GENDER ANALYSIS OF FACTORS INFLUENCING SOIL AND WATER CONSERVATION TECHNOLOGY UTILISATION AMONG VEGETABLE FARMERS IN EKITI AND OYO STATES, NIGERIA

[1]Faniyi, E., [2]Deji, O., [2]Olowoyo, O. [2]Sulaimon, W. and [3]Aduwo,O.
[1]Department of Agricultural Extension and Management, Rufus Giwa Polytechnic, Owo, Ondo State, Nigeria
[2]Department of Agricultural Extension and Rural Development, Obafemi Awolowo University, Ile- Ife, Nigeria
[3]Department of Sociology and Anthropology, Obafemi Awolowo University, Ile- Ife, Nigeria
Correspondence contact details: ebunfaniyi@gmail.com

ABSTRACT
The study assessed the gender analysis of factors associated with soil and water conservation technology usage among vegetable farmers in Ekiti and Oyo States, Nigeria. It specifically, described the socioeconomic characteristics of vegetable farmers and examined the gender-specific factors associated with soil and water conservation technology utilisation in vegetable production. The study adopted a multi-stage sampling procedure. Data were elicited from the respondents using an interview schedule and focus group discussion guide. The study used inferential and descriptive statistics to analyse the data from the survey. The findings showed that the mean age for male was 35 years and female vegetable farmers 41 years. While the mean years of vegetable farming experience for male was 16 years and female vegetable farmers was 19 years. Varimax factor rotation pattern was used to isolate six factors associated with soil and water conservation technology usage for male vegetable farmers, which were information-source factor (14.4%), family factor (14.0%), resources factor (11.7%), economic factor (10.5%), soil-fertility factor (8.3%), and institutional factor (8.0%). Also,five factors were isolated for the female vegetable which were include; personal-experience factor (21.6%), information source factor (20.0%), land acquisition factor (10.7%), resources factor (10.0%), and group membership factor (7.7%). Information, resources, economic, personal experience, and land acquisition were the gender-specific factors influencing soil water conservation (SWC) technology usage. It was recommended that the factors identified should be noted as springboard for technology development and dissemination in Nigeria, this will help in the removal of the existing gender gaps among the farmers, especially in the rural areas and ensure sustainable agricultural practices and rural transformation.
Keywords: Gender analysis, Soil-Water conservation, Vegetable farmers, Technology usage

INTRODUCTION

Food security is a major concern in sub-Saharan Africa (SSA). The concern is because countries in SSA suffer from low agricultural yields compared to the rest of the world (Olarinde, Binam, Abdoulaye, Maman, and Adekunle 2010) and because the smallholder farmers dominate the agricultural sector of most SSA countries. Nigeria's agricultural sector is grappling with fundamental issues of food security and sustainable agriculture because her food production is largely in the hands of smallholder farmers (Fatuase and Ajibefun, 2014).

Land degradation poses a severe threat to the sustainability of agricultural soils in Nigeria, which is caused by soil erosion (Akpokodje, Tse, and Ekeocha, 2010). Smallholder farmers of Nigeria, like in other places, are also confronted with the vagaries of climate change; hence for farmers to have increased agricultural productivity, which will lead to agricultural 'transformation and development,' there should be the restoration of soil fertility and conservation of soil and water resources.

The vegetable farmers in this study belong to the Underutilised Indigenous Vegetables (UIVs) farmers who were involved in the International Development Research Centre (IDRC) funded project called Nigerian-Canada underutilised vegetable (NicanVeg) project. The goal of the project was to popularise the production, processing, and consumption of underutilised indigenous vegetables (UIVs) in the rain-forest and savannah agro-ecological zones in Southwest, Nigeria with a view to empowering the participating farmers especially women, thereby enhancing household nutritional status and alleviating poverty (Adebooye *et al*., 2014).

The phase II of the project titled "MicroVeg" aimed at scaling up the indigenous vegetable production through the development and dissemination of micro-dosing technology to increase yields and income through value addition, as well as preserve soil and water ecosystems, and enable fertiliser cost saving (MicroVeg, 2015). The primary objective of the MicroVeg project is to improve environmental sustainability through better soil and water conservation (SWC) by developing a technology capsule on fertiliser micro-dosing and water management for underutilised indigenous vegetables (Micro Veg 2015). It is in view of this background that this study describes the socioeconomic characteristics of vegetable farmers and examined the gender-related factors associated with soil and water conservation technology utilisation in vegetable production.

METHODOLOGY

The study area was Ekiti and Oyo States, Southwestern Nigeria where the Micro Veg project is domiciled. Ekiti State comprises of sixteen Local Government Areas. It lies between latitude 7.667˚ N and longitude 5.250˚ E;and is bounded in the North by Kwara State, in the South by Ondo State, in the East by Kogi State and in the West by Osun State. On the other hand, Oyo State comprises thirty-three Local Government Areas with approximately 20,000 square kilometres of land area. The State is located between 7˚ and 9˚ north of the equator and bounded by longitudes 2˚ and 4˚ east of the Greenwich Meridian. It is bounded by Ogun, Osun, Kwara, and Republic of Benin in the South, West, North, and East, respectively. The average annual rainfall of the area ranges between 1150mm in the derived savannah and 1525mm in the rainforest zone. The Yoruba are the predominant inhabitants of the study area, which can be further, subdivided into some sub-ethnic groups because it is heterogeneous based on dialects. The primary occupation of the people is farming, with the predominance of simple tools such as hoes and cutlasses. The farmers cultivate both annual and perennial crops such as maize, cassava, yam, rice, cocoyam, tomato, pepper, plantain, banana, leafy and fruit vegetables, cocoa, kola, citrus, oil palm, and rubber. Animals such as poultry birds, pigs, sheep, goats, and cattle are reared for consumption and sale. Besides agriculture, other income-generating activities include fishing, trading, food processing, local soap making, mat weaving, cloth weaving, cassava processing, oil palm processing, tailoring, carpentry, basket weaving, pottery, and other small-scale enterprises.

A multi-stage sampling procedure was used to select respondents for the study. At the first stage, Ekiti and Oyo States were purposively selected based on their active vegetable production activities and participation in phase 1 of the project (NicanVeg). The second stage involved the selection of 50 percent of the MicroVeg project sites in each of the two states (proportionate technique). Ekiti State has a total number of 6 MicroVeg sites, while Oyo has 4 sites as of the time of the field survey. Three and two sites were selected from Ekiti and Oyo states, respectively, to give a total of five project sites. At the third stage, a simple random sampling technique was used to select respondents from each project site. At the last stage,10 males and 10 females from each project site in Ekiti state and 15 males and 15 females from each project site in Oyo state were randomly selected to give a total of 60 males vegetable farmers and 60 females vegetable farmers.A total of 120 respondents were selected for the study. The study used the structured Interview Schedule, and Focus Group Discussion Guide to elicit quantitative and qualitative information respectively

RESULTS AND DISCUSSION

Personal and socioeconomic characteristics

Results in Table 1 show that the mean age of male vegetable farmers (MVF) was 35.28 years with a standard deviation of 8.27 while the mean age of female vegetable farmers (FVF) was 40.94 years with a standard deviation of 10.34. This is in line with the findings of MicroVeg (2017),which revealed that FVF was older than their male counterparts. These findings are also in conformity with that of Deji *et al*. (2012) and Koledoye *et al*. (2013). The implication is that the majority of the MVF and FVF were in their active ages of production; hence they could actively participate in vegetable production, thereby enhancing food security. A higher percentage (80%) of the MVF were married, 18.3 percent and 1.7 percent were single and widowers respectively. In the female category, the majority (88.3%) of the FVF were married. The results unveiled that majority of the farmers was married. The result confirms that of Oluwalusi (2014) and Torimiro *et al*. (2014), who assert that vegetable farmers in southwestern Nigeria were married. The findings in Table 1a reveal that the majority of the MVF (70%) and most of the FVF (56.7%) came from the monogamous family. Conversely, a minority of the MVF (30%) and a few of FVF (43.3%) practiced polygamy. This finding reveals that monogamy was predominant in the study area. This observation may be because the majority were Christians, and their religion is not favorably disposed to marrying more than one wife, which is in agreement with the findings of Fungo *et al*. (2011). These findings infer that the traditional way of marrying two or more wives is gradually fading away because people are becoming more enlightened on the challenges associated with marrying two or more wives in the society. The mean household size for both the MVF and FVF was five persons with a standard deviation of 2.1and 2.0, respectively. This result shows that an average farmer in the study area has a household size of 5. It implied that rural households are gradually moving away from the tradition of having a large household size for labour on their farms; this is in tandem with the observation of (Alabi, 2005) who reported that majority of parents in the rural areas now send their children to schools instead of using them as cheap source of labour.

Results in Table 1 show that the mean years of formal education were 11.95 years and 9.61 years with a standard deviation of 2.89 and 2.55 for male and female vegetable farmers, respectively. The findings reveal that MVF in the study area spent more years in formal education than FVF. This finding is in tandem with the

submission of Torimiro *et al*. (2014), Oluwalusi (2014), and Olarinde *et al*. (2010), which established that the years of formal education is a springboard for the adoption and utilisation of agricultural innovation. The mean vegetable farming experience in years of male and female vegetable farmers were 16.25 and 19.22, respectively, while the standard deviation was 9.27 and 10.49, respectively. The finding revealed that FVF had relatively higher vegetable farming experience than their male counterparts. This finding implies that vegetable production is a traditional female task; male farmers are developing interest due to increasing popularity and economic value. These findings confirm the submission of Deji *et al*. (2012) and Torimiro *et al*. (2014).

Table 1: Distribution of respondents by socio economic characteristics

Variable	MVF n=60				FVF n=60			
	Frequency	%	Mean	S. D	Frequency	%	Mean	S. D
Age								
≤ 20.00	1	1.6			1	1.6		
21.00 - 30.00	15	25			7	11.7		
31.00 - 40.00	36	60	35.28	8.27	28	46.7	40.94	10.34
41.00 - 50.00	5	8.3			12	20		
51.00 - 60.00	2	3.3			11	18.3		
61.00 -70.00+	1	1.6			1	1.6		
Marital status								
Single	11	18.3			2	3.3		
Married	48	80			53	88.3		
Widow	1	1.7			5	8.3		
Family type								
Monogamy	42	70			34	56.7		
Polygamy	18	30			26	43.3		
Household size								
1-5	31	51.7			25	41.7		
6-10	21	35	5.0	2.1	24	40	5.4	2.0
Above 10	8	13.3			11	18.3		
Years of Formal Education								
< 6 years	0	0	11.95	2.89	8	13.3	9.61	2.55
6 -12 years	37	61.7			37	61.7		
13 years above	23	38.3			15	25.0		
Size of the Vegetable Farm (Ha)								
≤ 0.50	42	70			36	60		
0.60 –1	17	28.3	0.42	0.14	23	38.3	0.48	0.17
> 1	1	1.7			1	1.7		
Years of Farming Experience								
≤10.00	19	31.7	16.25	9.27	17	28.3	19.22	10.49
11.00-20.00	27	45.0			22	36.7		
21.00-30.00	10	16.7			12	20		
31.00 and above	4	6.6			9	15		

Gender-Specific Factors Influencing SWC Technology Utilisation

Factor and component analysis were carried out to isolate the crucial factors influencing the utilisation of SWC technologies in MicroVeg project sites. The relevant variables were inter-correlated and run with a varimax factor rotation pattern. Tables 3 and 5 show the results of the varimax rotation of variable included in the factor analysis, and the principal components subsequently extracted for male and female vegetable farmers. The results show that the inter-correlation between the variables yielded six factors for male vegetable farmers and five factors for female vegetable farmers. The factors were named based on the criteria used by Farinde (1995) and Ajayi (2002), which are:

i. The researcher's subjective interpretation of experiences from literature.
ii. Picking synonyms of the highest loaded variables on each factor.
iii. Retaining the name based on the similarity of the features reposed in the variables contributing to the factors and;

iv. Joint explanation of the meaning of the positive and highly loaded variables on each factor.

The factors associated with the utilisation of SWC technologies among male vegetable farmers are shown sequentially in Tables 2 and 3. The discussions on these factors are as follows:

Factor one: Information source factor

Variables that loaded very high on factor one was UIVs information source (L= 0.788), number of contacts with extension agent (L=0.756), agricultural information source (L= 0.699), access to credit (L=0.626), cosmopolite-ness (L= 0.328) and membership position (L=0.323). By implication, the male vegetable farmers have access to reliable information on vegetable production and the various SWC technologies utilised in their vegetable production.

Factor two: Family factor

Family type (L= 0.807), Household size (L=0.786), Age (0.776), and Years of farming experience (0.386) loaded highest on factor 2. This factor was named family factor based on the variable that has the highest loading. Farmers' family type, whether monogamy or polygamy, affects the SWC technologies utilised in terms of labour availability to work on the farm. The male farmers may employ their family labour during the preparation of the land for vegetable production by involving them in utilising SWC technologies. On the other hand, household size is also an additional variable to the utilisation of SWC technologies, a male farmer with a large household size would have more family labour compared to small household size, and this might increase the utilisation of SWC technologies by the male farmer.

Table 2: Result of a varimax rotated component matrix showing extracted factors associated with soil and water conservation technologies for male respondents

	Factors					
Variables	**1**	**2**	**3**	**4**	**5**	**6**
Source of UIVs information	.788*					
Number of Contacts with Ext Agents	.756*		.368*		.307*	
Source of Agric. Information	.699*		.403*			
Access to Credit	.626*					
Family Type		.807*				
Household Size		.786*				
Age		.776*		.357*		
Available Resources			.725*			
Years of Farming Experience		.386*	.696*			
Income from Vegetable			.443*	.750*		
Land Acquisition				.677*		
Size of the Vegetable Farm				.660*	.303*	
Soil Type					.843*	
Cosmopolite-ness	.328*				.428*	.415*
Institutions						.696
Year of Formal School		-.316				.596
Membership Position	.363					.443

Figures in * indicate variables with high loading on each factor.

Factor three: Resources factor

The variables that loaded highly for this factor were available resources (0.725), income from vegetable (L=0.443), agricultural information (L=0.403), and the number of contacts with extension agents (L=0.368). The resources available to the male farmers in terms of income and information also influenced their SWC technologies utilisation. This factor was named resources factor based on criterion three.

Factor four: Economic factor

The income of the male vegetable farmers (L=0.750), their land acquisition (L=0.677), and the size of their vegetable farms (L=0.660) were the three measures of loading that identified this factor. This factor was named based on criterion two. The income and size of the male vegetable farmer will influence his utilisation of the SWC technologies while the male farmer's mode of land acquisition has a direct relationship with his SWC technology utilisation.

Factor five: Soil fertility factor.

The variables that loaded very high on factor five was soil type (L=0.843). This was used to label this factor based on criterion two. Other variables found to positively and significantly contribute to this factor were cosmopolite-ness (L=0.428), number of contacts with extension agents (L=0.307), and size of vegetable farm (L=0.503). This implies that the type of soil the male farmer is cultivating will determine the extent of his SWC technologies utilisation. Also, contact with the extension agents and other farmers from different communities, as well as the size of the

vegetable farm of a male farmer, will significantly determine his level of SWC technology utilisation.

Factor six: Institutional Factor

The roles of the institution (L=0.696), years of formal schooling (L=0.596), membership position in organisation (L=0.443), and cosmopolite-ness (L=0.415) loaded highest on this factor. The various roles of institutions, such as extension agents and other governmental organisations, would influence the male farmer's utilisation of SWC technology. The educational level of the male farmers and their interactions with other farmers and their membership of association would enhance their acquisition of knowledge on various technologies. This relationship would influence their utilisation of SWC technologies.

Table 3: Factor's name, Eigenvalues and percentage variation accounted for by each factor associated with SWC utilisation for male respondents.

Factor	Name	Eigenvalue	% variance	Cumulative % variance
1	Information source factor	2.450	14.41	14.41
2	Family factor	2.383	14.02	28.43
3	Resources factor	1.997	11.74	40.17
4	Economic factor	1.782	10.48	50.65
5	Soil fertility factor	1.403	8.25	58.91
6	Institutional factor	1.365	8.03	66.93
7	Others		33.07	100.00

The factors associated with the utilisation of SWC technologies among female vegetable farmers are in Tables 4 and 5. The discussions on these factors are as follows:

Factor one: Personal-Experience factor

The years of farming experience (L=0.892), age (L=0.842), household size (L=0.723), years of formal education (L=0.659), Family type (L=0.607), income from vegetable (L=0.470), and size of the vegetable farm (L=0.478) had positive and high loading on factor one. Female farmers with various personal characteristics such as age, experience in vegetable farming, formal education, large household size, and other characteristics will have a positive disposition to utilise SWC technologies. The size of the farm and the income from the farm will determine the SWC technologies utilisation.

Factor two: Information-Source Factor

Variables that loaded very high on factor two were agricultural information source (L=0.860), source of UIVs information (L=0.826), access to credit (L=0.826), number of contacts with extension agents (L=0.649) and income from vegetable (L=0.536). This factor was named information source factor based on criterion three. The sources of information for the female farmers, if it is perceived to be reliable, will relatively influence their utilisation of such information to boost vegetable production.

Factor three: Land Acquisition factor

Three variables were positive and they significantly contributed to this factor. These were land acquisition (L=0.851), income from vegetable (L=0.480), and the number of contacts with extension agents (L=0.321). This factor was named land acquisition factor based on criterion two, and implies that the female farmers' mode of land acquisition will determine their SWC technologies utilisation.

Factor Four: Resources Factor

Available resources (L=0.734), cosmopolite-ness (L=0.614), and the number of contacts with extension agent (L=0.524) loaded highest on factor 4. This factor was named resources factor based on criterion two. The availability of resources for SWC to the female farmers would influence their utilisation of the SWC technologies. Farmers' contact with the extension agents enhances their being aware of the current trends in agriculture.

Factor five: Membership Position factor.

Membership position (L=0.862) loaded highest on this factor. Usually, the mutual support amongst farmers strengthened through membership in social organisations. When the female gender is recognized and given a position of responsibility within an organisation, it strengthens the relationship within the social organisation. It implies that the female farmers would have access to information on current technologies, and this would influence their utilisation of such technologies.

Table 4: Result of a varimax rotated component matrix showing extracted factors associated with soil and water conservation technologies for female respondents

	Factors				
Variables	**1**	**2**	**3**	**4**	**5**
Years of Farming Experience	.892*				
Age	.842*				
Household Size	.723*				
Year of Formal School	.659*	.315			
Family Type	.607*				.411*
Soil Type	.501	.481			
Source of Agric. Information		.860*			
Source of UIVs information		.826*			
Access to Credit		.826*			
Number of Contacts with Extension Agents		.649*	.321	.524*	
Income from Vegetable	.470	.536	.480*		
Land Acquisition			.851*		
Institutional			.529*		-.309
Available Resources			-.307	.734*	
Cosmopolite-ness				.614*	
Size of the Vegetable Farm	.478			.519*	
Membership Position					.862*

Figures in * indicate variables with high loading on each factor.

Table 5: Factor's name, Eigenvalues and percentage variation accounted for by each factor associated with SWC utilisation for female respondents

Factor	Name	Eigenvalue	% variance	Cumulative % variance
1	Personal-Experience factor	3.664	21.56	21.56
2	Information source factor	3.385	19.91	41.47
3	Land acquisition factor	1.829	10.76	52.23
4	Resources factor	1.695	9.97	62.20
5	Group membership factor	1.296	7.63	69.83
6	Others		30.17	100.00

CONCLUSION AND RECOMMENDATIONS

The primary objective of the MicroVeg project was to improve environmental sustainability through better soil and water conservation (SWC) by developing a technology capsule on fertiliser micro-dosing and water management for underutilised indigenous vegetables. Literature provides clear information on gender roles in SWC but not specific about the roles of women in the utilisation of SWC technologies, hence the motivation behind this study. The findings of the study show that FVF were older than their male counterparts. Furthermore, it identified six factors for MVF and five factors for FVF associated with their utilisation of SWC. Information source and family factors are crucial to the utilisation of SWC among the MVF, while the personal-experience and information source factors are critical to the utilisation of SWC among the FVF.

The following recommendations were made from the study. There is a need for integration of gender-specific principles into land tenure and tenure rights to ensure female farmers' unrestricted access to and control over land by debunking the economic and socio-cultural factors responsible for this. Also, the factors identified should serve as a springboard for technology development and dissemination to enhance gender equity in technology utilisation among the farmers.There is a need for government and non-governmental organisations as the major stakeholders in agriculture to integrate gender-responsive approach that recognizes and considers the gender needs among the farming populace into their policies, programs, and structure for improved food security and sustainable development.

REFERENCES

Adebooye, O. C., Deji, O. F., Ayanwale, A. B., Oyedele, D. J. and Alao, T. O. (2014). Stories of change: Nigerian women reap benefits from indigenous vegetables. Research report supported by the Canadian International Food Security Research Fund (CIFSRF) and Canada's International Development Research Centre (IDRC).

Ajayi, A. O. (2002). Participation of Rural Children in Farming Activities in Oyo State, Nigeria. An Unpublished Ph. D. Thesis, Department of Agricultural Extension and

Rural Development, Obafemi Awolowo University, Ile-Ife.

Akpokodje, E. G, Tse, A. C and Ekeocha, N. (2010). Gully Erosion Geo-hazards in Southeastern Nigeria and Management Implications. *Scientia Africana*.9 (1) 20-36

Alabi, D. L. (2005). Factors Influencing Effective Management of Financial Resources Among Selected Locally Available Trees and Spices in Osun State, Nigeria. Unpublished Ph. D. thesis. Obafemi Awolowo University, Ile-Ife pp. 96

Deji, O. F., Koledoye, G. F. and Owombo, P. T. (2012). Gender analysis of constraints to vegetable production in Ondo State, Nigeria. Conference proceedings; Nigerian Rural Sociological Association (NRSA), 21st Annual National congress.

Farinde, A. J. (1995). "Factors Associated with the Effectiveness of the Training and VisitFarmers in Ila Local Government Area of Osun State, Nigeria; *Middle-East Journal of Scientific Research* 2 (1): 14-20.

Fatuase, A. and Ajibefun, I. (2014): Perception and Adaptation to Climate Change among Farmers in Selected Communities of Ekiti State, Nigeria. *Journal of Agricultural Faculty of Gaziosmanpasa University. JAFAG*32 (3) 101-114

Fungo, B., Tenywa, M., Majaliwa, J., Kuule, M. and Kamugisha, R. (2011). Use of soil and water conservation practices in the Southwestern highlands of Uganda. *Journal of Soil Science and Environmental Management* 3(9) :250-259.

Koledoye, G. F., Ibidapo, I., Deji, O. F. and Adepoju, R. A. (2013). Gender assessment of arable crop farmers in soil management practices in Osun State, Nigeria. *Journal of Agricultural Science and Applications* 2 (4): 207- 212.

Micro Veg (2015). ProjectBulletin (MicroVeg Project-107983)23rd-30th May, 2015, Pp 2

Micro Veg (2017). Documentation of the Impacts of Crop Diversification on Resource Use Efficiency, Resilience and Gender Equity. *18-month Project Update Newsletter,* January, 2017. Accessed on line May 2017

Olarinde, L. O., Binam, J., Abdoulaye, T., Maman, N. and Adekunle, A. (2010). Adoption of and farmers' exposure to soil and Water Management Practices in the Sahel Savannah of West Africa: Average Treatment Effect (ATE) Estimations.Joint 3rd African Association of Agricultural-Economists and 48th Agric-Economists Association of South Africa Conference, Cape Town, South Africa, September 19-23, 2010.

Oluwalusi, J. O. (2014). Vegetable farmers' attitude towards organic agriculture practices in selected states of South West, Nigeria. *Journal of Agricultural Extension and Rural Development JAERD Vol 6 (7) 226-230*

Torimiro, D. O., Ayinde, J. O., Koledoye, G. F. and Oyedele, D. J. (2014). Farmers' involvement in under-utilised indigenous vegetable production: experiences and emerging issues from south-west Nigeria. *Journal of Agric. Sci. App.* (2).*39-45*