TECHNICAL INEFFICIENCY AND COMPETITIVENESS IN PRODUCTION: THE CASE OF RICE FARMERS IN NIGER STATE, NIGERIA.

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ABSTRACT

The study examined technical inefficiency and competitiveness among rice farmers in Niger State, Nigeria. Data for the analysis came from a random sample survey of the area of study. A Single-stage (Cobb-Douglas based stochastic frontier production function was used in analyzing the data. Evidence from the analysis indicates that the coefficient of land, male family labour and female family labour are 0.1354, 0.2713 and 0.2842 respectively. Those for hired labour, miscellaneous cost and improved seeds are 0.1637, 0.1165 and 0.5432 in that order. With coefficient of 0.5432, improved seeds tend to have the greatest impact on rice production. This is followed by female family labour. The coefficient of female family/ male family labour ratio indicated that the contribution of female and male to output is not the same. The average technical efficiency of about 0.81 is obtained. The average technical inefficiency is thus 0.19. The results of the inefficiency model show that farming experience, extension visits, and ratio of number of female to household size is negative and significant. The implication is that increases in these variables reduce the technical inefficiency of the farmers. About 85% of the farmers have their technical efficiency being greater than or equal to the mean technical efficiency. Rice production is thus classified as being competitive. Farm expansion, access to improved seeds, training programme and effective extension delivery services system measures were recommended

KEYWORDS: **Technical inefficiency, competitiveness, rice farmers, Niger state, Nigeria.**

INTRODUCTION

Rice is one of the major cereals widely grown for food in Nigeria. It is cultivated under diverse ecological and production systems. Five major systems have been identified. These are the upland rain-fed, inland shallow swamp, deep water/floating and lowland irrigated rice production systems (Olayemi 1997). The land area under rice cultivation in Nigeria was about 1.642 million hectares (FAO 1994). According to Nigeria Business (2004), the estimated area planted with rice is about 1.25 million hectares. These values indicate a reduction in area over the period 1994-2004.

Population pressures have led to high demand for food in most developing countries. However, the food producing capacity of these countries is constrained by two factors. These factors are the use of marginal lands or the diminishing opportunities to use new lands and declining productivity of over-cultivated areas caused by natural resource degradation (Crosson and Anderson 1992, McCalla 1994, Fulginito and Perrin 1998).

Federal Ministry of Agriculture (FMA) (1993) estimates that annual supply of food crops would have to increase at an average annual rate of 5.9% to meet food demand and reduce food importation significantly. Food production is known to be growing at about 2.8% per annum while the annual rate of population growth is 3.5% (Ajibefun and Abdulkadir, 1999). The reality is that Nigeria has not been able to attain self-sufficiency in food crop production despite increasing hectares put into production annually.

The major sources of change in food production include changes in the hectares of various crops cultivated annually, changing production technologies which affect variation in the yields, and the productivity of inputs used in crop production (Olayemi, 1997).

In Nigeria, Ofada rice was the common traditional seed variety planted. In more recent years, improved seeds of Federal Agricultural Research Oryza (FARO) and others have come into prominence (Olayemi, 1997). In addition to this, improved management practices such as improved seeds (FARO series), use of fertilizers and agrochemicals, agronomic practices (nursery dressing, transplanting, spacing, seed pruning, seed rate), have been developed and disseminated to farmers (NCRI, 1984; 1997). The issue of inefficiency, competitiveness of production and related productivity effects of these technologies has not been sufficiently investigated.

STATEMENT OF THE PROBLEM

Recent rice importation figures attest to the fact that rice is in high demand in Nigeria (Bello, 2004). The local production of rice is estimated to be three million tonnes. The current demand amounts to five million tonnes (NAMIS, 2004). There is a demand-supply gap of two million tonnes per annum for rice in Nigeria. In 1990, Nigeria imported 224,000 metric tonnes of rice valued at $US 60 million. Importation of rice rose to 345,500 metric tons in 1996 with a value of $US130 million. By 2001, rice import increased to 1.51 million metric tonnes valued at $US288.1 million (FAO, 2003). In 2003, Nigeria imported rice worth over $US 700 million when unrecorded trade (smuggling) is considered (Bello, 2004). This constitutes a great drain on the foreign exchange of the nation. The latest figures on rice production in Nigeria sourced from FAOSTAT (2006) cover the period 1990-2004. The figures of local output are used to represent domestic supply (DS) while the summation of domestic supply and imports is used to represent the total domestic demand (DD) for rice. Rice self sufficiency ratio (SSR) is calculated as the total domestic supply divided by the total domestic demand (SSR=DS/DD). This ratio is less than one for the period covered. This means that Nigeria is not self sufficient in rice production (Table 1).

This situation prompted the federal government to find ways of boosting the local production of rice. To this end, it allocated N1.5 billion for certified rice seeds multiplication and distribution (Bello, 2004). This, according to Bello (2004) is important in achieving rice self-sufficiency in Nigeria. Nasko (1989) and Bello (2004) asserted that Nigeria has the potential to provide enough rice from local production for its needs and even export.

The efficiency with which, farmers use resources, and the improved technologies/management practices available to them are important in agricultural production. The main issue in the Nigerian agriculture is that of low productivity. In recent years, despite all the human and material resources put into the sector, the rate of its productivity increase is said to be declining (Falusi, 1995). According to FACU (1992) and FDA (1995), the productive efficiency for most crops still fall under 60 percent. These shortfalls are attributed to inefficiency in production. The implication is that there is scope for additional increases in output from existing hectarages of food crops, if resources are properly harnessed and efficiently allocated. This study becomes crucial since increased output and productivity are directly related to production efficiency/inefficiency given the state of technology. According to Kalirajan and Shand (1989) and Parikh and Shah (1994), the level of technical inefficiency of farmers could be determined by a host of socio-economic and demographic factors

Rice self- sufficiency is a policy goal of the Nigerian government (Bello, 2004). The study of inefficiency focuses on the possibility of increasing output. It also focuses on conserving resources in use. This is an important aspect from the point of view of productivity increases necessary to achieve self-sufficiency in production. Inefficiency measurement can provide information, which is potentially useful in the formulation and analysis of agricultural policy. This can provide insight into the potentials for improved performance and expanded production. It can have far reaching implications for policy issues regarding price policy, import substitution, input supply and land distribution.

The main objective of this study is to analyze the production inefficiency and competitiveness in rice production in Niger State, Nigeria. The specific objectives are to:

Determine factors influencing rice production, ascertain the factors affecting the technical inefficiency of rice farmers, and examine the competitiveness in rice production among the farmers in the study area.

Issues in the Literature on Stochastic Frontier Production Functions Application

The relative efficiency in agricultural production is an important aspect from the point of view of agricultural development in developing countries (Umesh and Bisaliah, 1991). Economic efficiency comprises both technical and allocative efficiency and it is the product of technical and allocative efficiency (Rahman, 1994). The measurement of technical efficiency/inefficiency indicates to what extent resource-savings can be made or output increased without increasing the input- use levels. This is critical in developing countries where resources are meager and opportunities for developing and adopting better technologies are dwindling (Ali and Chaudhury, 1990). Hence, the optimal use of available resources is of policy relevance in this setting. Identifying the sources of inefficiency provides the structural handle for the remedies for reducing this and raises output levels (Admassie, 1999).

Stochastic frontier production functions have been applied in many studies to estimate technical efficiency/inefficiency in production (Battese et. al., 1996). However, there seems to be two schools of thought on the appropriate estimation approach for the model.

In the first approach, the technical inefficiency effects are assumed to be independently and identically distributed as half-normal or exponential random variables (Aigner et. al., 1977; Meeusen and Broeck, 1977; Jondrow et. al., 1982). As a result, in some empirical papers, the parameters of the stochastic production function are estimated as a first stage and the technical efficiency levels obtained. The predicted technical inefficiency effects are then regressed on various farm-specific variables believed to be significant in explaining inefficiency as a second stage (Parikh and Shah, 1994; Tadesse and Krishnamoorthy, 1997; Admassie, 1999).

In this procedure, and according to Battese et. al., (1996), the second stage contradicts the distribution assumption underlying the model. The technical inefficiency effects are assumed to be a function of farm factors, which implies that they are not identically distributed (Battese and Coelli, 1995; Coelli, 1994; Battese et. al., 1996). This apparent theoretical inconsistency led to a re-specification of the stochastic frontier models. In the re-specified formulation, the inefficiency effects are made an explicit function of farm specific factors and both the stochastic production function and the inefficiency models are simultaneously estimated (Kumbhaker et. al., 1991; Reifahneider and Stevenson, 1991; Haung and Lui, 1994; Battese and Coelli, 1995; and Battese et.al., 1996). These observations informed the use of the one-stage estimation technique in this study (Yao and Liu, 1998).

The analysis of technical efficiency also aims at evidencing one of the factors that determine the competitiveness of a farm or that of an economic sector. This methodology focuses on one of the factors from the microeconomic viewpoint. According to Apezteguia and Garate (1997), the implicit hypothesis in the approach is that if a farm or a productive unit is more efficient than any other, it is more likely to be competitive. This is in spite of the fact that competitiveness depends on a large set of both macro and micro-economic elements. This type of analysis is intended to provide a global measurement of the productivity of each of the participant in a particular sector.

A consistent approach to the measurement of technical efficiency/inefficiency is based on stochastic frontier production function estimation. The two benefits of this methodology are: (i) it reflects the technology in use in production, which is heavily influenced by the best performing farms and (ii) it represents the standard or technology against which the efficiency of farms within the sector can be measured. Competitiveness is hereby conceptualized as follows: a farm is most efficient and competitive if its technical efficiency is greater than or equal to the mean level for the sector and it is less efficient and less competitive otherwise.

Methodology

(i) Area of Study

Niger State, Nigeria is located between latitudes $8^0\ 11^1$ and $11^0\ 20^1$ N of the equator, and between longitudes $4^0\ 30^1$ and $7^0\ 15^1$E of the equator. It covers an estimated area of 4,240km^2. The mean annual rainfall ranges between 800 to 1000mm. The average annual number of rainy days ranges between 187 to 220 days. The rains start late April and end in October with the peak being in July. The dry season lasts for about six months of the year from November to April. The average minimum temperature is about 26^0c while the average maximum temperature is about 36^0C. The mean relative humidity ranges between 60 percent (January to February) and 80 percent (June to September). The state falls within the guinea Savannah vegetation belt. This vegetation supports the cultivation of root crops and grains. The predominant crops are rice, sorghum, millet, yam, groundnut and cotton. (NCRI, 1984; 1997).

(ii) Data collection

Bida zone in Niger Sate, Nigeria was purposively selected for this study. The selection was based on: one, its long history of lowland rice production. Two, is its proximity to the National Cereals Research Institute (NCRI) at Baddeggi where low land rice technologies emanate and are disseminated.

Bida zone is made up of seven local government areas. Three of these, Lavun, Bida and Gboko LGAs were purposively selected. In each LGA, 4 villages were randomly selected for a total of 12 villages. These are Labozhi, Batabi, Egbeko and Kitche in Lavun LGA and Ebonka, Ebba, Baddeggi and Egbati in Bida LGA. In Gbako LGA, Ndabe, Lemu, Gbemgba and Kataeregi were selected. In each village, 35 farmers were randomly selected from the list of farmers in the areas. This gave a sample size of 420 farmers.

(iii) Data Analysis

A Cobb-Douglas stochastic frontier production function is assumed to specify the technology of the rice farmers. The model is defined by;

$$\ln Q_i = a_0 + \sum_{i=1}^{6} a_i \ln X_i + a_7 x_7 + v_i - u_i \qquad \text{or} \qquad (1)$$

$$\ln Q_i = a_0 + \sum_{i=1}^{6} a_i \ln X_i + a_7 D + v_i - u_i$$

Where, Qi = rice output in Kg, X_1 = farm size in hectares, X_2=male family labour in hours, X_3 = female family labour in hours, X_4= hired labour in hours, X_5 = miscellaneous costs on management practices, X_6 = the ratio of female family to male family labour, and X_7 = use of improved seeds which is a dummy variable (D) if yes=1, otherwise=0.This specification follows Battese et al;(1996). They used three intercept dummies to represent fertilizer (D_1), tractor use (D_2) and owner/tenant status (D_3) and two slope dummy variables which interacted D_1 with fertilizer quantity and D_2 with land preparation. Amaza and Olayemi (2003) also used an intercept dummy variable to represent fertilizer use. This variable equals one if organic fertilizer was applied and zero otherwise. Based on this information in the literature, this study uses an intercept dummy to represent the use of improved seeds in production. The idea is to capture the shift in the production function above or below the constant term as a result of the use of improved seeds. V_i is assumed to be independent and identically distributed normal random variables with mean zero and variance $ó_v^2$. They are independently distributed of U_i and U_i's are the non-negative technical inefficiency effects, which are assumed to be independently distributed and arise from the truncation (at zero) of the normal distribution with variance $ó_u^2$. $a_{i's}$ are parameters to be estimated.

There is no theoretical way of deciding how many inputs should be included in a production function. However, a distinction should be made between family and hired labour in less developed countries (LDCs) (Deolalikar and Vijverberg, 1987; Junakar, 1989). By extension gender labour contribution to production should be highlighted as the returns to work and how they differ by gender must be considered (Jacoby, 1992). Most studies generally assumed that the labour of men and women are perfectly substitutable in production and other uses. Recent studies treat men and women even children as different types of workers, each with their own shadow value of time or marginal productivity (Jacoby, 1992). Bardhan (1973), opined that family and hired labour may be heterogeneous in some cases hence may not be perfect substitutes while Deolalikar and Vijverberg (1987), asserted that the model in which family and hired labour are included as separate explanatory variables is the best.

The inefficiency model is represented by u_i which is defined by equation (2) as

$$u_i = \delta_0 + \delta_1 Z_1 + \delta_2 Z_2 + \delta_3 Z_3 + \delta_4 Z_4 + \delta_5 Z_5 \qquad (2)$$

Where, Z_1 = age of farmers, Z_2 = year of farming experience, Z_3 = number of extension visits, Z_4 = ratio of female to household size and Z_5 = education variable which is a dummy(D). If farmer has 6 or more years of formal education=1, otherwise=0 (Olomola, 1998). Alene et al;(2005), in addition to farm size, age, extension and distance to market which are continuous variables in a similar study used five dummy variables in the inefficiency model. These accounted for credit for modern inputs, education/literacy of household head, timely availability of inputs, plot ownership and plot quality. This merely represents an intercept dummy specification. It is used to capture the impact of education/literacy level on inefficiency.

Since the dependent variable of the inefficiency model represents the mode of inefficiency, (i) a positive sign of an estimated parameter implies that the associated variable has a negative effect on efficiency and this implies inefficiency and (ii) a negative sign indicates that the reverse is true i.e. it has positive effect on efficiency and this means a reduction in inefficiency (Yao and Liu, 1998). The selection of the variables used in this study was guided by economic theory and as suggested by previous/similar studies in the literature.

Working Hypotheses.

Null Hypothesis

H_0: γ 0. That the technical inefficiency effects are stochastic in the model.

Alternative Hypothesis

H_1 $\gamma \neq 0$ That the technical inefficiency effects are not stochastic in the model.

The parameter γ defined by γ $\sigma u^2/\sigma^2$ where σ^2 $\sigma u^2 + \sigma v^2$ is expected to be close to 1. This suggests that the technical inefficiency effects are significant in the model. It also implies that the specified mode l better fits the data than the deterministic or average production function model.

Null Hypothesis.

H_0: $\delta_1 = \delta_2 = \delta_3 = \delta_4 = \delta_5$ 0 That the coefficients of the inefficiency model are not significantly different from zero.

H_1: $\delta_1 \neq \delta_2 \neq \delta_3 \neq \delta_4 \neq \delta_5 \neq 0$ That the coefficients of the inefficiency model are significantly different from zero.

Technical Efficiency.

The technical efficiency of the i^{th} farm is defined by the ratio of observed output (Q_i) to the corresponding frontier output (Q_i^*).

TE Q_i Q_i^* which is obtainable from the result of FRONTIER 4.1. Based on the individual farm's technical efficiency the mean technical efficiency for the sample of farms is obtained (Yao and Lui, 1998)..

RESULTS AND DISCUSSION

Parameter estimates for the model obtained by the use of Frontier 4.1 (Coelli, 1994) are given in Table 1.

The stochastic frontier result indicates that the coefficients of land (X_1), family labour (X_2), and female family labour (X_3) are 0.1354, 0.2213 and 0.2842 respectively. It is however observed that female family labour has a higher elasticity relative to the male-family labour. The first and the third coefficients are significant at the 1% level while the second is significant at the 5% level.

This result tends to suggest that unit increase in female family labour adds more to the output relative to a unit change in male family labour in terms of labour utilization in rice production. Hired labour (X_4), miscellaneous costs (X_5) and use of improved seeds (X_7) have coefficients of 0.1637, 0.1165 and 0.5432 respectively. These are significant at 10%, 5% and 1% in that order. These coefficients denote the variation or possible change in the output as a result of a unit change in the inputs.

The coefficient of output with respect to improved seeds is the largest. This tends to suggest that improved seed has a great impact on rice production in the area of study. The female-male family labour ratio (X_6) coefficient is positive and significant at the 5% level. This accounts for the possible difference in female /male contribution to output. It also confirms that their respective contribution to output is not the same since the coefficient of their ratio is significantly different from zero. (Battese and Tessema, 1993). There is a difference of 28.6 percent in favour of female family labour.

Table 1: MLE Estimates of the Stochastic and Inefficiency Model

Variables	Parameters	t-values
Land (X_1)	0.1355*** (0.0504)	2.6865
Male family labour (X_2)	0.2213** (0.0977)	2.2651
Female family labour (X_3)	0.2842)*** (0.0894)	3.1790
Hired labour (X_4)	0.1637* (0.0969)	1.6894
Miscellaneous costs (X_5)	0.1165** (0.0524)	2.2233
Ratio female/male labour (X_6)	0.2561** (0.1059)	2.4183
Improved seeds (D) (X_7)	0.5432*** (0.1477)	3.6777
Constant (K)	3.8521	2.3115
Inefficiency model	0.0361	1.0744
Age (Z_1)	(0.0336)	
Experience (Z_2)	-0.2472** (0.1169)	2.1146
Extension visits (Z_3)	-0.2584*** (0.0861)	3.0012
Ratio female/Household size (Z_4)	-0.1053** (0.1269)	2.2500
Education (Z_5)	-0.1269 (0.1266)	1.0024
Constant (K)	1.6524	1.8379
Sigma δ^2	1.0362***	3.6491
Log-likelihood	-160.3142	
γ	0.9564	

Source: Data Analysis, 2006.

With the inefficiency model the coefficient of age (Z_1) came up positive though it is insignificant. All the other coefficients in the model are negative. Farming experience (Z_2) and the ratio of female to household size (Z_4) are significant at the 5% level. Number of extension visits (Z_3) is significant at the 1% level. These findings imply that increases in these variables have the tendency of reducing the level of inefficiency in rice production. Female contribution is once again highlighted as inefficiency reducing. The education variable (Z_5) is negative and insignificant but is retained in the model. Alene et al; (2005) in their study also obtained a negative result with the same kind of specification. Their own parameter was, however, highly significant while in the current study it is not. They concluded that it reduces inefficiency and by extension increases efficiency.

The insignificant coefficients in the model are retained. According to Battese and Coelli (1994), there is no recommended statistical methodology to drop variables whose estimated coefficients are not at least twice their estimated standard errors. The parameter is estimated to be close to one at 0.9564. This confirms that the technical inefficiency effects are significant in the estimated model. It also implies that the traditional production function with no technical inefficiency effects is not an adequate representation of the data.

The results of the composite hypotheses tested in this study are presented in Table 2. The first null hypothesis, which specifies that the technical inefficiency effects in the stochastic frontier are not stochastic, is rejected at the 5% level. The alternative hypothesis that the inefficiency effects are stochastic is thus accepted.

Table 2: Hypotheses Testing

Hypotheses	χ^2 (tabular)	χ^2 calculated	Decision
Ho: $\gamma = 0$ Hi: $\gamma \neq 0$	7.82	65.43	Reject Ho Accept Hi
Ho: $\delta_1 = \delta_2 = \delta_3 = \delta_4 = \delta_5 = 0$ Ho: $\delta_1 \neq \delta_2 \neq \delta_3 \neq \delta_4 \neq \delta_5 \neq 0$	11.07	48.79	Reject Ho Accept Hi

Source: Data Analysis, 2006.

$\chi^2_{3,\,0.5} = 7.82$ $\chi^2_{5,\,0.5} = 11.07$

The second null hypothesis, which specifies that the explanatory variables in the model for the technical inefficiency effects have zero coefficients, is rejected also at the 5% level. Thus, it can be concluded that the explanatory variables in the model contribute significantly, to the explanation of the technical inefficiency effects for the rice farmers. These variables thus collectively have significant effects on the level of technical inefficiency.

Technical Efficiency

The mean technical efficiency for the sample of rice farmers is 0.8127. The mean technical inefficiency is thus 0.1873 about 19%. This is expected since the technical inefficiency effects in the estimated model are significant. The implication of this is that the technical efficiencies of the sample of farmers are less than one. This mean that they are not operating at their frontier of production. The average technical inefficiency index of about 0.19 implies that their production is 81% of its potential or of the technically feasible output. This result suggests a potential to increase production by 19% using existing farm technology.

Competitiveness in Rice Production

About 85% of the sampled farms have their technical efficiency being greater than or equal to the mean technical efficiency of 0.8127. This means that only 15% of the farms have technical efficiency less tan the mean. They are thus classified as being less efficient and hence less competitive in their production of rice. The greater percentage of 85% is most efficient and competitive. Since they are in the majority, they can be used to represent the whole sample and classifying rice production as being competitive in the area of study.

This study covered the adoption of improved management practices in terms of miscellaneous costs on the practices used by the farmers. The question arising from the result obtained is: can management address all the challenges to production in this setting? The answer to this question can be deduced from the relative significance of the factors beyond the farmers' control in terms of the deviation from the potential output. If the factors beyond the farmers' control account for a larger share of the deviation, then unavoidable environmental effects can be expected to generate the difference even under the best possible management practices. (Mochebelele and Winter -Nelson 2000).

This effect is reflected in the ratio of the standard error of Ui to that of Vi denoted as lambda (λ). This is equal to 2.0828 for this set of farmers. The factors which are beyond the farmers' control account for a large share of the deviation from potential output. A similar result was obtained by Mochebelele and Winter-Nelson; 2000) since the farmers are already adopters of biological and chemical technologies, improved and/or intermediate mechanical technologies which can shift the production frontier could address the problem. Hence, the issue of intermediate mechanical technology adoption arises.

Summary

The study revealed that land, male-family labour, female family labour, hired labour, ratio of female /male family labour and improved seeds are significant factors influencing rice production in the area of study. The contribution of female and male to output is not the same. There is some 28.6 percent differential in favour of female family labour. Improved seeds variable has the greatest influence on output followed by female family labour in terms of the magnitude of their coefficients. A mean technical efficiency of about 0.81 was obtained in the study. The results thus revealed an average technical inefficiency of about 0.19.

The inefficiency model indicated that experience in farming, extension visits and ratio of female/household size are significant inefficiency reducing factors and by extension efficiency increasing. The study showed that 85 percent of the farmers have technical efficiency greater than or equal to the mean technical efficiency. Rice production in this setting is therefore classified as being competitive.

Conclusion

The study used a Cobb-Douglas based stochastic frontier production and inefficiency model to examine technical inefficiency and competitiveness in rice production in Niger, State. The results of the study have been discussed. It is hoped that they will be useful to scholars working on similar studies and to policy makers in formulating measures that will improve rice production in Niger State, in particular and Nigeria in general.

Recommendations

The study revealed that land and improved seeds are positive significant factors influencing rice production. A land redistribution policy that will increase the farm size of farmers since they are small-scale producers will lead to an increase in rice production. In the same vein, the provision and timely availability of improved seeds will improve the technical efficiency of the farmers. The certified rice seed multiplication and distribution scheme of the government should be made functional and efficient so as to assist the farmers.

In the inefficiency model, experience and extension visits variables are deemed to be of policy relevance. One, it is often stated that experience is the best teacher. Two it can also be acquired through training, interaction with extension agents, exposure to media and research institutes. This can be achieved through an effective and efficient extension services delivery system. It is thus recommended that training be organized for the farmers through extension services.

The extension visits variable implies that increases in the number of visits reduce inefficiency. There is the need to increase the number of these visits. One way of doing this is to provide more extension agents by those responsible (the public and private sectors) but for now the government mostly. Adesiji (2002) found that generally the ratio of extension agents to farmers is very low in Nigeria. Policies and strategies that provide these inputs as recommended will help farmers to realize the unexpected production gains from rice production and the accompanying improved management practices.

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Table 1: Volumes and Values of Nigeria's Rice Imports (1990-2004)

Year	Area harvested (000ha)	Yield ton/ha	*local supply(Tons)	*local supply(MT) (DS)	Imported Volume (MT)	*Total domestic Demand (MT) (DD)	*SSR =DS/DD
1990	1,208.00	2.07	2,500,560	2,546,320.3	224,000	2,770,320.3	0.92
1991	1,652.00	1.95	3,221,400	3,280,351.6	296,000	3,576,351.6	0.92
1992	1,664.00	1.96	3,261,440	3,321,124.4	350,000	3,671,124.4	0.91
1993	1,564.00	1.96	3,065,440	3,121,537.6	350,000	3,471,537.6	0.90
1994	1,714.00	1.42	2,433,880	2,478,420.0	350,000	2,828,420.0	0.88
1995	1,796.00	1.63	2,927,480	2,981,052.9	300,000	3,281,852.7	0.91
1996	1,784.20	1.75	3,122,350	3,179,489.0	345,500	3,524,989.0	0.90
1997	2,048.00	1.60	3,276,800	3,336,765.4	699,054	4,035,819.4	0.83
1998	2,044.00	1.60	3,270,400	3,330,248.3	594,057	3,924,305.3	0.85
1999	2,191.00	1.50	3,286,500	3,346,643.0	812,452	4,159,095.0	0.81
2000	2,199.00	1.50	3,298,500	3,358,862.6	785,745	4,144,607.6	0.81
2001	2,207.00	1.25	2,758,750	2,809,235.1	1,508,335	4,317,570.1	0.65
2002	3,160.00	1.01	3,191,600	3,250,006.3	1,232,411	4,482,417.3	0.73
2003	3,531.00	0.96	3,389,760	3,441,623.3	1,600,000	5,041,623.3	0.68
2004	3,704.19	0.96	3,556,022.4	3,621,097.6	1,350,000	4,971,097.6	0.73

Source: FAOSTAT, 2003, 2006.
* Values calculated by the Authors