Constraints to women's adoption of improved agricultural technologies introduced by Women in Agriculture in Edo State, Nigeria

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ABSTRACT

The contribution of new technology to economic growth can only be realized such technology is widely diffused and adopted. This study was conducted to analyse factors affecting women's adoption of improved agricultural technologies introduced by Women In Agriculture (WIA) in Edo State. A multi-stage sampling procedure was used to select 144 women from three Local Government Areas of Edo South ecological zones**.** An interview schedule was used to collect data and both descriptive and inferential statistics such as frequency, percentages, percentages, mean and chi-square was used to analyse the data at p=0.05. Results show that the women were aware of all technologies introduced to them by WIA, however, *gaari* processing, dry and wet seasons vegetable production, and use of oil palm seedlings were the major ones adopted by the women. in the study area as these technologies rank 1st, 2nd, 3rd and 4th respectively, Market problem (79.9%, 85.4%), lack of access to credit (83.3%, 87.5%) were constraints identified by women as affecting the adoption of both production and processing technologies introduced to the them as these have the highest percentage among many others. Marital status (χ^2= 53.163), education (χ^2=25.48), major occupation (χ^2= 52.47), source of land (χ^2=28.576) and source of input (χ^2=36.653) had significant relationships with adoption of agricultural technologies. Socio-economic, environmental and technological factors should be considered by researchers when introducing a technology. Technologies that build on assets which the poor women already have are more likely to be adopted.

Keywords: Technology adoption, Agricultural technologies, Women In Agriculture (WIA)

INTRODUCTION

Agriculture plays an important role in economic growth, enhancing food security, poverty reduction and rural development. It is the main source of income for around 2.5 billion people in the developing world (FAO, 2003). Smallholder agriculture is identified as a vital development tool for achieving the Sustainable Development Goals, one of which is to reduce the number of people suffering from extreme poverty and hunger by 2015 (World Bank, 2008). However majority of small holder farmers rely on traditional method of farming using hoes and cutlasses and this has lowered the level of productivity. Over 70% of maize produced in developing countries comes from smallholder farmers who use traditional methods of production (Muzari *et al.,* 2012). These farmers generally obtain very low crop yields because of the local varieties used by farmers which have low potential, most of the maize is grown under rain-fed conditions and irrigation is used only in limited areas, little or no fertilizers are used and pest control is not adequate (Muzari *et al.,* 2012).

This has triggered much of discussion on the need to increase productivity and sustainability in agriculture globally but very little information is available on specific means to achieve this aim. Increasing agricultural productivity is critical to meeting expected rising demand for food and fibre, as such, it is important to examine recent performance in cases of modern agricultural technologies (Challa, 2013). Agricultural technologies are seen as important routes out of poverty in most developing countries; however the rate of adoption of these technologies has remained low in most of these countries (Uaiene, Amdt and Masters (2009). Adoption of improved technologies increases productions, leading to constant socio-economic development. Adoption of improved agricultural technologies has been associated with higher earnings and reduced poverty; improved nutritional status; lower staple food prices; increased employment opportunities as well as earnings for landless laborers (Kasirye, 2010). Adoption of improved technologies is believed to be a major factor in the success of the green revolution experienced in Asian countries (Ravallion and Chen, 2004; Kasirye, 2010). On the other hand, non-adopters can hardly maintain their marginal livelihood with socio-economic stagnation leading to deprivation (Jain *et al.*, 2009).

Women are the key farmers, food producers and natural resource managers, in most countries of sub-Sahara Africa. This is because they provide 65% – 89% of food, provide nearly half of farm labour, shoulder over 90% of domestic responsibilities and work twice as many hours as men (Mtsor and Idisi, 2004). Akpabio (2005) also reported that women carry over 80 tonnes of fuel, water and farm produce for a distance of more than one kilometre over the course of a year. Women play significant and crucial roles in agricultural development and allied fields including crop production livestock production (Oyegbami,2016), horticulture, post-harvest operations, agro forestry, fisheries, and the likes.

The nature and extent of women's involvement in agriculture, no doubt, varies greatly from region to region. Even within a region, their involvement varies widely among different ecological sub-zones, farming systems, castes, classes and stages in the family cycle. But regardless of these variations, there is hardly any activity in agricultural production, except ploughing in which women are not actively involved (Uzomah 2011). Studies on women in agriculture conducted in Nigeria by Ogunbameru and Pandey, (1992), Ironkwe and Ekwe (1998), all point to the conclusion that women contribute far more to agricultural production than has generally been acknowledged. Recognition of their crucial role in agriculture should not obscure the fact that farm women continue to be concerned with their primary functions as wives, mothers and home makers. Yahaya (2002) recorded that 76% of women from Oyo and Bauchi state are actively involved in farming activities or are engaged in their husband farms.

In Nigeria women supply most of the needed labours in agricultural activities and this is the most important factor of production, even women in seclusion (purdah) generate substantial income through food crop processing (Yahaya, 2002). Despite all efforts made by women in contributing to agricultural development there are still restriction in their roles as farmers due to unequal right and unequal access to land and control over resources, as asserted by technical centre for agricultural and rural Co-operation (CTA 2000).

The Women In-Agriculture (WIA) sub-component of the Agricultural Development Programme (ADPs) was instituted in 1988 to address gender specific agricultural problem. The focus was on food, nutrition, processing, storage and utilization of crop and livestock produce; in order to raise women's income and living standard through business oriented farming and processing strategies. Ever since the introduction of the (WIA) programme in Nigeria, and with the current emphasis on participatory extension, various efforts have be made to elicit various levels of information on the activities and effectiveness of the programme in specific limited areas in Nigeria. This study therefore aimed at finding out factors affecting the adoption of improved technologies introduce by WIA in Edo State.

Objective of the study

The broad objective of the study was to find out factors affecting the adoption of agricultural technologies among women in Edo State, Nigeria.

The specific objectives were to:

- examine the socio-economic characteristics of the women in the study area.
- identify selected technologies introduced by WIA to women in the study area
- find out women's awareness and adoption of specific agricultural technologies introduced by WIA program.
- investigate constraints to adoption of selected technologies by women in the study area

Hypothesis of the study

There is no significant relation between socio-economic characteristic of women and the adoption of improved technologies introduced by WIA in the study area

METHODOLOGY

Study area - The study was carried out in Edo State. The state is one of the 36 States in Nigeria and has three distinct ecological zones. These are the mangrove swamp forest to the south, the tropical rainforest in the middle and the guinea savannah to the north. The State shares boundaries with Delta State in the South and South east, Kogi State in the north and northeast, River Niger in the East and Ondo State in the west. The State occupies an area of 19,283.93Km2 with a population of 3,218,332 people (NPC, 2006). The annual rainfall varies from 2500mm in the southern parts to 1500mm in the northern parts with high annual temperature of about 30oc. The people are predominantly farmers, growing mainly food crops such as, yam, cassava, plantain, maize, melon, pepper and cash crops such as pineapples, pawpaw, palm produce, cashew and rubber and they also involve in trades.

Sampling technique and sample size - The population of this study comprise of women farmers registered with WIA**.**A multi-stage sampling procedure was used to select 144 women

for the study. The first stage was random selection of three Local Government Areas from Edo South ecological zone**.** The second stage involved selection of six communities from the selected three local government areas to make a total of 18 communities. The third stage involved random selection of 8 women from each community who had contact with WIA, to give a total of 144 women used for the study.

Data collection and analysis - A well-structured interview schedule was used to collect information on the socio-economic characteristics of women, awareness and adoption of selected technologies and women's perceived factors affecting technology adoption. Descriptive statistics such as frequency counts and percentages were used to present results. Chi-square analysis was used to test the relationship that exists between the socio-economic characteristics of women and adoption of selected technologies.

RESULTS AND DISCUSSION

Socioeconomic characteristics

Table 1 shows the socio-economic characteristics of the women in the study area. The age distribution shows that majority (73.5%) of the women were between the age of 26-55 years with a mean age of 49 years. It implies that the respondents are still young and are therefore still active and should be inquisitive to want to adopt new or improved technology. Age is also assumed to be a determinant of adoption of new technology. According to Kariyasa and Dewi (2011), Older farmers are assumed to have more knowledge and experience and are better able to evaluate technology information than younger farmers. On contrary age has been found to have a negative relationship with adoption of technology. This relationship is explained by Adesina and Zinnah (1993) that as farmers grow older, there is an increase in risk aversion and a decreased interest in long term investment in the farm. On the other hand younger farmers are typically less risk-averters and are more willing to try new technologies. More than half (56.2%) of the women were married, and all the women had one form of education or the other. This implies that most of them will be able to read and write to some extent and will be able to comprehend the technicalities involved in any new technology. Education of the farmer has been assumed to have a positive influence on farmers' decision to adopt new technology. Education level of a farmer increases his or her ability to obtain; process and use information relevant to adoption of a new technology (Mignouna *et a*l., 2011; Lavison 2013). About half (50.04%) of the women were into farming as major occupation, while only 23.6 % were processors among others. This will make them adopt improved farming technologies that may be introduced to them because they would want to increase their agricultural production as well as income. Most of the women (63.8%) had household size of between 4-7 individuals with a mean household size of 6 persons. Their household size can serve as a source of family labour for their farming activities. It was also discovered that most (90.6%) of the women had farm size of about 2 hectares. These farm size, though small are ample enough for their activities and can enable them adopt new technologies. Most (72.8%) of the respondents had a monthly income of between N15,001 and N50,000 with a mean income of N48,950 which is relatively low compared to the high cost of living in the study area. Adoption of improved technology will lead to an increase in income.

The result also show that 59.8% of the women got their input (planting materials) from open markets, while 16.0% sourced theirs from families and friends and 24.3% from the state ADP. Farmers are more likely to source for planting materials from sources that are convenient for them. However, it is better to source for input from reliable sources like ADPs and research institute so as to be sure of the source such input or technology. Furthermore, 50.7% of the women got credit from their personal savings and had little access (9.7%) to loan especially from financial institutions. Access to credit can be a stimulus to technology adoption.

Table 1: Distribution of respondents by their socioeconomic characteristics (n=144)

Variable	Frequency	Percentage Mean
Age		
≤ 25	5	3.5
26-35	11	7.6
36-45	38	26.4 49 years
46-55	56	39.2
≥ 56	34	23.8
Marital status		
Single	25	17.4
Married	81	56.2
Divorced	13	9.0
Widowed	25	17.4

Variable	Frequency	Percentage Mean
Education		
Adult education	35	24.3
Primary	30	20.8
Secondary	15	10.4
Tertiary	64	44.5
Major occupation		
Artisan	13	9.0
Civil servant	10	6.9
Farming	72	50.0
Processing	34	23.6
Trader	15	10.4
Household size		
≤ 3	14	9.7
4-7	94	65.3 6.1
≥ 8	36	25.0
Farm size (acres)		
≤8	125	86.8
9-15	15	10.4 4.1
≥ 16	4	2.7
Income		
≤ 15,000	8	5.6
15,001-50,000	99	68.8
50,001-85,000	16	11.2 48,950
85,001-120,000	15	10.4
≥120,0001	6	4.2
Source of input		
ADP	35	24.3
Friends/relatives	23	16.0
Open market	86	59.8
Source of credit		
Bank	14	9.7
Cooperative	28	19.4
Friends/relatives	29	20.1
Personal savings	73	50.7

Awareness of selected technologies introduced by WIA to women

Awareness of a technology always precedes adoption. Table 2 shows four production and four processing technologies that were selected out of the ones introduced to the women in the study area by WIA. The result shows that the women were aware of all the technologies introduced, however *gaari* processing (86.5%), dry season (84.3%) and wet season vegetable production (81.2%) and use of oil palm seedling (75.0%) were the most popular technologies among the women in the study area as these technologies rank 1st, 2nd, 3rd and 4th, respectively. Although the difference in percentage of awareness may be due to the fact that some women are into farming as major occupation, while others were into processing and will most likely concentrate on technologies that concern them. The use of improved cocoa seedlings (59.7%) and plantain chips processing (62.5%) were also popular technologies among the women.

Table 2: Distribution of respondents by awareness of selected technologies introduced by WIA . n=144

Technology introduced	Aware	Rank	Not aware
Production technologies			
Dry season vegetable production	120 (84.3)	2nd	24 (16.7)
Wet season vegetable production	117 (81.2)	3rd	27 (18.8)
Use of improved cocoa seedlings	86 (59.7)	8th	58 (40.3)
Use of oil palm seedlings	108 (75.0)	4th	36 (29.0)
Processing technologies			
Pineapple chips processing	102 (70.1)	5th	42 (29.2)
Gari processing	126 (86.5)	1st	18 (12.5)
Plantain chips processing	90 (62.5)	7th	54 (37.5)
Soya milk processing	93 (64.6)	6th	51 (35.4)

Source: Field Survey, 2016
Figures in parentheses are percentages

Adoption of selected technologies

Table 3 shows the adoption of the various technologies introduced to the women in the study area. Findings reveal that *gaari* processing (86.5%), dry season (84.3%) and wet season (81.2%) vegetable production and use of oil palm seedling (75%) were the most adopted technologies as these ranked 1st, 2nd , 3rd and 4th, respectively. According to the women, these technologies have increased their production and income and that is why they maintain their adoption status of these technologies. Furthermore, only 5.6% of the women who adopted *gaari* processing discontinued its use, while it was not adopted by 16.7%. According to some of the women, lack of access to credit and high cost of cassava tubers were reasons for discontinuance and non-adoption of gaari processing According to Doss (2003) Characteristic of a technology is a precondition of adopting it, trialability or a degree to which a potential adopter can try something out on a small scale first before adopting it completely is a major determinant of technology adoption

Table 3: Distribution of respondents by adoption of the various technologies introduced by WIA (n=144)

Technology introduced	Adopted and still using	Adopted but discontinued	Do not adopt
Production technologies			
Dry season vegetable production	60 (41.6)	42 (29.2)	42 (29.2)
Wet season vegetable production	82 (56.9)	22 (15.3)	40 (27.8)
Use of improved cocoa seedlings	77 (53.5)	32 (22.2)	35 (24.3)
Use of oil palm seedlings	43 (29.9)	40 (27.8)	61 (42.3)
Processing technologies			
Pineapple chips processing	64 (44.4)	21 (14.6)	59 (41.0)
Gari processing	112 (77.7)	8 (5.6)	24 (16.7)
Plantain chips processing	60 (41.5)	24 (16.6)	60 (41.5)
Soya milk processing	44 (30.6)	18 (12.5)	82 (56.9)

*Percentages are in parentheses

Constraints to adoption of selected technologies introduced by WIA to women

Table 4 shows constraints to the adoption of selected technologies introduced by WIA to women. Out of the four processing technologies identified (soymilk processing, gari processing, pineapple chips and plantain chips processing), 53.5%, 48.6%, 59% and 62.5% of the women indicated high cost of input as constraints the adoption of these technologies. This corroborates the submission of Mwangi and Kariuki (2015) that the cost of technologies is a major constraint in technology adoption. Lack of control over production resources like land, capital, climate and many other factors were also identified by the women as factors affecting technology adoption. This was indicated by 79.9%, 70.1%, 66.7% and 68.1% of women in soymilk, *gaari*, pineapple chips and plantain chips processing, respectively. Other factors identified were pest and diseases, complexity of technology and market problem which were identified by few of the women.

The production technologies identified were dry season vegetable production, wet season vegetable production, use of improved cocoa seedling and use of improved oil palm seedling. Also, 64.6%, 40.3%, 52.1% and 49.3% of the women indicated high cost of input as factors affecting adoption of these technologies, respectively. Ndove*et al* (2006) submitted that high cost of input like fertilizer and high breed seed reduces the adoption of some technologies. Lack of control over production resources was also one reason given by the women as affecting technology adoption. An example given by some of the women was the negative effect of climate on crop production, especially on some crops like cassava, tomatoes and maize with associated effect of diseases and pest infestation which lead to low productivity. Lack of capital and lack of access to credit also constrained women's adoption of technologies. It is believed that access to credit promotes the adoption of risky technologies through relaxation of the liquidity constraint as well as through the boosting of household's-risk bearing ability (Simtowe and Zeller, 2006).

This is because with an option of borrowing, a household can do away with risk reducing but inefficient income diversification strategies and concentrate on more risky but efficient investment.

Distribution of respondents by specific constraints to adoption of selected technologies (n=144)

Technologies	High cost of input	Pest & disease problem	Complexity of technology	Marketing problem	Lack of access to credit	Lack of control over production resources
Production technologies						
Dry season vegetable production	93 (64.6)	81 (56.2)	62 (43.1)	114 (79.2)	115 (79.9)	76 (65.3)
Wet season vegetable production	58 (40.3)	75 (52.1)	66 (45.8)	113 (78.5)	98 (68.1)	101 (70.1)
Use of improved cocoa seedlings	75 (52.1)	93 (64.6)	70 (48.6)	99 (68.7)	120 (83.3)	99 (68.7)
Use of oil palm seedlings	71 (49.3)	92 (63.9)	73 (50.7)	91(63.2)	90 (62.5)	93(64.6)
Processing technologies						
Soya milk processing	77 (53.5)	71 (49.3)	75 (52.1)	123 (85.4)	116 (0.6)	115 (79.9)
Pineapple chips processing	85 (59.0)	62 (43.1)	76 (52.8)	107 (74.3)	126 (87.5)	96 (66.7)
Gari processing	70 (48.6)	69 (47.9)	71 49.3)	99 ((68.7)	119 (82.6)	101 (70.1)
Plantain chips processing	90 (62.5)	66 (45.8)	82(57.1)	10371.5)	122 (84.7)	98 (68.1)

Relationship between respondents' selected socio-economic characteristics and level of adoption of agricultural technologies introduced by WIA

The result in Table 5 shows the Chi-square analysis of relationship between respondents' socio-economic characteristics and their adoption of agricultural technologies. The result shows marital status (χ^2= 53.163, p= 0.000), education (χ^2=25.481, p=0.013), religion (χ^2=21.659, p=0.010), major occupation (χ^2= 52.471, p= 0.001), source of land (χ^2=28.576, p=0.018) and source of input (χ^2=36.653, p=0.000) had significant relationships with adoption of agricultural technologies. This implies that the marital status, education, religion, major occupation, source of land and source of input are the determinants of adoption of agricultural technologies in the study area. For instance, the more educated a women farmer, the higher she is likely be willing to adopt new agricultural technologies introduced to her production and processing enterprises. For instance a study by Okunlola *et al.* (2011) on adoption of new technologies by fish farmers found that the level of education had a positive and significant influence on adoption of the technology. This is because higher education influences respondents' attitudes and thoughts making them more open, rational and able to analyze the benefits of the new technology (Waller *et al.,* 1998). This eases the introduction of a new innovation which ultimately affects the adoption process (Adebiyi and Okunlola, 2010) Furthermore, source of land may likely affect technology adoption especially where the land is inherited, but a farmer that purchased land for farming will want to increase production for increased income thus would likely adopt new or improved technology. This also applies to source of input, if the inputs are from a reliable source; it is likely to be adopted by women except where high cost is an impediment.

Table 5: Chi-square test of the relationship between socio-economic characteristics of respondents and the level of adoption of agricultural technologies introduced by WIA

Variables	X^2	Df	p – value	Remark
Age	18.480	12	0.102	NS
Marital status	53.163	12	0.000	S
Education	25.481	12	0.013	S
Major occupation	52.471	24	0.001	S
Household size	7.535	6	0.274	NS
Farm size	2.004	6	0.919	NS
Income	19.573	12	0.076	NS
Source of land	28.576	15	0.018	S
Source of credit	19.952	12	0.068	NS
Source of input	36.653	9	0.000	S

P>0.05 = Not significant (NS)

CONCLUSION AND RECOMMENDATION

The study has shown that majority of the women in the study were aware of selected technologies introduced to them by WIA. Also, about half of the women adopted and are still using some of the technologies like *gaari* processing, wet season vegetable production and use of oil palm seedling, while some of the women though adopted but later discontinued adoption. Reasons given for discontinuance were high cost of input, lack of credit facilities, pest and disease problem, complexity of technology, market problem and lack of control over production resources (land, capital, climate) among many others. Marital status, education, major occupation, source of land and source of input were significant to adoption of selected technologies. Based on findings from the study, it is recommended that some factors such as environmental factors, status (educational and economic) of the farmer, type of technology, should be considered by researchers when introducing a technology to the farmer. Technologies that build on asset which the farmers already have are more likely to be adopted faster.

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