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Assessment of Efficient Utilization of Production Inputs among Women Rice Farmers in Niger State, Nigeria

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Abstract
Rural women have feature prominently in rice production enterprise, specifically; up to 70% of the rice produced in Africa comes from women (FAO, 2011). *In Niger State, rice is traditionally regarded as a product of women. Women living in this area are having high knowledge about traditional farming methods of rice production. However,* low productivity coupled with stiff competition posed by importers over the years has restrained the women farmers from earning significant returns from their investment and this has created rice production deficit. To minimize the effect of the rice production shortfalls on state demand, several efforts have been made by successive governments together with donor partners in a form of implemented projects to increase rice production. However, this effort is still ineffective due to limiting factors such as: inadequate institutional support (access to credit, research and extension), inappropriate production system, inadequate basic infrastructures, production risk and inefficiency on the part of the farmers.In light of these assertions, the challenging question to this review is that 'can women rice farmers improved on their technical efficiency to reduce production risk and increase output'?Thus, this review seeks to assess the efficient utilization of production inputs among women rice farmers in Niger State, Nigeria.
Keywords: Inputs, Production, Efficiency

Introduction

Women's work in agriculture has become more visible as their involvement in agricultural production has deepened in response to the economic opportunities in commercial agriculture and the rising need for them to provide for the household. The role of women in Nigeria economic sector cannot be over emphasized. Women are the real driving force of the nation's economy and are therefore crucial to the sustainable development of the country (Satyavathi*et al.,* 2010). Rural women plays significant role in the production of food and cash crops and manage mixed agricultural operations, involving crops, livestock and fish farming thus are considered major stakeholders in agricultural inputs utilization (FAO, 2011). Agricultural inputs are the key considerations in the production of food for better livelihood. Rural households negotiate their livelihoods by obtaining access to agricultural inputs; land, labour and capital which lead to enhanced family wellbeing and sustainable use of these inputs (Anaglo*et al*., 2014). Without access to sufficient agro inputs (as the case with rural women farmers), it is unlikely that production and income earning capacities can be improved on a sustainable basis.Rice (*Oryza spp*) is a cereal crop which has become a staple food of considerable importance in many African countries, where its consumption among urban and rural poor households has increased considerably (West African Rice Development Association (WARDA), 2010). Rice is the second most important cereal crop in the world after wheat in terms of production (Okali, 2011). Nigeria ranks the highest as both producer and consumer of rice in the West Africa sub-region (Beke, 2011). Nigeria has a rich history of rice production and consumption, as indigenous rice species (*Oryza glaberima*) have been grown in Nigeria for years (WARDA, 2010). Rice has overtime developed into a major Staple

crop in the
Nigeriandiet, with a demand profile cutting across all regions. A variety of other factors have also contribu ted to this increased demand including rapid urbanization, acceleration in the population growth rate, incr ease in per capita income, and changes in family occupational structures (Damola, 2010).Rural women farmers are important for increasing rice production and productivity. Although, rural women in some parts of Nigeria worked side by side with men in rice production with some marked division of labour among them. The role that women play however is greatly marked with gross production challengessuch as: inadequate institutional support (access to credit, research and extension), inappropriate production system, inadequate basic infrastructures, production risk and inefficiency on the part of the farmers (Yiadom-Boakye *et al*., 2013). In the mist of these challenges, National and State ministry of agriculture as well as some Donor agencies have partner to outlined projections to double rice cultivation to reduce importation using intervention programmes such as Anchor-borrowers and Fadamaprogrammes. To this end, this review seeks to address the following research questions.

- What is theefficiency level of inputs utilization among women rice farmers in the study area?
- What are the socio-economic factors influencing efficient inputs utilization among Women Farmers?
- What are the constraints associated with the utilization of rice production inputs?

Methodology

This paper is based on the review of efficient utilization of production inputs among women rice farmers in Niger State, Nigeria.Niger State was created out of the former North Western State and became a fully autonomous State on 3rd February, 1976, with headquarter at Minna. Niger State is in the North-central part of Nigeria and lies in between longitude 3^0 30^1 and 7^0 20^1 East of the Greenwich Meridian and latitude 8^0 20^1 and 11^0 30^1 North of the equator. The State presently comprises of 25 Local Government Areas (LGAs) and it is made up of three major ethnic groups which are the Nupe, Gbagyi and Hausa. However the total inhabitants in the State are over 3,954,772 people (National Population Commission of Nigeria, 2016) from 2006 population census. But, going by the annual population growth rate of 2.5 percent in Nigeria (NPC, 2016), the population of Niger State was projected to be 5,556,200 (NPC, 2016) by the year 2016.

Discussion

Concept of Efficiency: Efficiency is a very important factor of productivity growth, especially in developing agricultural economics, where resources are meager and opportunities for developing and adopting better technologies are dwindling. Jayamaha and Mula (2011) define efficiency in terms of the comparison of two components (inputs and outputs), with the highest productivity level from each input level referred to as the 'efficient situation'. This has led to the introduction of frontier production functions which estimate the maximum output as a function of inputs.Freid, Lovel and Schmidt (2008) also defined efficiency as a comparison between observedand optimal value of output and input. Efficiency increases if more outputs are generated without changing inputs, or if the same outputs are generated with lesser number of inputs. According to Freid*etal*. (2008), limited resources can be used for production through efficiency measurement. The importance of efficiency was highlighted to include: Firstly, it is a success indicator and performance measure by which production units are evaluated. Secondly, the exploring of hypothesis relating to the sources of efficiency differential can only be possible by measuring efficiency and separating its effects from the effects of the production environment.Thirdly, identification of sources of inefficiency is important to the public and private organisation policies designed to enhance performance (Ajibefun, 2008).In general, efficiency shows the inputs – output relationship of the production function which defines the possible combinations of inputs and the resulting outputs (Hollingsworth and Peacock, 2008). It is a measure of the ratio of output to input. It is a very important factor in productivity growth especially in developing agricultural economics where resources are meager and opportunities for developing and adopting better technologies have lately been dwindling.

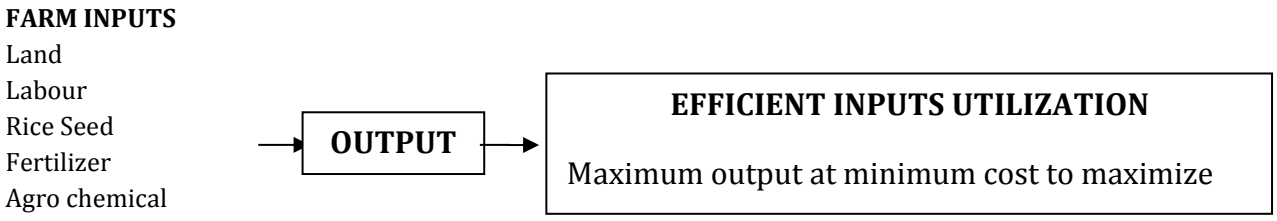
Technical and Allocative efficiency

Technical efficiency refers to the ability of a firm to achieve maximum possible output with available resources. It measures the ratio of output and it is concerned with the ability to utilize the best practice in order to use lesser amount of a set of input in producing the best output. The human capital variables (i.e. age, education, farming experience, institutional and socio-economic variables could influence a farmer.

These factors are considered as a major influence of technical efficiency (Bashin and Akpalu, 2001). While Allocative efficiency refers to the ability to contrive an optimal allocation of a given resources. Similarly, allocative efficiency is said to be the choice of an optimum combination of input consistently with the relative factor price maximum or absolute (Inoni, 2007).

Economic efficiency: It is a product of technical and allocative efficiency. This therefore implies that measurement of all allocative and technical efficiency is pre-requisite to attainment of economic efficiency. Empirical literature shows that it can be measured from a production function or profit approach (Inoni, 2007).

Production Theory: Production is the process of transforming inputs such as capital, labour, and land into goods and services called output. These resources can be organized into firm or producing unit whose ultimate objectives may be profit maximization, output maximization, cost minimization or utility maximization or combination of the four. Efficiency of production according to Inoni(2007) can be divided into technical, allocative and economic efficiencies. Economic efficiency embodies both technical and allocative efficiencies, once the issues of technical inefficiency have been removed from the question of choosing between the set of technically efficient alternative methods of production, allocative efficiency comes to forefront.A farmer is allocatively efficient if production inputs are allocated according to their relative prices(Inoni, 2007).In traditional economic theory, efficiency is generally assumed as an outcome of price-taking competitive behaviour. In this context, assuming no uncertainty, a production function shows the maximum level of output that can be obtained from given input and prevailing technology (Paul and Kolawole, 2008). However, variation in maximum output can also occur either as a result of stochastic effects (such as good or bad weather, measurement error and so on). It can also be attributed to the fact that firms may be operating at various levels of inefficiency due to mismanagement, poor incentives structure and imperfect competitive behaviour, inappropriate input level, or combination of these factors (Paul and Kolawole, 2008). Production process can be represented diagrammatically as:



Source:Sineikogyo (2000)

Figure 1: graphical representation of production theory

This diagrammatic representation shows the flow of resources into the farm: these resources are allocated as input mixed and managed to produce rice.

Efficiency of Inputs Utilization among Women Rice Farmers

According to the study of Ogunniyi and Oladejo (2011), females are more restricted in terms of access to inputs. Lower yields produced by women in these areas may be attributed to lower levels of inputs and less financial stability than men. SimilarlyMussa*et al*. (2012) study on analysis of resource use efficiency in smallholder mixed crop-livestock agricultural systems and reported that smallholder farmers are resource use inefficient in the production of major crops with mean technical, allocative, and economic efficiency level of 0.74, 0.68 and 0.50, respectively. This study also supports the view that large family size, and membership of relevant associations leads to higher levels of resource use inefficiency. Equally, Otitoju and Arene (2010) in the study "constraints and determinants of technical efficiency in medium-scale production" observed that the average technical efficiency was about 73%. The determinants of technical efficiency which were statistically significant were sex, age and experience. Sex and age had an inverse relationship with technical inefficiencies of the farmers while experience had a direct relationship. Oluwatayo*et al*. (2008) in a study on resource use efficiency of rural farmers in Nigeria; shows that the

farmers were 68% efficient in their use of resource. Likewise, Brodrick (2014) revealed that education, farm size, age, extension contacts, family sizes, marital status were found to be the major factors that determine the level of efficiency in input utilization.

Socio-economic Factors Influencing EfficientInputs Utilization among Women Farmers Farmer's socio-economic characteristics are among the most common variables associated with farmers' adoption behavior. It plays an important role in creating awareness and knowledge as they influence decision and level of input utilization for agricultural production (Barungi *et al.,* 2013). Some of the socioeconomic characteristics of the farmers which may affect their level of input utilization and efficiency include: age, education, land ownership, farm size, types of labour, access to farm inputs, access to credit, access to extension services, farming experience and household size. For this study, the following characteristics were reviewed:

Age: The age of farming household heads was observed to have an inverse relationship with the productivity of farmers in the studies of Di Falco and Bulte (2011). Thus, as the household head grows older the chances of utilizing a new technology becomes slimmer and less efficient. However, this assertion is inconclusive as evident by the study of Oyesola*et al*. (2011) which revealed adoption of production inputs decline with increase in age. Similarly, most adoption studies conducted outside the country have found a negative effect of age to adoption of production resources (Kassie *et al*., 2015) however, some studies have shown a positive correlation, while others have found age to be insignificant. This implies that, the influence of age on inputs utilization is inconclusive (Knowler and Bradshaw 2007) and warrants a more nuanced study.

Education: Education is associated with adoption because it is believed to increase farmers' ability to obtain, and analyze information that helps farmers to make appropriate decision.

In almost every adoption study, education of the farmer is considered to positively influence the farmer's likelihood of adopting a new technology or practice because farmers with better education have more exposure to new ideas and information, and thus have better knowledge to effectively analyze and use available information (Kassie *et al*. 2013). While most studies consider education in terms of number of years of formal education, the categorization of education by Baumgart-Getz *et al*. (2012) seems more appropriate: in contrast to formal education, it reflects knowledge farmers attain through other means such as extension programs, workshops, and field days.Solomon (2008) indicated positive relationship between education and efficient utilization of production inputs. Similarly, findings by Yengoh (2010) indicated that education enhances productivity and efficiency among farming households in the humid forest, dry savannah, and moist savannah agro-ecological zones of Nigeria.

Household size: Households with more adults are more likely to adopt improved management practices since many of these practices are labour intensive (Kassie *et al*., 2013). Hence, Household heads are the final decision makers regarding choice of technologies and farm inputs utilization. Similarly, as the household size increases, the likelihood of expanding farming size and by implication utilizing more inputs is expected to be high as evident in the study of Marenya and Barrett (2007).

Farming experience: Years of farming experience is another factor that enhances efficiency among farming households. Years of farming experience in Nigeria increases as age of farmers increases. Age in farming experience is therefore positively correlated with the efficiency of the farmers. Older farmers have also been observed to have higher productivity than younger farmers. For example,Lambrecht*et al.*(2014)observed that productivity in the humid forest and moist savannah agro-ecological zones of Nigeria was positively associated with more experience in farming. AlsoKassie *et al.*(2015) reported that the economic efficiency level of farmers was significantly affected by farming experience.

Land ownership: Land related variables influence farmers' adoption behavior, as land holding is an important unit where agricultural activities take place. Secure land tenure has been widely demonstrated to play a critical role in influencing farmers' willingness to invest in rice production (Kassie *et al*., 2013). Concerning land holdings, different studies reported its effect positively. For example, a study conducted by Teshome*et al*.(2014) reported that land ownership and farm size contributed positively in farmers' efficient utilization of improved production resources. Kamau*et al.* (2014) showed that farmers that owned parcels of land on which they farmed were more productive than non-landowning farming households. This is

because they were ready to make huge investments on such land through the adoption of new technological packages to enhance productivity levels.

In relation to land management, it is argued that 'assurance effect' of secure land tenure provides a guarantee to farmers to invest in both short and long-term soil management practices (Grimm and Klasen, 2014) because it eliminates threats of appropriation.

Farm size: Odongo and Muhua (2015) using the profit function equation found that small farms attained higher productivity levels than larger farms. Therefore, they came up with a contrary conclusion which shows large and small farms that exhibits equal levels of productivity. Mugwe*et al*. (2009) however observed that large farms were more efficient than small farms in farm inputs utilization. Equally, Pulido and Bocco (2014) shows that larger farm size owners were much more motivated to adopt improved farm management practices in other to enhance their productivity.

Constraints to Rice production: The primary production challenges for women rice farmers were weeds, soil health fertility and increasing incidence of weather volatility (Oyesola*et al*., 2011). Weed pressure is an issue for all growers and requires regional solutions and adaptive management (Adesope*et al*., 2012). Equally, managing for soil health and lack of access to organic fertilizer inputs is an ongoing management challenge and barrier to improving healthy rice production. Furthermore, Bwambale (2015) discloses that the most important constraint perceived by the farmers in crop production processes were short life of bio cultures, non availability of culture in time and non availability of seed/variety resistant to diseases/insect nematodes. Similarly, rice growers also faces marketing challenges such as distance to markets, clear and transparent pricing, strong relationships throughout the supply chain and markets for all grains (not just cash crops) in rotation (Oyesola*et al*., 2019). While Abdullahi *et al*. (2019), classified the problems perceived by the women rice farmers in continuing utilization of production inputs as;

- Weather/climate change (chronic humidity, extreme rain events, drought)
- Difficulty of disease and pest management and Loss of conventional farm network
- Poor rice farmers' networking in sharing production knowledge
- Limited technical and financial support for rice producers
- Opaque value chain: lack of communication on planting dates, yields, prices, market demand
- Few forums for relationship building between rice farmers and buyers
- Distance to input produce markets and Lack of storage facilities
- Limited market for non-cash crops in rotation
- Weed pressure and High costs of production
- Traditional extension services are less focused on large scale rice production
- Difficulty in accessing loans for large scale rice production

Conclusion and Recommendations

From the review, it is obvious that rice farmers in the study area were mainly small land holders with relatively low efficiency in resources utilization.Lower yields produced by women in the area may be attributed to lower levels of inputs and less financial stability. Some of the socio-economic characteristics of the women farmers influencing their level of input utilization and efficiency include: age, education, household size, farming experience, land ownership and farm size.To this end, the primary production challenges for women rice farmers in the area were Weather/climate change, Poor rice farmers' networking in sharing production inputs and difficulty in accessing loan by women farmers for large scale rice production. Thus, it was therefore recommended that;

- Agricultural input suppliers should provide farmers with adequate inputs through trusted institutions like friends, Family and extension agents.
- Periodic training of the women farmers on efficient rice production practices through extension agents should be given optimum priority
- Financial institutions should make access to credit flexible and easy to women rice farmers.

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