53.20	300	15960	
Herbicide (liters)	7.92	1500	11880.00		2.28	3000	6840	
Insecticide (liters)	3.96	1500	5940.00		4.56	1500	6840	
Fungicide (liters)	3.96	1400	5544.00		2.28	3000	6840	
Mechanical labour (ha)	1.98	30000	59400.00		1.14	30000	34200	
Hired labour (man-day)	235	1200	282000.00		131.87	1500	197805	
TVC				475796.10				314483.40
Fixed Cost								
Land rent per cycle (ha)	1.98	16000	31,680.00		1.14	18000	20520	
Dep. on Knapsack sprayer	3	15000/5yrs	900.00		4	15000/5yrs	12000	
Dep. on pumping machine	2	70000/5yrs	28,000.00		3	70000/5yrs	56000	
Dep. on Sack bag	300	50/6mth.	5,000.00		450	50/6mth.	3750	
TFC				65,580.00				92,270.00
TC (TVC+TFC)			541,376.10				406,753.40	
Gross margin (TR-TVC)				531,332.47				443,416.60
Net gain (TR-TC)				465,752.47				351,146.60
Benefit-Cost Ratio				0.98				1.41
Return on Investment				0.86				0.86

Source: Field Survey Data, May 2019.

The profitability of rainfed and dry season rice farming calculated in table 2 had a mean paddy output of 4.624 tons/ha for rainfed and 5.114 tons/ha for the dry season. This suggests that dry seasons rice farming yields more grains since all the variables of production are subjected to the farmer's control at dry season. The farm is equally exposed to more sun-light for photosynthesis. The total cost incurred for rainfed farming under 1.98 ha. was ₦541,376.10 (₦288,573.79/ha) and ₦406,753.40 (₦388,961.93/ha) was incurred for the dry season under the 1.14 ha. The enterprise

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received revenue of ₦1,007,128.57 and ₦757,900.00 for rainfed and dry season respectively. The benefit-cost ratio of 0.98 for rainfed and 1.41 for the dry season is an indication that rice farming under rainfed can cover for its operational expenses by 98% and 141% for the dry season in a short run.

The production had a net-returns of ₦465, 752.47 (₦235,228.52/ha) for rainfed and ₦351,146.60 (₦308,023.33/ha) for dry season respectively. Finally, both seasons had a return on investment of 0.86 signifying that ₦1 capital investment in rice farming will return a profit of ₦0.86 to the business.

The difference in net gain among rain-fed and dry season rice paddy farming

The researcher used the difference in mean to ascertain the net gain of rice production at both seasons, finding revealed that the farmers make an extra ₦72,794.81 for engaging in dry season rice paddy production. Apart from ensuring continued availability/supply of rice to the food basket in the Nigeria economy, it also proved to be more profitable.

Table 3: Mean difference in the profitability of rice farming

Production season	Mean farm size (ha)	Net gain (₦)
Main seasons	1.98	465752.47
	1	235228.52
Dry season	1.14	351,146.60
	1	308,023.33
The difference in a net gain		**72,794.81**

Source: Field Survey Data, May 2019.

Challenges faced by both rain-fed and dry season rice paddy farmers

The challenges faced by rice paddy farmers at any of the production seasons was captured in table 7 above. Information on main season rice paddy farming shows that the major problems encountered in main season rice farming as shown by the following percentages: 95.71%, 71.43%, 61.43%, 48.57%, and 42.86% were cattle menace, competition, scarcity of labour, high cost of labour, and high incidence of pest and diseases respectively. Also, major challenges faced by dry season rice paddy farming had the following percentages; 96.67%, 90.00%, 76.67%, 70.00%, and 66.67% were the high cost of inputs, increase in bird attack, cattle menace, expensive water pumping machine, and poorly developed irrigation facility respectively.

Table 4: Challenges of rice paddy production at both main and dry seasons

Sn	Challenges	Frequency		Percentage (%)		Ranking	
		Main season	Dry season	Main season	Dry season	Main season	Dry season
1	Scarcity of labour	43	5	61.43	16.67	3	10
2	High cost of input	10	29	14.29	96.67	10	1
3	Flood	14	-	20.00	-	8	12
4	Drought	-	2	-	6.67	13	11
5	High incidence of pest and diseases	30	12	42.86	40.00	5	7
6	Increased bird attack	13	27	18.57	90.00	9	2
7	Control of water is expensive	20	9	28.57	30.00	6	9
8	Lack of market for the produce	8	-	11.43	-	11	12
9	Competition	50	12	71.43	40.00	2	7
10	High cost of labour	34	20	48.57	66.67	4	5
11	Cattle menace	67	23	95.71	76.67	1	3
12	Expensive water pumping equipment	17	21	24.29	70.00	7	4
13	Poorly developed irrigation facility	4	20	5.71	66.67	12	5

Source: Field Survey Data, May 2019. *multiple responses were allowed.

Table 5: Significant difference in the profitability of rice farming for both season

Variable	Obs.	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]	
Dry season	30	308,023.33	3334.638	18264.57	304503.2	318143.4
Main season	70	235,228.52	28.56451	238.9878	235143	235256.9
Combined	100	271,625.93	1,681.60	9,251.78	269,823.10	276,700.15
Diff		72,794.81	3334.761		69303.06	82943.68
t = **22.8272**		Satterthwaite's degrees of freedom			29.0043	

Source: Field Survey Data, May 2019.

Two samples unpaired and unequal variance t-test was used to observe if a significant difference exists in the net gain of the rainfed and dry season rice farming in Ayamelum LGA. The samples had 70 main season rice paddy farmers and 30 dry season rice paddy farmers in the study, finding shows a net gain difference of ₦72,794.81 and a t-value of 22.8272** significant at 0.000 probability level. Thus, the null hypothesis one is rejected hence the difference in net gain is significant in the study area.

References

[1] Agricultural Transformation Agenda (ATA) (2010). Rice Transformation Project Proposal Report submitted to the Federal Ministry of Agriculture and Rural Development, Abuja Nigeria.
[2] Akande, T. (2003). The Rice Sector in Nigeria. United Nation Crop Project (UNCP) Country.
[3] Babatunde R.O., Salami M.F., Mohammed B.A. (2016). Determinants of Yield Gap in Rainfed and Irrigated Rice Production: Evidence from Household Survey in Kwara State. Department of Agricultural Economics

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and Farm Management. University of Ilorin. *Invited paper presented at the 5th International Conference of the African Association of Agricultural Economists, September 23-26, 2016, Addis Ababa, Ethiopia.*

[4] Foyeku S. and Rice Millers, Importers and Distributors Association of Nigeria (2017). Nigeria cannot attain self-sufficiency in rice production by 2018. Retrieved online, January 12, 2018 from www.shipandport.com.

[5] Imolehin, E. D. and Wada, A. C. (2005). Meeting the rice production and consumption demands of Nigeria with improved technologies. National Cereals Research Institute Badeggi Niger State, Nigeria. Pp12.

[6] International Rice Research Institute (IRRI, 2013). World rice statistics. Retrieved from http://ricestat.irri.org:8080/wrs.

[7] NPC., 2006. National Population Census results. Federal Government of Nigeria Official gazette 24, (94): 6-7.

[8] Ogbeh A. (2018). Nigeria's Local rice output hits 17 million tonnes. Federal ministry of agriculture and rural development. Retrieved online January 12, 2019 from www.shipandport.com.ng.

[9] Tashikalma A. K., Sani R. M. and Giroh D. Y. (2014). Comparative Profitability Analysis of Selected Rainfed and Irrigated Food Crops in Adamawa State, Nigeria. *global journal of pure and applied sciences vol. 20, 2014: 77-87*. www.globaljournalseries.com.

[10] United State Department of Agriculture (2014): Agricultural Statistic. U.S. Government. Washington. Printing Office. DC Area (202) 512-1800.

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