THE ROLE OF WOMEN IN AGRICULTURE (WIA) IN AGRICULTURAL AND FOOD PRODUCTIONTECHNOLOGY AMONG WOMEN'S IN KADUNA STATE, NIGERIA

Suleiman, R., [1]Yusuf, H.O., [2]Taiwo, A. and [3]Awotodunbo, A.A

[1]*Department of Agricultural Extension and Rural Development, Ahmadu Bello University/Institute for Agricultural Research, Zaria, Nigeria*

[2]*Samaru College of Agriculture, Ahmadu Bello University, Zaria, Nigeria*

[3]*Leventis Foundation Nigeria*

Corresponding author e-mail: rabiu.suleiman@yahoo.com. Phone +2348033576713

Abstract

The study focused on the role of Women in Agriculture (WIA) in agriculture and food production technology among women's in Kaduna State. A multi-stage sampling procedure involving random and purposive sampling were employed in selection of 200 women farmers in four agricultural zones including: Maigana, Samaru, BirninGwari and Lere zones of Kaduna State. Data for the study was obtained with the uses of a well -structured questionnaire and interview scheduled. Descriptive statistics involving percentage distribution and rank was used to achieve objectives (i) and (iii), while inferential statistic of multiple regression analysis was employed to achieve objective (ii) of the study respectively. Result showed that the uses of drought resistance crops, modern method of fertilizer application and modern pesticide application practices were rank as 1st, 2nd and 3rd respectively. Result also revealed that fish and oven dried fish production, cattle and ram fattening, the use of milking machine, record keeping and uses of socio-media in advertising products were also indicated by the respondents as agricultural technologies and food production practices. Results of socio-economic characteristics influencing technological transfer among the women shows that age, years of farming experience, marital status and household size were significant at (10%) level of significant. Also, access to market and rural infrastructure were significant at (1%) while education attainment was found to be significant at (5%) level of significant accordingly. High cost of technology, inadequate of extension service delivery, process involved in technology transfer, local peculiarities and differences, gender bias toward women in technology transfer and low level of women capital were of the problems associated with technology transfer among women. Based on these bottle- necks, it was recommended that women farmers should be: encourage to annex their resources together through cooperative society, facilitated process of developing awareness and capacity on gender issues, to bring about personal or behavioral and organizational change for gender equality. More so, government should: employ more agricultural extension agents to help in technology transfer to farmers, reduce the delinquent involved in farmers accessing loan from financial institution.

Keywords: Role, women, agriculture, technology, transfer, Kaduna State

INTRODUCTION

Agriculture has always been responsible for producing food for the world population. It dates back well over 10,000 years ago, to the time of the hunter gatherer societies in South west Asia and China. Back then before the dawn of agriculture, it supported only 4 million people. Today modern agriculture now feeds over 7 billion people worldwide, so this statistic alone shows just how far the industry has come in recent years. (Tillman,Cassman and Matson, 2002). Advances in technology within agriculture have made a tremendous contribution to the lives of every human being in the world today, both economically and socially. It is not just an industry it is the foundation of our civilization. The introduction of new technologies and scientific methods (advancements) has made a monumental improvement on the farming sector in recent decades. Its welcomed induction has not only made

farming more sustainable and profitable; it has also dramatically reduced the manual workload placed on many farmers(Matthews, 2017).

With the world's population rapidly growing, the need to find new ways of feeding everyone has become more important than ever before and with global hunger on the rise again, Food and Agriculture organization (FAO, 2014) has stated that if the predicted global population figures become a reality, then world food production will need to rise by 70% .Food production within the developing world will also need to double. Women make important contributions to the agricultural and rural economies of all regions of the world. However, the exact contribution both in terms of magnitude and of its nature is often difficult to assess and shows a high degree of variation across countries and regions.

The projected 70% increase in food production still faces many agronomic challenges. As a result, producing enough food at an acceptable cost on the planet will heavily rely on intensive research into everything from new seed varieties, drought resistant crops to new more efficient farming practices. Despite women accounting for 43 percent of the agricultural labor force in developing countries and even more than 50 percent of the agricultural workforce in most of the Sub-Sahara Africa (SSA) region, the productivity gap between men and women farmers persists (FAO, 2012). Existing family farm research shows that women consistently lack technology and agricultural production declined, which have lower productivity compared to male farmers, with the productivity deficit estimated to range between 13–25 percent in SSA region(O'Sullivan, Rao, Banerjee,Gulati, andVinez,2014).These all pose major challenges in relation to achieving adequate and sustainable food production in the years. It has been well documented that the livelihoods of many women's farmers in northern regions have being ruined, as farming was their only means of income that they may have had and the hope of been able to provide food for their families is now in jeopardy. (Christianand Albrecht,2012).)

But these concerns can all be eliminated if farmers have access to more readily available technologies and equipment that can support an upsurge in local food production, raising farming incomes as a consequence. The whole idea of "Agricultural technology" revolves around enough food production that most effectively uses nature's goods and services without harming nature itself (FAO, 2002)The woman in agriculture (WIA) program of the Kaduna agricultural development programme (KDADP) was created in 1990 to address the gender-related deficiencies within the existing extension programmewith the intention of increasing the wellbeing of women farmers in the State through group formation for effective utilization of improved agricultural production technologies and management practices. Over the years, this program has recorded much success both in terms of clientele coverage and disseminated technologies. However,the contribution of women in agriculture is poorly documented in Nigeria. Consequently, few studies have been carried out to assess the role of women in agriculture (WIA) in technology on agriculture and food production among women's in Kaduna State. This has indeed created knowledge or information gap in literature and call for a specific study to facilitate a holistic understanding of the role of women on the technologies on agriculture and food production. Hence, this paper presents an overview of the evidence on the roles of women in agriculture (WIA) in technology on agriculture and food production in Kaduna State. In this study therefore, the following research questions were addressed:

I. What are the types of technologies in agriculture and food production that are transferred to the women in Agriculture (WIA)?
ii. What are the socio-economic characteristics influencing technological transfer among the women in agriculture?
iii. What are the problems associated technology transfer among women in the study area?

The broad objective of this study is to examine the role of WIA in technology in agriculture and food production transferred among women in Kaduna State. The specific objectives are to;\

I. identify the types of technologies in agriculture and food production that are transfer to the women in agriculture;

ii. determine the socio-economic characteristics influencing technology transfer among the women in agriculture in the study areas, and

iii. identify the problems associated with technological transfer among the women in the study areas.

METHODOLOGY

The study area

Kaduna State occupies almost the entire mid-central portion of the Northern parts of Nigeria and shares common borders with Zamfara, Katsina, Niger, Kano, Bauchi, Nasarawa, Plateau states, and the Federal Capital Territory to the South-West. The state is located globally between latitudes 9

Table 1: Populatio women

Agrlture zon	Seled LG	Comunitasele d	Popatiosamse	10% sample siz
Mana	Giw and	Giw and Tud	232	23
	sob -gar	Bom and shik	264	26
Samu	Kac a, ar	Kac and Dut	236	24
	Kag ko	Kag oan kafa an	252	25
Bir gwa	Bir Gw and	Birn wari and Ugw	248	25
	Kac na Sou	Tele sion Sa-b gari	228	23
Ler	Kau and	Kau and kaju	268	26
	Sab Bir	Sab and Sam ka	279	28
Tot			2,0(	20

Data analysis Data for the study was analyzed by the use of descriptive statistics involving percentage distribution and rank used to achieved objectives (i) and (iii), while inferential statistic of multiple regression analysis was employed to achieved objective (ii) of the study respectively.

The explicit explanatory form of multiple regression was expressed as follows:

$Yi = Y^*i$ if $Y^*I >= 0$ (1)

$Y^*i = \beta 0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta 5 X_5 + \ldots\ldots \beta_8 X_8 + e$ (2)

Where:

Yi = Number of technology and food production adopted by the women

Yi*= Unobserved factors that influencing technology transfer among the women,

e=Truncated error term

β0 = Intercept term

β1… β8= Slope coefficients,

βX = Socio-economics characteristics of women in the study area.

X_{1i} = Age (Years), $X_{2i=}$ Farming experience (Years of farming experience), X_{3i}= Marital Status (Single= 1, Married = 2, Separated/ divorced= 3), X_{4i} = Household size (Number of dependence) X_5= Education attainment (Years spent in schooling), X_{6i}= Amount of credit (Amount received in Naira), X_{7i} = Access to market (Number of access), X_{8i} = Access to rural infrastructure (Number of access)

RESULTS AND DISCUSSION

Types of technologies in agriculture and food production transfer to the women through WAI programme The introduction and developments in science and technology have contributed to life of many women in agricultural technologies and food production practices through the activities of WAI in Kaduna State. The result from Table 2 indicated that the uses of drought resistance crops was rank as 1st, modern method of fertilizer application and modern pesticide application practices were rank as 2nd and 3rd respectively. Farmers in Kaduna State suffered the harsh consequences weather conditions which has resulted into low crop yield and production decline, However, drought resistant crops would guarantee sustainable growth, no matter what the weather. Perhaps, women farmers characteristically use lower levels of purchased technological inputs, such as fertilizer and low-yielding seed varieties (Peterman*et al*., 2014). The use of resistance crops and modern method of fertilizer application by women are labor and time-saving, including post-harvest and value-addition technologies. Depending on the nature of these technologies, any of these have the potential for raising agricultural productivity, reducing post-harvest losses, as well as improving food and nutrition security of women family farmers in Africa (Udry*et al*., 2015). (O'Sullivan*et al*., 2014). (FAO, 2011).

Result also showed that modern pesticide application technology as indicated by the respondents become necessary for the facts that in many parts of Africa, food production has stalled in the last 2 decades due to emergence of pests and diseases that have destroyed many crops and livestock's Therefore, Agricultural technology tools need to be introduced in situation like this immediately. Modern pests and diseases management tools would help increase yield and production whilst, also ensuring that the correct amount of herbicide and pesticide is used(FAO, 2012). It was further revealed that fish and oven dried fish production, cattle and ram fattening, milking machine technology, record keeping and uses of socio-media in advertising products were also indicated by the respondents as agricultural technologies and food production practices involved in through WAI programmes. Also, life and dried fish production technology practices among the women can reassure reputable business among the practicing women. However, increase in farmer's productivity and sales will depend or consumers taste and preference Emerole (2014).

The introduction of cattle fattening, uses of milking machine and artificial insemination technologies among women has helped to increase dairy and food production. in recent years within the State. It has been critically acclaimed for years as being one of the most effective tools available for livestock producers in order to improve the productivity and profitability of their businesses. In the same affirmations Cothren (2012) suggest that artificial insemination and livestock fattening are the most effective technological tools available to livestock producers. This is because it offers them the chance to choose the gender of the resulting calf with a high rate of accuracy dairy production, including milk, cheese, butter, beef and the rest. This also has the potential to totally change the way in which producers think about breeding, and it will also lead to massive increase income of farmers.

The uses of social media as indicated by the respondent's shows that women desire a reputable business, as advertising through social media can increase their productivity and sales. News (2017) opines that the social media usage can give potential producer the opportunity to reach people locally, regionally, nationally and even internationally.As it was further revealed from Table 2 that the uses of incubator machine for poultry production and irrigation system control as type of agricultural technologies and food production practicesby the women in Kaduna state. The uses ofincubator machine for poultry production has been set up under a joint project of WIA in the State to stimulate creation and development of small and medium scale enterprises in the study area. Olamide (2015) stipulated that incubation technology is a unique business support model that contains inbuilt capacity to contribute valuable interventions for women enterprise creation and development. Also, irrigation system control practices enable available water access to women farmer which provides greater availability and stability of food supplies during the dry season, enables crop diversification, including micronutrient-rich vegetables and fruits, and generates income to women during the lean season. Reliable water access for irrigation is an important entry point for women's empowerment, as it helps to promote gender parity by supporting women to overcome unemployment (WHO, 2017).

Table 2: Distribution of respondents based on the type of agricultural technologies and food production practices

Type of technologies and food production practices	Percentage	Rank
Uses of genetically modified crops	45	12th
Practicing of cattle and ram fattening	80	5th
Fish and oven dried fish production	84	4th
Uses of incubator from poultry production	58	9th
Irrigation system control practices	66	8th
Teaching of modern method of fertilizer application	92	2nd
Uses of milking machine	52	10th
Artificial insemination practices	48	11th
Record Keeping	78	6th
Uses of socio-media of advertising their products	72	7th
Uses of drought resistance crops	94	1st
Modern pesticide application practices	88	3rd

*Multiple responds allowed

Socio-economic characteristics influencing technological transfer among the women

Result of multiple regression analysis Table 2 indicated that pseudo P^2 is 0.298. This shows that 30 percent in the variability in socio-economic characteristics influencing technological transfer among the women in Kaduna State is explained by the explanatory variables specified in the model with 95 percent level of confidence and the log likelihood function was 69,399. However, the coefficient of age was positive and statistically significant at 10% level of probability. This is in line with *a priori* expectation. It implied that as women increases in age, the higher the tendency to make a decision for technological and food production practices choice. This is in line with the finding of Emerole*et al*., (2014) who inferred that older farmer is considered economically and emotionally matured to be involved in choice and adoption technology. Age is also assumed to be a determinant to influence of new technology. Older farmers are assumed to have gained knowledge and experience over time and are better able to evaluate technology information than younger farmers (Mignouna*et al*. 2011) The result further shows that the coefficient of years of farming experience was positively signed and statistically significant at 10% level of probability. This indicates that years of farming experience influences the choice of technology and food production among women. This finding is *in tandem* with that of Adeoye*et al.* (2014) that women with years of experience generally engaged in agricultural technology practices to increase economic supports to family needs.

The coefficient of marital status was positive and statistically significant at 10% level of probability. This implies that married status of women influences the technology and food production among women than the single women. This is in agreement with the finding of Olatomide*et al.* (2015) that marital status would lead to an increased technology acceptance and food production among women and their career choice. It further revealed that married couples help in active participation in technology and food production among women development, thus making a better decision on venturing in agribusiness. Similarly, the coefficient of household size was positive and statistically significant at 10% probability level. The a *priori* expectation was met as increase in household size among women will inspire technology and food production increases their desire to invest in agricultural productivity, so as to generate enhanced resources sufficient to feed the entire household. The findings corroborate the assertion of Onoja (2014) that household size of productivity was positively correlated with technology and food production among farmer in Rivers State, Nigeria.

Education has been identified as one of the key elements in increasing agricultural technology and food production preference. The coefficient of educational attainment of the women was negative and significant at 5%, this implies that education has an inverse relationship with women choice of technology and food production practices attainment among women. As education help in striving for innovation in agriculture. The finding concurs with the *a priori* expectation as educated women has good potential to practice the uses and adopt technology for food production. This is in line with the findings of Daudu, Oladipo, Olatinwo, Kareemand Dolapo, (2019). That the level of education attainment influenced innovation and adoption of technological practices among farmers. In the same assertion Mignouna, Manyong, Rusike,Mutabazi andSenkondo, (2011). Stipulated that education level of a farmer increases his ability to obtain; process and use information relevant to adoption of a new technology. Similarly, analysis on the access to credit by the women shows a positive and significant effect at 5% level of probability. This however, implied that access to credit had significant influence on women technology and food production practices. Access to credit has been reported to stimulate technology adoption. It is believed that access to credit influencing embracing of risky technologies through relaxation of the liquidity constraint as well as through the boosting of household's-risk bearing ability (Mohamed and Temu, 2018). The result of the access to market bore negative sign and is statistically insignificant at 1%. It implied that access to market has an inverse

relationship with women choice of technology and food production practices. The result is a deviation with the *a priori* expectation of the study as it was expected that if women have access to market, women will have a well-defined technology awareness to take investment decision (Onoja *et al*., 2014) The coefficient of access to rural infrastructure was positive and significant at 1% level of probability. This implied that an individual whose communities had access to rural infrastructure tend to make a better decision on the choice of technology and food production practices. Thus, a *prior expectation* was met. This finding corroborates the finding of Nwibo *et al*. (2013) that access to rural infrastructure facilities influences technology and food production practices in most rural communities in Nigeria.

Table 2: **Socio-economic characteristics influencing technological transfer among the women**

Variables	Coefficient	Standard error	T-value	P-value
Constant	0.5779	0.0795	7.291	0.000
Age	0.0088*	0.0045	1.954	0.069
Year of farming experience	0.0062*	0.0032	1.684	0.058
Marital status	0.08411*	0.0451	1.864	0.601
Household size	-0.0023*	0.0012	-1.916	0.095
Education attainment	-0.0092**	0.0423	-2.343	0.020
Access to credit	4.211**	1.721	2.447	0.014
Access to market	-0.003***	0.001	-2.753	0.098
Access to rural infrastructure	-0.0102***	0,003	-2.554	0.073
Diagnostic statistic				
Sigma	0.1786	0.0828	2.156	0,019
LR chi^2	12790			
Prob (chi^2> value)	0.035			
Log likelihood	69.339			

Symbol: ***= Significant at 1%, **= Significant at 5%, *= Significant at 10%.

Problems associated with technology transfer among women

Result from Table 3 indicated that high cost of technology has been ranked as 1st problems associated with the transfer of technology among women. Many studies have reported a positive relation between high cost of technology and adoption of agricultural technology (Onyemobi, 2016 and Ogechi, 2016). However, Farmers with financial capabilityare likely to adopt new technology as they can afford to devote part of their capital to try new technology unlike those with less capital base (Mohamed *et al*., 2018). Inadequate of extension service delivery, Process involved in technology transfer and Local peculiarities and differences were ranked as 2nd, 3rd and 4th respectively as the problems associated with the transfer of technology among women. Presently

there relatively few numbers of extension agents compared to the number of women farmers in Nigeria This idea is in line with Daudu *etal*. (2019) affirmation that, extension agent is a key to the success of any extension service delivery organization because they have direct contact with end-users of any farming technology. The processes involved in the transfer of the technologies. By this, in developing most technology, the farmers are not carried along, they are top down in nature, and the process of getting them is filled with a lot of rigidity and red tape, conditions the poor farmers cannot cope with. Worse still, is the late arrival of these technological inputs at the stages in the production process when they would not be useful to the farmers. (Ohikere and Aruhi, 2011).

On a general note, Idachaba (2000) stated that there are enough packages on the technology shelf and the missing link in an effective agricultural extension system to disseminate available technologies.Other challenges include: Local peculiarities and differences in technology transfer, gender bias toward women in technology transfer, low level of women capital and lack of access to land. Which were rank as 5th, 6th, 7th and 8th accordingly as the problems associated with the transfer of technology among women. As in the case of local peculiarities and differences in technology It is very difficult to cause a women farmer to abandon his already established ways of doing thing no matter how primitive, for a so-called better technology which she is not sure of. In addition, some of the technologies do not conform to the local differences and peculiarities. Also, some technology is gender specific. It will not be wise and truthful to introduce a technology that disfavored the traditional norms of a society. By placing the role of the male in the hands of the women and vice versa,that would be a taboo.

Women shoulder the bulk of household and childcare responsibilities in many countries in SSA Countries. Such unpaid household production tasks may limit technology adoption, especially if they require greater time involvement by women. In Nigeria, adoption of agricultural technology depends on household labor as adoption of such technology increases women's workload (Teklewold*et al*., 2013). Also, traditionally women's rights to land were primarily governed by their marital status and women's land rights do not extend beyond accessing or owning land outside the context of marriage (Aguilar*et al*., 2014)

Table 3: Problems technology transfer

Problem associate technolog transfer	Percen	Ra
Local pec and differ technolog transfer	8 8	4th
High cost technolog	9 7	1st
Process in techno transfer	9 1	3rd
Gender b toward w technolog transfer	8 4	6th
Low leve women ca	8 2	7th
Lack of a land	7 8	8th
Inadequa extension delivery	9 5	2nd
Lack of s infrastruc	8 6	5th

* Multiple response allow

Conclusion and recommendations

Women in Agriculture plays critical role in technology and food production through women in agriculture (WAI) programme. Agricultural technology has been developed with keeping two important things in mind: first thing is to obtain the highest yields possible and second thing is to get the highest economic profit possible. These technologies have foster development and growth for women various agricultural production system. The uses of technology for food production depends on the characteristics of the technology and the advantage of such technology to the end user. The socio-economic attributes of the farmers that influenced technology transfer among women includes: years of farming experience, age, marital status and education attainment of women. Others includes access to credit, access to market and access to rural infrastructure. Some of the problems associated with the technology transfer among women includes: high cost of technology, inadequate of extension service delivery, the process involved in technology, local peculiarity and differences in technology transfer and lack of social infrastructure among others.

Therefore, it was recommended that government should recruit more and qualified extension agents in the State to enable them disseminate new and improved technological transfer system that is requires, and foster linkage mechanisms between the farmers. Also, by establishing vertical and horizontal links at multiple levels that will lead to the emergence of holistic, cross sectoral, and integrated approaches from planning and implementation, and institutional capacity building in any technological and food production system. The financial position or reputation of a farmer plays vital role in his level of adoption of a technology and this need improvement, it was suggested that women farmers should be encourage to annex their resources together through cooperative society, more so, government should reduce the bottle neck involved in farmers accessing loan from financial institution. This is because farmers financial status will hedge against risk and protect any danger in the adoption and uses of any technology.

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