PRIVATE SECTOR (CANDELL COMPANY) AND BOOSTING RICE PRODUCTION A CASE STUDY OF R-BOX TECHNOLOGY ADOPTION IN BADEGGI BIDA LOCAL GOVERNMENT AREA OF NIGER STATE.

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ABSTRACT

The study investigated the role of private sector in boosting rice production a case study of R-Box technology adoption in Badeggi-Bida local Government area of Niger state. The primary data used for the study was obtained through the use of structured questionnaire administered to ninety-six farmers. A multistage sampling technique was employed to select the farmers. Descriptive statistic and multiple regression analysis were used for the analysis of data. The results showed that 62.4% of the farmers who used the R-Box technology were between the age group of 30-59 years of which 85% were males. It went further to reveal that 31.25% of farmers who used the R-Box package realized a revenue of N400,000 while about 70.83% of those who did not use this package realized less than N100,000. The study revealed that the variables of fertilizer use,labour,farmsize and credit use were found to be statistically significant for those who used the R-Box package and with an R^2 of 93%. However only fertilizer, farmsize and credit were found to be positive and significant for farmers who did not use the package. The study concluded by recommending the need for a collaboration of the private sector (i.e Candell Company) with financial organizations to grant soft loans to farmers to enable them procure the R-Box package.

INTRODUCTION

A complete package for rice production with R-Box technology as its trade name was initiated, by the candel company in collaboration with national cereals research institute (N.C.R.I) Badeggi. National seed services (NSS) , premier seed. Federal Department of Agriculture (FDA) and the Agricultural development project (ADP) of Niger state and FCT. This conservation tillage project was developed under the current presidential initiative on rice production. The objective of the scheme was to demonstrate and train farmers on conservation tillage practice. Conservation tillage crop production was introduced with a view of reducing the adverse effect on conventional tillage. it includes tillage system that creates as good an environment as possible for growing crops and optimize conservation of soil and water resources consistent with soil and economic practices.

More than 60% of rice produced in Nigeria comes from the low land (Singh et al, 1997). However the hectarage and productivity growth is low and may be difficult to sustain because of limited tractor availability, declinining soil structure and increase in the population and diversity of perennial weeds in the low land. These situations have made minimum tillage with the use of cost effective herbicides apparently viable. The complete package of improved management practices for rice production includes; variety, method of land preparation, optimum planting date and density, fertilizer (dose,timing,application mode), water management, inexpensive but safe pest and disease control optimum harvesting date and methods of harvesting, threshing and drying.(WARDA,2002). Their concern in the field of agriculture is to bring about agricultural development through best quality and quantity of rice production, using necessary technology which is R-Box technology through application of agricultural research findings. However certain

conditions must be met, these includes;

i. The willingness by citizens to advance economically
ii. Opportunities and organizations to use the technology
iii. Elimination of political, social and economical obstacles
iv. Ability to incorporate the technology in overall development and to continue using it.

militating against the self sufficiency of rice production in the country, these includes;

Several production constraints/problems have been identified as limiting factors

i. Limited adoption of improved practice
ii. Inadequate credit/input
iii. Lack of appropriate implements
iv. Disease and pest attack
v. Nutritional disorder/iron toxicity
vi. Soil and water management
vii. Inconsistency in government policy (NCRI, 1997).

It has also been identified in the study area that there exists a shortage in its production among the small scale farmers and even that which is of low quality, due to traditional farming practices,slow rate of adoption of new technology and most importantly the challenge of credit to purchase inputs adequately and also in good time. These problems identified, by Candell group of companies necessitated what is known as the Rice-box technology with an aim to boosting rice production among small scale farmers.

The components of R-Box technology includes;

i. Chemically dressed upland and lowland seed variety.
ii. ORIZO plus which is a broad- spectrum rice herbicide
iii. Boost extra which is a folia fertilizer
iv. ZDP which is an insecticide

R-Box technology was purchased by the farmers at N7000 (seven thousand naira) it yield in kg (output) was estimated to be 3.5 tons/hectare. The technology is adoptable because all the input for rice production is intact in the box. This gives adequate inputs for rice production. The package was made through farmers participatory selection of the various input based on that of standardizing the cultivation culture in both upland and lowland rice. Each unit of package contains the entire variable "input" required for the cultivation of a quarter (0.25) hectare of rice from planting to harvesting. In the pilot scheme a total of eleven farmers (9) from Niger state and two (2) from FCT were selected for participation in the field evaluation of the package. An interactive pre-season work shop was first organized at NCRI headquarters Badeggi to train the participatory farmers on the protocol for using the package.

OBJECTIVES

The broad objective of this study is to determine the role of the private sector in boosting rice production in the study area. The specific objectives are to :

i. determine the socio-economic characteristic of farmers in the study area;
ii. compare the productivity levels of farmers that adopted R-Box technology and those who did not;
iii. determine the cost and return from the use of R-Box technology;
v. make policy recommendation based on the findings.

METHODOLOGY

The study area of this research is Badeggi, Bida local government area of Niger state. The state has 25 local government areas. Niger state lies between latitude 30-20o north, it is boarded to the north by Sokoto state, west by Kebbi state, south by Kogi state and south west by Kwara state and south east respectively.

Niger state is situated in the middle belt zone of the country. The state is indispensably one of the largest fertile agricultural lands in Nigeria. The study area is characterized by annual rainfall of 1400mm (NGSG, 2003; NSDPA 1997).

A multiple stage sampling technique was used; first Bida local government was purposively selected because of its prevalence in rice production, secondly four district areas from which two villages each were randomly selected giving a total number of eight villages. Thirdly a total number of 12 farmers from each of the (8) eight villages (six (6) of those using R-Box technology and six (6) of the farmers not using) were randomly selected giving rise to a total number of 96 farmers. Data were collected through the use of well structured questionnaire and personal interviews and were analyzed with the use of simple descriptive statistic such as percentages, other statistical analytical tool that was used includes the multiple regression analysis.

LITERATURE REVIEW

Rice has a great potential and can play a crucial role in contribuiting to food and nutritional security, income generation, poverty alleviation and socioeconomic growth of Nigeria. Globally rice is an important food crop and is easily preferred over many traditional foods such as sorghum,millet and most root and tuber crops such as yam and cassava.(Defoer et al,2004, World bank,1996 and Warda,2001). Nigeria has the potential to be self sufficient in rice production as virtually all the ecological zones are suitable for its cultivation either as swamp,upland or under irrigation (FAS,2002 and PCU 2002).Production is primarily by small-scale producers with average farm size of 1-2 hectares. Average yield of upland and low rainfed rice in Nigeria is 1.8 tons/ha,while that of irrigation is 3.0 tons/ha.(PCU,2002). This very low when compared with 3.0 tons/ha from upland and lowland systems and 7.0 tons/ha from irrigation systems in places like Cote d ivoire and Senegal (Warda and Niser 2001).

The setting up of the presidential task force on rice production was to enable the achievement of being self sufficient and to export.The initiative seems not to have solved the problem of the rising demand against the inadequate production. Against this backdrop it is pertinent to involve all stakeholders most particularly the private sector. Improvement in efficiency of resource use by farmers, adoption of improved technology and production practices could be brought to bear through interventions and programmes from the private sector.

THEORETICAL FRAMEWORK

Production function stipulates the technical relationships between inputs and output in any production process (Olayide and Heady 1982;Chambers 1988; Yilmaz and Ozkan,2004). It can be expressed in implicit form as :

$Y_I = F(X_I)$ ----------EQN 1

Where ;

Y_I and X_I denotes outputs and inputs respectively and I is the i th output and input.

However, for this study the multiple regress ion was used to compare and estimate productivity levels of farmers who adopted R-Box technology and those who did not. The model was expressed in its implicit form as;

$Y = F(X_1, X_2, X_3, X_4, X_5, X_6,$ ---------- e)----------EQN 2

Where ;

Y = Output of rice in bags

X_1 = Amount of fertilizer used in Kg

X_2 = Quantity of improved rice seeds used in Kg

X_3 = Chemicals used in N

X_4 = Farm size in (Ha)

X_5 = Labour used in N

X_6 = Amount of credit used in N

Being the estimated parameters fo r both those who adopted rice box technology and those who did not.

Four functional forms were estimated using ordinary least squares (OLS) estimation technique. The four functional forms were expressed in the explicit form as;

Farmers who adopted the R-Box technology:

Linear:

$Y_w = b_0 + b_1x_1 + b_2x_2 + b_3x_3 + b_4x_4 + b_5x_5 + b_6x_6 +$.....e ----------EQN 3

Cobb-douglas

$\ln Y_w = \ln bo + b_1 \ln x_1 + b_2 \ln x_2 + b_3 \ln x_3 + b_4 \ln x_4 + b_5 \ln x_5 + b_5 \ln x_5 + b_6 \ln x_6 +$---------e ----EQN 4

Semi-log:

$Y_w = \ln bo + b_1 \ln x_1 + b_2 \ln x_2 + b_3 \ln x_3 + b_4 \ln x_4 + b_5 \ln x_5 + b_5 \ln x_5 + b_6 \ln x_6 +$---------e ------EQN 5

Exponential:

$\ln Y_w = b_0 + b_1x_1 + b_2x_2 + b_3x_3 + b_4x_4 + b_5x_5 + b_6x_6 +$.....e ----------EQN 6

Farmers who did not adopt the R-Box technology:

Linear:

$Y_{wo} = b_0 + b_1x_1 + b_2x_2 + b_3x_3 + b_4x_4 + b_5x_5 + b_6x_6 +$.....e ----------EQN 7

Cobb-douglas

$\ln Y_{wo} = \ln bo + b_1 \ln x_1 + b_2 \ln x_2 + b_3 \ln x_3 + b_4 \ln x_4 + b_5 \ln x_5 + b_5 \ln x_5 + b_6 \ln x_6 +$---------e ----EQN 8

Semi-log:

$Y_{wo} = \ln bo + b_1 \ln x_1 + b_2 \ln x_2 + b_3 \ln x_3 + b_4 \ln x_4 + b_5 \ln x_5 + b_5 \ln x_5 + b_6 \ln x_6 +$---------e -----EQN 10

Exponential:

x_1- x_n = 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 (explanatory power of the model) and the statistical significance of the magnitudes of the coefficients and the signs on the estimated parameters. The Cobb Douglas production function was chosen based on the above specified criteria.

RESULTS AND DISCUSSION

a. Socio-economic status of respondents.
The socio-economic characteristics of respondent considered in this research work includes; age, sex, house hold size, level of education and source of awareness. Table 1 revealed that about 62.4% of respondent that made use of R-Box technology fell between the age of 30-59 years while about 66% of those that did not use R-Box technology fell at the age of 60 years and above, this signifies that youths are quiet receptive to adopting new technologies, of which 85% were males and found to be more responsive to new technology than the women according to the results.

The table also revealed that both categories of respondents have a household size of 6-10 persons i.e 60% and50% respectively. Eighty-four percent (84%) of the respondents who made use of R-box technology are literate while 68% of those who did not adopt the technology are illiterate, this reveals that the level of education has a positive significance and relationship to adoption of new technology.

Source of awareness of respondents about R-Box technology.
About 52% of respondent got to know about R-Box technology through agricultural development project (ADP) while more of them heard it from the television.

Table 1
SOCIO-ECONOMIC CHARACTERISTICS OF RESPONDENTS IN THE STUDY AREA

Class	F.W.R -Box Tec Frequency	%	F.W.O R -Box Tech Frequency	%
Age (Years)				
0-29	11	22.9	-	-
30-39	8	16.6	3	6.25
40-49	14	29.2	6	12.50
50-59	8	16.6	7	14.58
60 Above	7	14.7	32	66.07
Total	48	100	48	100

SEX				
Male	41	85.42	35	72.92
Female	7	14.59	13	27.08
Total	48	100	48	100
Household size				
0-5	16	33	17	35.42
6-10	29	60	24	50.00
11-20	3	6.25	7	14.58
21 above	-	-	-	-
Total	48	100	48	100
Educational level				
Arabic	18	39.50	11	22.90
Primary	18	16.67	4	8.35
Secondary	15	31.25	-	-
Tertiary	-	-	-	-
Illiterate	7	14.89	33	68.75
Total	48	100	48	100

Source of awareness		
Means of awareness	Number of respondents	%
Through friends and neighbour	6	12.50
Through Radio	5	10.41
Through Television	-	-
Directly from research Institute	12	25.00
Through The ADP	25	52.09
TOTAL	48	100

NOTE: F.W.R= Farmers with Rice -Box technology
F.W.O.R= Farmers without Rice Box technology
Source: Field Survey data 2006.

Cost and Returns Of Respondents

The results in this table shows that 18.7% of farmers with R-Box invested more than forty thousand naira (N40,000).While 4.17% of farmers who did not make use of the R-Box technology invested less than thirty thousand (N30,000).

31.25% of respondent that used R-Box technology realized the revenue of over four hundred thousand naira (N400,000), while 70.83% of those who did not use R-Box had revenue of less than one hundred thousand naira (N100,000).It can be implied from the level of income realized that the use of this package brought about this amount of income realized (ie above N400,000), as compared to the amount realized by those farmers who did not use the package. It can be inferred that this no doubt resulted from the high quantity of rice realized after production

TABLE 2

DISTRIBUTION OF RESPONDENTS ACCORDING TO AMOUNT INVESTED AND REVENUE REALIZED

Total amount invested ₦	F.W.R - Box Tech.	%	F.W.O.R -Box Tech.	%
?5000				
6,000-15,000	6	12.50	25	52.08
16,000-20,000	7	14.59	17	35.41
21,000-30,000	15	31.25	2	4.17
31,000-40,000	11	22.91		
>40,000	9	18.75		
TOTAL	48	100	48	100
Revenue Realized ₦				
?50,000			14	29.17
51,000-100,000	4	8.34	34	70.83
101,000-150,000	1	2.18		
151,000-200,000	8	16.67		
201,00-250,000	4	8.33		
251,000-300,000	16	33.33		
301,000-400,000	15	31.25		
Total	48	100	48	100

NOTE: F.W.R.= Farmers with Rice-Box
F.W.O.R = Farmers without Rice - Box
Source: Field Survey data 2006.

REGRESSION ESTIMATES FOR RICE PRODUCTION WITH R-BOX TECHNOLOGY AND WITHOUT R-BOX TECHNOLOGY

The results of the multiple regression analysis were obtained by regressing six (6) variables; amount of fertilizer used (x_1), quantity of improved rice seed used(x_2), chemicals used (x_3), farm size (x_4), amount of labour (x_5) and amount of credit used (x_6) against the output (Y) being of rice in kg/ha. Four functional forms were tried and the Cobb Douglas Production function was chosen as the lead equation.

FARMERS WHO USED R-BOX TECHNOLOGYY

From table 3, the value of the coefficient of multiple determination (R^2) indicated that about 93% of the variation in output in rice production is explained by the explanatory variables in the model. The results here revealed that farmers who used this technology had a significant F-statistic. Fertilizer use (x_1) was found to be positive and statistically significant at all levels. This implies that fertilizer has a positive and statistical effect on rice output. The coefficients of the Cobb-Douglas production function are direct elasticities, this means that if fertilizer input is increased by 0.228% by 1 bag holding other variables constant, output of rice will increase by 0.228%. Improved rice seed variety (x_2) was negative and not significant at any level. We can safely deduce that the variety had no significant effect on rice production, and inefficient production practices in spacing, time of fertilizer application,weeding etc could be contribuitory factors to the insignificant effect of improved rice seeds on the yield of rice.

Labour (x_5) was also found to be positive and statistically significant. This implies that increasing labour will increase the output of rice. Chemical (x_3) was not significant although it had a positive coefficient and by implication an increase in the quantity of chemicals applied to rice does not have any significant effect on rice output. Farm size (x_4) was found to be positive and statistically significant at 5%, this is seen to be in agreement with theory. Amount of credit (x_6) was also seen to be positive and significant at 1% for rice production.

Table 3
ESTIMATES OF COBB -DOUGLAS PRODUCTION FUNCTION FOR RICE PRODUCTION WITH R-BOX TECHNOLOGY

Variables	Regression coefficient	T-value	Level of significance
Constant term	-1.427	-1.064	0.294
Fertilizer (x_1)	0.228	2.324	0.05
Improved rice seed (x_2)	-0.171	-3.217	0.01
Chemical (x_3)	1.096E-02	0.238	
Farm size (x_4)	0.400	2.252	0.05
Amount of labour (x_5)	0.183	1.774	0.1
Credit used (x_6)	0.539	4.191	0.01
R^2	0.93		
F value	91.535		

Source: computed from survey data 2006.

FARMERS WHO DID NOT USE R-BOX TECHNOLOGY

The value of the coefficient of determination R^2 indicated that about 95% of the variation in rice output was explained by the explanatory variables in the model. The F-statistic was significant, the variables fertilizer (x_1) ,farm size (x_4) and credit (x_6) were found to be positive and affected rice output significantly. Other variables i.e local rice varieties (x_2) chemicals (x_3) and amount of labour used (x_5) did not affect rice output significantly. From this results it can be deduced that the output of rice production is boosted by the efforts of the Candel company through the R-Box technology as compared to the traditional methods and use of local varieties by farmers in the study area.

TABLE 4 ESTIMATES OF COBB -DOUGLAS PRODUCTION FUNCTION FOR RICE PRODUCTION WITHOUT R-BOX TECHNOLOGY

Variables	Regression-coefficient	T-value	Level of significance
Constant term	1.627	2.115	0.041
Fertilizer (x_1)	0.220	2.926	0.01
Local rice seed varieties (x_2)	-4.116E-02	-0.754	
Chemical (x_3)	2.815E-02	0.436	
Farm size (x_4)	0.705	8.045	0.01
Amount of Labour (x_5)	7.506E-02	0.846	
Credit used (x_6)	0.124	2.505	0.05
R^2	0.95		
F- Value	134.32		

Source: computed from survey data, 2006.

SUMMARY CONCLUSION AND RECOMMENDATION

The adoption of R-Box technology was observed to be an important technology in boosting the productivity of rice farmers in the study area. The adoption of R-Box technology by the farmers was what accounted for the high and significant level of agricultural production and high revenue/ profit realized from its sale from the study carried out. The adoption of R-Box technology with efficient resource allocation cannot be over emphasized. Based on these findings it is recommended, that the Candell group should themselves liaise with some financial institutions to provide credit for these farmers to assist them procure the R-Box, particularly at low interest rates.

REFERENCES

Aye,G.C.and Oboh,V.U. (2006): Resource use efficiency in Rice Production in Benue state, Nigeria; Implications for food security and poverty alleviation.In: Proceedings of the 20th conference of farm management association of Nigeria (FAMAN), held on the 18th-21st September,2006 at Forestry Research Institute of Nigeria, Federal College Of Forestry Jos,Plateau state. Eds: Shola Adepoju and Peter Bola Okuneye.

Chambers, G.R .(1998) : Applied production analysis 5th edition Cambridge university press. U.K.

Defeor,T; Woperis,M.C.S.; Jones, P.R.;Lancon,F.; Erestein,O.:and Guei,R.G. (2004): Challenges and Technical Oppurtunities for rice production systems for food security and poverty alleviation in sub-saharan Africa. FAO Rice conference Rome, Italy.12-13 febuary 2004.

FAS (2002):Nigeria Rice Production and Import duty raised. www.fas.org 12th/October/2003

International Rice Research Institute (IRRI)(1995):World Rice Statistics.Pp34-42.

National Cereals Research Institute NCRI, (1997). Rice production and processing training manual.

Niger State Agricultural Development Project NSADP, (1997): Food basket: an information booklet on Niger state Ministry of Agriculture and Natural Resource pp 1-18

Niger State Dairy NGSG, (2003): A yearly Publication by Ministry of Information and Culture, Niger state pp1-6

Olayide,S.O. and Heady, E.O. (1982) :Introduction to agricultural production economics.University press Ibadan. Pp 233-283.

Okoruwe,V.O.and Ogundele,O.O.(2004): Technical efficiency differentials in rice production technologies in Nigeria.www.aercafrica.org/documents/rp research paper 154.
22nd august 2008.

Project Coordinating Unit (PCU)(2002):Crop Area Yield Survey (CAY). Federal Ministry Of Agriculture and Rural Development,Abuja.

Singh, B.N et al (1997). Rice growing Environments and Biophysical constraints in different agroecological zones of Nigeria. Met.J.2 (1) 35-44. spore (1996).

World Bank (1996): African Rice: History and Future Potential.African development indicators.world bank Washington.D.C.

Yilmaz,I. and Ozkan (2004) :Econometric analysis of land tenure systems in ctton production in Turkey.International journal of biology and agriculture.1560-8530; 1023-1025.