parative Analysis of Resource Use Efficie... Crop nterprises in Lapai Local Government Area of Niger State.

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ABSTRACT

udy examines the resource use efficiency in cereal crop enterprise production in Lapai Local ment Area Of Niger state. The two cereal crops selected were rice enterprise and sorghum rise. Data for the study was collected from 40 rice farmers and 40 sorghum farmers randomly d in five villages. The data collection was from October to December 2006 cropping season. tion function analysis which incorporates the conventional neoclassical test of economic and al efficiencies were used as the analytical techniques. Profitability analysis was also used to ine the profitable enterprise. Findings revealed that for rice production fertilizer input was lly utilized by the farmers while other inputs seeds, labour and farm size were over used. On the and in sorghum production all the inputs seed, labour, fertilizer and farm size were over utilized. rofitability analysis revealed that rice enterprise was the most profitable with a mean net farm e value of N1,419,600.00 per hectare while sorghum had a net farm income of N7,700/ha. The show that there is the need for farmers to be advised on the appropriate allocation of resources st efficiency and output. This would mean using less of seeds input, labour and farmsize for rice ction, while for sorghum production less of all the inputs should be used.

ODUCTION

ls are the most important source of food an, early man depended entirely upon s as a major source of food and transition hunting to sedentary life revolves round ls. Most ancient civilizations tend to be on ereal crop or another as a source of food. l crops basically include rice, millet, maize, um, wheat, barley etc.

tudy focuses on sorghum and rice cereals, ium grain ranks fifth in the world after t, rice, maize and barley (FAO,2006). hum is a major crop for many poor ers especially in Africa, central America and (WIKIPEDIA,2006).

een 1960 and 1972, sorghum was reported ave accounted for 49% of the total uction of cereals in Nigeria and on the age 46% of the acreage devoted to it's vation. (FOS,1972). Sorghum is ominantly a starchy food, it has some ein content and a concentration of vitamin mplex on the outer bran layer of the grain)/ICRISAT,1996). Sorghum is locally umed in the form of indigenous food and drinks, porridges side dishes popped grains.(WIKIPEDIA,2006).It is a valuable industrial crop for the brewing of alcohol and non alcoholic drinks as well as in the bakery and confectionary industry .It is also a significant crop for animal feeds, stalks for thatching houses and making fences. (Oloko et, al. 2000,WIKIPEDIA, 2006).

There was an indication that rice was the major cereals for early societies in China and Sorghum for early societies in Africa (WARDA,1994) . However, rice ranks second in importance among the World population of cereals after wheat followed by maize and sorghum (WARDA,1994; Jones,1995).

Rice forms an important component of Nigeria's diet. The average Nigerian consumes 21kg of rice per year representing a percent of total calorie intake and 23% of total cereal consumption (FAO,2004) .Production is primarily by small scale producers with average farm size of 1-2 hectares (WARDA AND NISER,2001). Similar studies carried out by Ibrahim *et al.* (2005), in the same ecological

[illegible] as this present study [illegible] that farm [illegible] not significantly affect farmers output [illegible] rice production. The results [illegible] that [illegible] increase in farm size [illegible] to rice [illegible] will boost it's output.

[illegible] production increases, can result from expansion [illegible] cropped areas ([illegible], [illegible]), Nigeria [illegible] not been able to attain self sufficiency in [illegible] production despite increasing hectares put [illegible] production annually ([illegible], [illegible]).

[illegible] constraints to increase food production in [illegible] study area is attributed to a combination of [illegible] factors such as low and erratic [illegible] rainfalls, insufficient crop husbandry practices, [illegible] shortages, inadequate credit making the [illegible] adoption of improved technology beyond the [illegible] reach of small holder farmers. Untimely [illegible] availability and misappropriation of inputs due to [illegible] political interferences and greed, [illegible] inappropriate decision on how best to allocate [illegible] resources, inadequate use of complementary [illegible] production inputs and inadequate adoption of [illegible] improved technologies by farmers, poor land [illegible] tenure system. Cereal crops require highly [illegible] technical management at the farm level.

[illegible] Resource allocation and productivity is an [illegible] important aspect of increased food production [illegible] which is also associated with the management [illegible] of the farmers who employ these resources in [illegible] production. Farmers might use resources [illegible] rationally but not at the economic optimal level. [illegible] Against this backdrop, this study is aimed at [illegible] comparing resource efficiency between sorghum [illegible] and rice crop enterprises in the study area. The [illegible] broad objective of the study is to, compare the [illegible] efficiency of resource utilization between [illegible] sorghum and rice enterprises.

[illegible]ETHODOLOGY

[illegible]is study was carried out in Saka district in [illegible]pai Local Government Area of Niger state. [illegible]ger state lies between latitudes 8°21' and [illegible]°30' and longitudes 3°30' and 7° 20'. It is [illegible]uated in the middle belt zone of Nigeria and is [illegible]dispensably one of the largest fertile [illegible]ricultural lands in Nigeria covering about [illegible]73,170km² of the total land area of the [illegible]untry. The area has a tropical climate marked [illegible] wet and dry seasons. The inhabitants are [illegible]ainly Nupes, Kakanda, a small fraction of [illegible]waris and semi sedentary Fulani.

[illegible]e study focused on two cereal crops in the [illegible]ea which includes the rice crop enterprise and [illegible]e sorghum crop enterprise. Sampling [illegible]ocedure involved a multistage sampling [illegible]chnique in which firstly Saka district was purposively selected from [illegible] [illegible] [illegible] production in the area. [illegible] [illegible] were purposively selected from the [illegible]. Twenty [illegible] farmers ([illegible]) were randomly selected, [illegible] of [illegible] rice farmers and [illegible] sorghum farmers [illegible] making the total number of sampled farmers to eighty ([illegible]).

Data was collected in the [illegible] cropping season. Data used for the study was sourced primarily, [illegible] questionnaires. Data was analysed using descriptive statistics, regression analysis and farm budget techniques. Regression model was used to examine input-output relationship given by the implicit form;

$$Y = f(X_1, X_2, X_3, X_4, X_5, e) \quad \text{---------------------- (1)}$$

Where;

Y = Output of rice and Sorghum respectively in (Kg)

X_1 = Seeds used in (Kg)
X_2 = Labour in mandays
X_3 = Fertilizer used in (Kg)
X_4 = Farm size in (Has)
X_5 = Capital items in ₦ (Depreciated cost of fixed cost items)
e = error term.

Four functional forms were tried, and were expressed in the explicit form as;

$$Y = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + e \text{ ----------------------- EQN 1 (Linear)}$$

$$\ln Y = \ln b_0 + b_1\ln X_1 + b_2\ln X_2 + b_3\ln X_3 + b_4\ln X_4 + b_5\ln X_5 + e \text{ --- EQN 2 (Cobb-Douglas)}$$

$$Y = \ln b_0 + b_1\ln X_1 + b_2\ln X_2 + b_3\ln X_3 + b_4\ln X_4 + b_5\ln X_5 + e \text{ ---------- EQN 3 (Semi-log)}$$

$$\ln Y = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + \text{------} e \text{ ---------- EQN 4 (Exponential)}$$

Where;
b0 = constant.
b_1- b_5 = estimated regression coefficients.
e = error term,
X_1- X_5 = Independent variables

The functional form producing the best fit was chosen as the lead equation based on the following criteria:

The number of estimators that are statistically significant, value of F-statistics, magnitude of coefficient of multiple determination R^2

atory power of the model) and the al significance of the magnitudes of the nts and the signs on the estimated ers.The Cobb Douglas production Was chosen as the lead equation for While Linear function was chosen as equation for rice.

y of resource use was determined by wing ratios;

/MFC (Rahman and Lawal,2003 and ho et al; 2000)

PP, Py

dy/dx = b_i . Y_i/X_i , where the semi-log he lead equation.
dy/dx = b_i . Y_i/X_i , where the cobb- form is the lead equation.
dy/dx = b_i , where linear form is the ation.

Marginal value product of factor x_i
= Marginal physical product
Marginal factor cost, Pxi (unit price of

hmetic mean value of output
hmetic mean value of input considered
lt price of output

iency ratio; where;
resource is efficiently utilized
resource is under utilized
resource is over utilized,

dgeting techniques

argin=Gross farm income-Total variable

n income = Gross margin -Total cost

TS AND DISCUSSION

onomic characteristics of respondents
ults in table 1 revealed that 48% and f the respondents under rice and enterprise fell within the age range of ears. These distributions indicates that ths are highly involved in cereal crop on in the study area. The average ld size was 11 persons for both ses .Rice enterprise constituted mainly % male farmers while the sorghum se revealed that 17.5% were females 5% males.

dy revealed that farmers operated small rm holdings. The rice enterprise was characterized by 88.7% farmers having farm sizes of between 3-4 hectares and 11.3% having greater than 4 hectares. The sorghum enterprise revealed smaller farm sizes for farmers showing 38% having between 1-2 hectares and 61.3% having between 3-4 hectares. The level of education is very low with almost 92.5% of farmers in rice enterprise and 90% of farmers in sorghum enterprise having no formal education at all. While 7.5% and 10% from both enterprises revealed that they had Arabic education. The low level of education may have tremendous implication on adoption of innovation because this is a disadvantage to adoption. Nevertheless, the youthful nature of most of the farmers may be an advantage to innovation, since youths are said to less risk averse and may have better exposure to new ideas (Obeta *et al*).

Production input-output relationship

Following the apriori econometric criteria for the selection of the form producing the best fit. The linear functional form was lead equation for rice enterprise while the cobb-Douglas functional form was lead equation for the sorghum enterprise.

From Table 2, the linear functional form revealed that about 76.4% of the variation in rice output was explained by the factor inputs as indicated by the value of the R^2 . The variables labour (x_2) and cost of capital items (x_5) had positive coefficients and were statistically significant at 1% and 10% respectively. The variables seeds (x_1) and farm size (x_4) had negative coefficients and were significant at 1% and 10% respectively. Fertilizer (x_3) had a positive coefficient but was not found to be significant at all.

From table 3, the cobb-Douglas production function revealed that about 78.6% of the variation in sorghum output was explained by the factor inputs as indicated by the R^2 value. The factor inputs labour (x_2) and capital items (x_5) had positive coefficients and were significant at 1% . Seeds (x_1) ,farm size (x_4) and fertilizer (x_3) had negative coefficients, with fertilizer (x_3) and farm size (x_4) being significant at 1% level of significance.

These positive coefficients implies direct relationship between input and output and that increase in the quantity of these inputs would increase the output. The significant factor inputs implies that , they are the major determinants of output. The negative coefficients implies an inverse relationship between the factor inputs and output, suggesting that an increase in these

factor inputs would decrease output and vice versa.

Efficiency of resource Use

The marginal contributions of production resources in terms of the physical and value products and the level of input utilization depicting efficiency levels was revealed by tables 4&5 respectively.

The use of an extra unit of fertilizer input in rice production has the highest input of 1.244 and ₦49.76 addition to rice output and revenue respectively. Followed by fertilizer, while a unit increase in seeds and farm size would result in a reduction in the returns of rice output.

From table 5, in sorghum enterprise the use of an extra unit of labour input has the highest contribution of 2.632 and ₦ 65.8 addition to sorghum production. While in the case of sorghum enterprise, unit increases in seeds, fertilizer and farm size would only result in a reduction in the returns of sorghum output.

In comparing efficiencies of resource utilization in the cereal crop enterprises under study, findings revealed that for rice production fertilizer input was optimally utilized by the farmers, whereas seeds, labour and farm size were overused.

Profitability analysis

Table 6 revealed the findings of the gross margins and net farm incomes from the two enterprises respectively. The findings revealed that rice production enterprise contributed greater revenue of a mean value of ₦ 1,419,600.00/ha as compared to the sorghum enterprise of ₦ 7,700.00/ha.

CONCLUSION AND RECOMMENDATION

In comparison of efficiency levels of cereal crops under study, rice production enterprise was seen to be more efficient in resource utilization. The study revealed that the inputs in rice production were at least more sub optimally utilized as compared to the sorghum enterprise. Rice production was also seen to be more profitable.

These findings revealed that farmers should be advised to embrace rice cultivation seeing they have a better understanding and application of resource allocation to boost production. However, it also goes to say that to raise output in rice production farmers should be advised on the use of less of seeds input, labour input and farm size. While for the sorghum enterprise, less of all the inputs should be used to approach efficiency level. The study revealed that majority of the farmers were non literate ,thus in advising the farmers on appropriate allocation of resources will require the cooperation of the farmers themselves, the efforts of the research institute, the private sector, the Government and most importantly the extension agents. The extension agents should be on hand to assist farmers make, take and implement the right decisions towards allocation of these resources.

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Table 1: Socio-economic characteristics of respondents

Variable	SORGHUM		RICE	
	Frequency	Percentage	Frequency	Percentage
Age				
25-40	39	48	38	47.5
41-55	35	44	28	35
≥ 56	6	8	14	17.5
Total	80	100	80	100
Educational Status				
No formal Education	74	92.5	72	90
Arabic education	6	7.5	8	10
Primary education				
Secondary education				
Tertiary education				
Total	80	100	80	100
Gender				
Male	80	100	66	82.5
Female			14	17.5
Total	80	100	80	100
Farm Size (Ha's)				
≤ 1			31	38
1-2	71	88.7	49	61.3
3-4	9	11.3		
≥ 4	80	100	80	100
Total				
Household Size				
≤ 10	56	70	64	80
11-15	24	30	16	20
≥ 16	80	100	80	100
Total				

Source: Field survey data 2006.

Table 2: Estimated linear function for rice enterprise

Variable	Regression Coefficient	T-Values	R^2	F-ratio
Constant	-745.421	-3.879*	0.764	36.659
Seeds (Kg) (X_1)	-4.153	-3.538* * *		
Labour (X_2)	0.681	6.469* * *		
Fertilizer (kg) (X_3)	1.244	-0.789		
Farm size (Ha's) (X_4)	-0.240	-1.772*		
Capital items (₦) (X_5)	2.223	1.707*		

Source: Field survey data 2006. Note: ***, ** and * implies statistical significance at 1%, 5% and 10% levels, respectively.

Table 3: Estimated Cobb-douglas function for sorghum enterprise

Variable	Regression Coefficient	T-Values	R^2	F-ratio
Constant	4.231	3.027* * *	0.786	34.793
Seeds (Kg) (X_1)	-7.626E02	-0.587		
Labour (X_2)	0.476	5.171* * *		
Fertilizer (Kg) (X_3)	0.194	-2.211*		
Farm size (Ha's) (X_4)	-7.915E -02	-1.003*		
Capital items (₦) (X_5)	0.441	1.355*		

Source: Field survey data 2006, Note: ***, ** and * implies statistical significance at 1%, 5% and 10% levels, respectively.

Table 4: Efficiency of resource use in rice enterprise.

Resource	MPP (bi)	MVP (bi.py)	MFC (₦)	MVP/MFC
Seeds	-4.153	-166.12	30	-5.53
Labour	0.681	27.24	300	0.0908
Fertilizer	1.244	49.76	50	0.9952
Farm size	-0.240	-9.6	1500	0.0064

Source: Field survey data 2006.

Table 5: Efficiency of resource use in sorghum enterprise

Resource	MPP (bi)	MVP (bi.py)	MFC (₦)	MVP/MFC
Seeds	374.89	-9372.25	18	-520.680
Labour	2.632	65.8	300	0.219
Fertilizer	-4.516	-112.9	50	-2.258
Farm size	437.77	-10,944.25	1500	-7.296

Source: Field survey data 2006.

Table 6: Profitability Analysis Of Rice And Sorghum Crop Enterprise

Mean values/ha	RICE(N)	SORGHUM (N)
Gross farm income	1,968,000.00	177,000.00
Total cost	548,400.00	169,300.00
Fixed cost	38,372.75	23,112.05
Variable cost	510,027.25	146,187.95
Gross margin	1,457,972.75	30,812.05
Net farm income	1,419,600.00	7,700.00

Source: Field survey data 2006.