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Gender variation in land use intensity and degradation among arable crop farmers in southwest, Nigeria:

A mixed method study.

Olamide Olowoyo[1]*, Olanike Deji[2], Waheed Sulaimon[2], Ebunoluwa Faniyi[3].

[1]*Department of Agricultural, Leadership, and Community Education, Virginia Tech. olowoyomide@gmail.com, Blacksburg, USA.

[2]Department of Agricultural Extension and Rural Development, Obafemi Awolowo University. dejiolanike@gmail.com, sulaimon_suberu@yahoo.com, Ile-Ife, Nigeria.

[3]Department of Agricultural Extension and Management, Rufus Giwa Polytechnic. ebunfaniyi@gmail.com, Owo, Nigeria.

ABSTRACT

Context and background

The intensive use of land is regarded as the major source of agricultural growth in many developing nations, even though this intensive usage has been seen as one of the most substantial human impacts on the global environment. However, the intensification of agricultural land use has led to many environmental and social challenges. This study used a descriptive-correlational mixed method research design to investigate the gender variation in the land use intensity (LUI) and degradation among arable crop farmers in southwest, Nigeria.

Goal and Objectives:

This study was conducted with a view to determining the level of land use intensity and degradation among male and female arable crop farmers.

Methodology:

A multistage sampling technique was used to select 336 respondents for the study, a total of 168 male and 168 female farmers were selected from two states: Ekiti and Oyo. A well-validated structured interview schedule was used to collect quantitative data from the 336 respondents. Focus Group Discussion (FGD) guide was used to elicit qualitative information from the selected 107 participants from the two states.

Results:

The results show that Fallow Rotation Intensity (FRI) was found to be higher among female arable crop farmers (ACFs) compared to male farmers, but the cropping intensity (CI) was higher among male farmers compared to female farmers. Land use intensity among male farmers was higher than that of female farmers. The study also shows evidence of the increasing intensity of land usage, characterized by increased cropping intensity and increased frequency of farmland cultivation among male and female arable crop farmers. Land use intensity and degradation intensity were significantly different among female and male ACFs. This study recommends policy formulation and implementation on land usage that will make male and female ACFs feel emotionally attached to the land they cultivate.

Keywords

Land use intensity, land degradation, cropping intensity, fallow rotation intensity, and gender variation.

1. INTRODUCTION

Land as an essential natural resource is a vital agricultural input for food production. Access to land is very important for the achievement of sustainable agriculture, national development, and food security (Adamu, 2014). The vitality of land is well demonstrated in its quantity, accessibility, quality, and availability. In the Nigerian arable crop production context, productivity is determined by land quality (Raufu, 2010). The quality factor to a greater extent determines the usage of inputs such as tractors, labor, and agrochemicals for crop production among Nigerian female and male arable crop farmers (ACFs). The quality of arable land reduces due to increased land usage intensification and fallow contraction. Research (Ajijola et al., 2014; Saka et al., 2011; Oyekale, 2007) reveals that the occurrence of reduced length of fallow and the non-static nature of farming systems in Nigeria justifies the increase in the intensity of land usage through intensive or continuous cropping. However, Tsue et al., (2014) highlighted the potential of achieving increased agricultural production through the intensive use of land, with the opinion that proportionate use of modern inputs is necessarily required to achieve sustainable agricultural growth through the increased intensity of land usage. Moreover, if these conditions are not strictly adhered to, then increased land use intensity might result in continuous productivity and yield decline, soil structure loss, soil fertility depletion, and degradation of land.

Agricultural intensification is a means through which land productivity is increased over time by increasing the number of different inputs used on the land per unit area. It is a means by which the utilization and productive capacity of land that is currently under use is increased (Shrestha et al., 2021; Shriar, 2000). Intensification of land usage is the extent to which land and the available resources have been used to achieve the aim of usage (Ajijola et al., 2014). Lands are used intensively in the following ways: "pesticide use intensity, labor use intensity, fertilizer use intensity, seed use intensity, manure use intensity, and the intensity of animal traction" (Tiffen et al., 1994). The intensive use of land is regarded as the major source of agricultural growth in many developing nations, even though this intensive usage has been seen as one of the most substantial human impacts on the global environment (Matson et al., 1997). The intensification of agricultural land use has led to many environmental and social challenges. Likewise, the indiscriminate use of agrochemicals and non-adherence to recommended procedures has led to many well-known health and environmental problems (Olowoyo & Deji, 2017). Land use intensification may also result in converting marginal lands like pastoral land or grasslands to crop-production land (Li et al., 2013). Likewise, land fragmentation by families also puts more pressure on the lands year in and year out (Oyekale, 2007; Agbonlahor et al., 2003). Basically, one of the issues of concern in the study of land use intensity is the determination of what constitutes intensity. 'Land-use intensity' could be measured either from an input or output perspective. With a focus on output, intensity can be measured in production units which include: 'monetary values, kilograms, calories, tons' among others per area of land and per time unit (Shriar, 2000). Conversely, with a focus on input, the amount of input is measured and weighed using appropriate indicators, such as, "cultivation frequency, cropping systems, and farmland proportion cultivated" (Shriar, 2000).

Research (Oyekale, 2007; Saka et al., 2011) revealed that the occurrence of reduced length of fallow is a consequence of the inadequate availability and accessibility to land by arable crop farmers. Land accessibility for arable crop farming is crucial for an increase in the production of food and germane for any meaningful agricultural development. But the right to ownership and access to arable land in some parts of the world including Nigeria is positively skewed in favor of male farmers compared to female farmers (Adekola et al., 2013). Female farmers often face more challenges in land acquisition when compared to their male counterparts (Olowoyo & Deji, 2020), because they have limited access to and control over land (Britwum & Akorsu, 2016). Thus, if farmers don't have full access and control over land, there will be less efficient usage of the land and less consideration of the future environmental impact of land's nutrients over-exploitation. As such, farmers who have access to the over-explored land will be left with the choice of agrochemical usage to regain the lost nutrients. The overexploitation of land nutrients through continuous/intensive cropping and reduced length of fallow degrades the arable land (Oyekale, 2012). Most of the farmers engage in excessive intensity of land use for food production, which often leads to land degradation (Saka et al., 2011). It is against this backdrop that this study investigated the gender variation in land use intensity and degradation among female and male arable crop farmers in southwest Nigeria.

Hence, this study contributed to bridging this gap by providing in-depth empirical answers to the following research objectives:

1. Determine the gender variation in land use patterns and land use intensity among arable crop farmers.
2. Investigate the gender variation on the intensity of land degradation among arable crop farmers.

The purpose of this study is to analyze the gender variation in land use intensity and degradation among arable crop farmers in southwest, Nigeria. Specifically, the study determines the gender variation in land use patterns and land use intensity among arable crop farmers and investigates the gender variation in the intensity of land degradation among arable crop farmers. This study also tested a null hypothesis; there is no significant difference between land use intensity and degradation among male and female arable crop farmers.

2. METHODOLOGY

2.1 Research design

The research design adopted for this study was a descriptive-correlational mixed-method research design. This method gives a broad understanding of the research problem using both qualitative and quantitative data. This research design involves a separate sequential collection of both qualitative and quantitative data. Qualitative data was first collected, followed by quantitative data. Qualitative data gives a broad understanding and unveils the hidden gender issues associated with land use intensity and degradation among female and male arable crop farmers. It was used to explore the intensity of land usage and land degradation among female and male arable crop farmers. The

quantitative data was used to quantitatively measure necessary variables associated with land usage, land use intensity, and degradation among female and male arable crop farmers.

2.2 The study area

The study was carried out in southwest Nigeria. The region is made up of six states which are: Ekiti, Oyo, Ogun, Lagos, Ondo, and Osun states, spreading between Longitude 4°W and 6°E and Latitude 6°N and 4°S, with land area of 114,271 square kilometers. The zone features a typically equatorial climate with different wet and dry seasons and a major growing season that lasts up to 9 months between March and November. Rainfall is 1480mm on average with a mean temperature range of 18°- 24°C monthly in the wet season and 30°- 35°C in the dry season. A marked break in rainfall is experienced in this area in the month of August. Precipitation is also high during the rainy season. Agriculture is an employment source for the populace in this zone, with female and male farmers actively involved in arable crop production. The predominant form of crop production in this area is annual crop cultivation through rain-fed agriculture.

2.3 Sampling techniques and data analysis

The sample size was selected using a multi-stage purposive sampling technique. First is the purposive selection of two states, Ekiti, and Oyo based on the paramountcy of arable crop production coordinated by the Agricultural Development Programme (ADP). This is followed by purposively selecting two ADP zones, with high production of arable crops; each from the forest and savannah zones of each state, to make four agricultural zones (Ekiti: Zone 1 and Zone 3, Oyo: Ibadan/Ibarapa and Saki Zones). Thirdly, three Local Government Areas (LGAs) known for high arable crop production were selected from each agricultural zone, giving twelve LGAs. This is followed by the selection of two communities in each LGA using a simple random sampling technique to give twenty-four communities. Finally, seven male and seven female arable crop farmers were selected using snowball sampling technique from each farming community making a total of 336 respondents for the study. A structured interview schedule was used to elicit quantitative data. The focus group discussion (FGD) guide was used to elicit qualitative data. Three focus group discussion sessions were conducted in each zone with one in each LGAs to make a total of twelve sessions, six for males and six for females. Participants for the FDG range from 8 to 10 arable crop farmers giving a total number of 107 participants. Different sessions were conducted for male and female arable crop farmers with no age discrimination. The qualitative data from the focus group discussion were analyzed thematically using Atlas.ti software, while quantitative data from the interview schedule were processed using statistical package for social sciences (SPSS) software and analyzed using descriptive (mean, frequency, percentage, and standard deviation) statistics and analysis of variance (ANOVA), was used to test the hypothesis.

2.4 Measurement of land use intensity

The study generated land-use intensity scores using two indices as used by Saka *et al.* (2011), namely fallow intensity rotation and cropping intensity index. 'Fallow Rotation Index' (FRI) was initially proposed by Ruthenberg (1980) and 'Cropping Intensity Index' measures the 'proportion of the year for which the land is occupied by crop' as proposed by Dayal (1978). Consequently, farmers were

categorized into 'fallow rotation pattern' using the 'Fallow Rotation Intensity Index' whereby *FRI*<33 = shifting cultivation (low) 33≤R≤66 Bush Fallow systems (medium) and R>66 is permanent/continuous cultivation (High).

The FRI is given as: $FRI_i = t_i / C_i$

Where:

FRI_i = 'Fallow Rotation Intensity' (0<R≥1)

t_i = 'Number of years for which cropland is consecutively cultivated before been allowed to fallow'

C_i = 'Length of cropping cycle' ('addition of years of consecutive cultivation and period of Fallow')

To account for the crop load effect on the land, this study estimates the Cropping Intensity Index as proposed by Dayal (1978). The index measures the cropping intensity of the land over a growing season. This is said to be the proportion of years the land is occupied with economic crops. According to Dayal (1978), the approach accounts for cropping system choice variation, diversity in the gestation period of crops, and choice of multiple cropping. The index shows where intensity can be increased by raising multiple cropping levels since it shows the average number of months a hectare of land is being cultivated. The cropping intensity index is thus measured as,

Cropping intensity (*CI*) = $\frac{Aci.Di+Aci.Di+Aci.Di+.....}{S}$

Where:

CI = 'Cropping Intensity Index' (crop year/ha)

Aci = 'Land area under crop i'

Di = 'The duration of crop i in the field in months

S = 'The net sown area in the land unit concerned'.

Similarly, 'CI≤33 (low) 33<CI≤66 (medium) and RCI> 0.66 (High)', these groupings were also ranked as 1, 2, and 3 for low, medium, and high respectively. The score generated from the two indices (fallow rotation index and cropping intensity) were later put together to generate a Composite Land-use Intensity score.

3. RESULTS AND DISCUSSION

3.1 Personal and socio-economic characteristics of farmers

Results in Table 1 show that the mean age of male arable crop farmers (MAF) was 45.57±11.03 years while that of female arable crop farmers (FAF) was 41.72±10.68 years. This indicates that the respondents were vibrant and within their productive age ranges. At this vibrant age, male and female arable crop farmers (ACFs) tend to increase the use of land which might lead to land degradation. The finding agrees with Akintonde et al., (2016) who reported that the average age of Oyo and Ekiti states' arable crop farmers is 49.43 years, and with Sulaimon *et al.,* (2023), who reported the average age of rural dwellers in Osun State Southwest, Nigeria to be 47.08±11.67 years. The mean household size among MAF was 7.00±2.21 members, and 6.00±1.96 members among FAF.

The finding reveals that MAF had higher household size than the FAF which might be due to polygamous family type common among MAF, and they might benefit more from the advantage of large household membership compared to their female counterpart in terms of family labor. Large household size could also be an indicator of increased land use intensity among farmers, thereby leading to land degradation. The finding agrees with Akintonde et al., (2016)'s report that the average household size of Oyo and Ekiti states arable crop farmers were 6 members. The mean years of formal education were 6.15±5.04 and 5.25±4.80 years for MAF and FAF respectively. Higher formal education among male and female arable crop farmers might influence them to try new things, such as cultivating new varieties of crops, which must have increased their intensity of land usage, thereby leading to land degradation. On the other hand, male and female ACFs might also acquire the knowledge to combat land degradation through their formal education. This finding is in tandem with Fasakin & Adegboyega (2020) who estimated the mean years of formal education of female arable crop farmers in Southwest Nigeria to be 7.47 years.

The mean arable farm size for male and female arable crop farmers were 4.39±2.31 and 3.13±1.80 hectares respectively. This implies that male arable crop farmers had larger farm sizes than female farmers and this might influence their production output as well as increase in land usage, and the resultant land degradation. The gender gap here might be because of the challenges of land acquisition female farmers encountered (Olowoyo & Deji, 2020) and the larger household size among male farmers which necessitates the acquisition of more land to provide for the pressing family needs. The finding agrees with the submission of Adeola & Adetunbi (2015) who estimated the mean farm size of food crop farmers in south-western Nigeria to be 4.4 hectares. The mean years of farming experience were 24.10±9.25 and 21.54±9.04 years respectively, for male and female arable crop farmers The findings reveal that male arable crop farmers had higher farming experience than female farmers. This implies that male arable crop farmers might have better knowledge of arable crop production compared to female farmers. Farmers with more years of experience might have better knowledge of how to manage land degradation. The finding agrees with Ibrahim *et.al.,* (2015) and Adeola & Adetunbi (2015) who estimated the mean years of farming experience of arable crop farmers in south-western Nigeria to be 23.5 and 23.8 respectively.

Table 1: Distribution of respondents on personal and socio-economic characteristics

Variables	Male(n=168)		Female(n=168)		Total (n=336)	
	Freq.	%	Freq.	%	Freq.	%
Age						
≤30 years	14	8.3	17	10.1	31	9.23
30–60 years	136	81.0	143	85.1	279	83.0
61 years and above	18	10.7	4.8	4.8	8.0	7.74
Mean	45.47		41.72		43.64	
SD	11.04		10.68		11.01	
Household size						
≤ 5	33	19.62	48	28.6	81	24.11
6-10	122	72.62	114	67.8	236	70.24
11 and above	13	7.74	6	3.6	19	5.65
Mean	7.00		6.00		7.00	
SD	2.21		1.96		2.12	
Years of formal education						
Not applicable	52	31.0	61	36.3	113	33.6
<6	55	32.8	61	36.3	116	34.6
6-12	48	28.5	38	22.3	86	25.5
13 and above	13	7.7	8	4.8	21	6.3
Mean	6.15		5.25		5.70	
SD	5.04		4.80		4.94	
Arable farm size (ha)						
≤2	40	23.3	67	40	107	31.9
3-5	75	45.2	81	48.1	156	46.4
6 and above	53	31.5	20	11.9	73	21.7
Mean	4.39		3.13		3.76	
SD	2.31		1.80		2.16	
Farming experience						
≤15	8	24.5	64	38.2	102	31.4
16-30	90	52.2	72	40.8	162	46.2
31 and Above	40	20.3	32	21.0	72	22.4
Mean	24.10		21.54		22.82	
SD	9.25		9.04		9.22	

Source: Field survey, 2019.

Freq.= Frequency, **SD**= Standard Deviation

3.2 Land Use Intensity

3.2.1 Fallow rotation index

The fallow rotation index measures the number of years in which the cropland is cultivated consecutively before fallowing and the length of the cropping cycle. Results in Figure 1 show that the majority (67.1% and 79%) of male and female ACFs, respectively, fell in the fallow rotation index of > 66 (continuous cropping), while 20.8 and 17.4 percent MAF and FAF, respectively, fell within the fallow rotation index of >33≤66 (bush fallow). Few (7.2% and 3.6%) male and female ACFs, respectively, fell in the fallow rotation index of ≤33 (shifting cultivation). The mean fallow rotation index for male ACFs was 0.70±0.15, while that of female ACFs was 0.72±0.12. This indicates that male

and female arable crop farmers in the study area practiced continuous cropping, leading to land degradation. The result also reveals that female arable crop farmers did practice continuous cropping more than their male counterpart, this might be a result of some of the specific challenges female farmers encounters in land acquisition for cultivation, and thus they tend to cultivate more on the land available to them with a lesser year of fallow, thereby leading to land degradation. The result is in tandem with Saka et al., (2011) who estimated the fallow rotation index of food crop farmers in South-western Nigeria to be 0.74. The results in Table 2 show the length of fallow, years of continuous cropping, and the cropping cycle among female and male ACFs in the study area. The mean years of fallow were 4.39±2.16 and 2.90±1.48 years among male and female arable crop farmers, respectively. This indicates that female farmers have a shorter fallow period than males, this might be because they have access to few parcel(s) of land compared to male farmers. The mean years of continuous cropping were 11.1±4.62 and 10.5±4.21 years among male and female arable crop farmers respectively. The mean years of the cropping cycle were 15.54±5.73 and 13.48±4.54 years for male and female arable crop farmers, respectively. This result is in tandem with the finding of Saka *et al.* (2011) who estimated the cropping cycle of food crop farmers in South-western Nigeria to be 14.80 years.

Table 2: Distribution of respondents on fallow rotation intensity

Variables	Male(n=168)		Female(n=168)		Total (n=336)	
	Freq.	%	Freq.	%	Freq.	%
Years of continuous cultivation						
≤15	133	81.5	149	88.6	282	83.9
16 and above	35	18.5	19	11.4	54	16.1
Mean	11.14		10.58		10.86	
SD	4.62		4.21		4.42	
Fallow period(yrs.)						
≤5	110	65.5	152	90.5	262	77.9
6 and above	58	34.5	16	9.5	74	22.1
Mean	4.39		2.90		3.65	
SD	2.16		1.48		2.00	
Cropping cycle(yrs.)						
≤10	36	21.6	46	27.5	82	24.6
11-20	94	55.6	115	68.3	209	61.9
21 and above	38	22.8	7	4.2	45	13.5
Mean	15.54		13.48		14.51	
SD	5.73		4.54		5.26	

Source: Field survey, 2019. **Freq.**= Frequency, **SD**= Standard Deviation

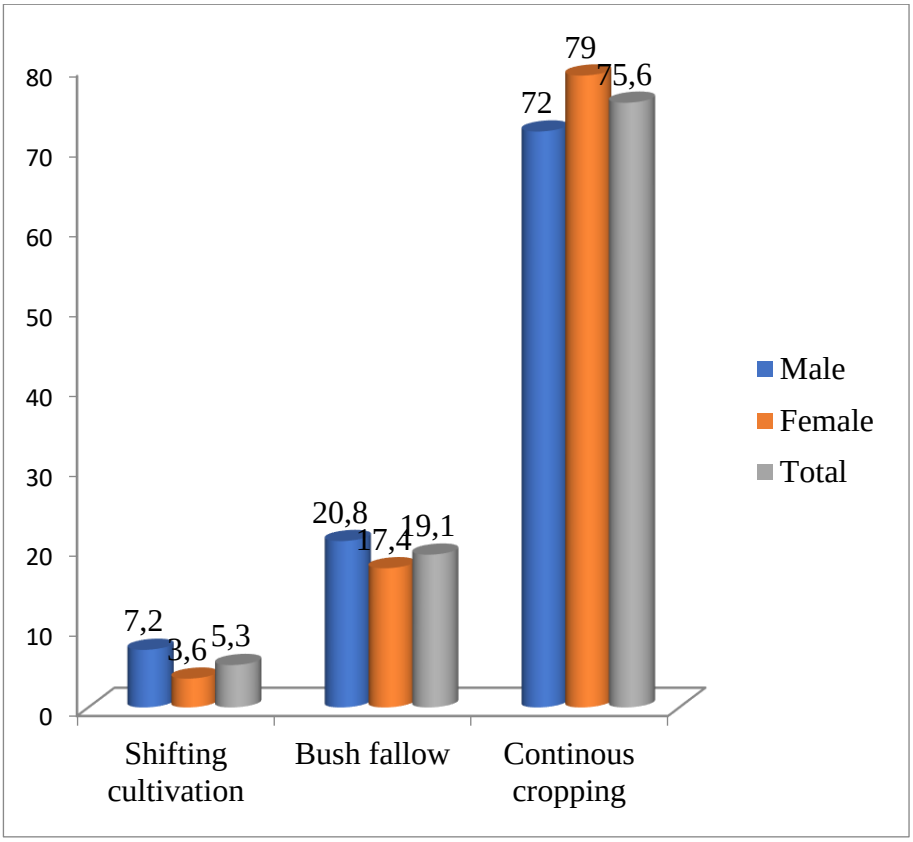

Figure 1: Distribution of respondents on fallow rotation index

Mean= MAF (0.70) FAF (0.72) Total (0.71)

Standard deviation= MAF (0.15). FAF (0.12) Total (0.14)

Source: Field survey, (2019).

3.2.2 Cropping intensity

The 'cropping intensity index' measures "the proportion of years for which the land is occupied with the economic crop". The index measures "the cropping intensity to which the land is subjected over a cropping season, and it is defined as the proportion of the year by which the land is occupied with economic crops". Results in Table 3 show that the mean months/ha of cropping intensity among male and female ACFs were 15.69±8.18 and 14.05±7.48 months/ha, respectively. The results reveal that male arable crop farmers had higher cropping intensity compared to their female counterparts. This implies that male arable crop farmers' land is occupied with economic crops longer than female farmers' land. This indicates a continuous usage of land and higher cropping intensity among male farmers compared to female farmers, thereby leading to land degradation.

The Table also shows respondents' distribution on years of cropping intensity. About 42 and 53 percent of MAF and FAF, respectively, had cropping intensity of 1.1 to 2.0 years/ha, while 37.6 and 39.4 percent of MAF and FAF, respectively, had less or equal to 1 year/ha of cropping intensity. Also 20.3 and 7.2 percent MAF and FAF, respectively, had 2.1 years/ha above of cropping intensity. The mean years/ha of cropping intensity was 1.30±0.68 and 1.17±0.61 years/ha for male and female ACFs, respectively. The findings show that arable crop farmers significantly occupied their land with economic crop averagely for more than nine months therefore they tend to no longer be able to

increase crop production through multiple cropping as advanced by Dayal (1978). The findings also show that male ACFs had higher cropping intensity compared to their female counterpart, which may be due to unfavorable secondary land ownership patterns, as well as the higher pressures for the exchange of farm, produce for money to meet the household's financial obligations among the female farmers. This implies that female arable crop farmers still have a better chance of increasing production through multiple cropping. This result agrees with the findings of Saka *et al.* (2011) who estimated the mean cropping intensity of food crop farmers in South-western Nigeria to be 1.24 years.

Table 3: Distribution of respondents on cropping intensity

Variables	Male(n=168)		Female(n=168)		Total (n=336)	
	Freq.	%	Freq.	%	Freq.	%
Cropping intensity(months)						
≤10	59	35.2	62	37.0	121	36.0
11-20	61	36.1	75	44.5	136	40.5
21 and above	48	28.7	31	18.5	79	23.5
Mean	15.69		14.05		14.87	
SD	8.18		7.48		7.87	
Cropping intensity(years)						
≤1						
1.1-2.0	63	37.6	66	39.4	129	38.3
2.1 and above	71	42.1	90	53.4	161	47.9
Mean	34	20.3	12	7.2	46	13.8
SD	1.30		1.17		1.23	
	0.68		0.61		0.65	

Source: Field survey, 2019

Freq.= Frequency, **SD**= Standard Deviation

3.2.3 Level of land use intensity

Results in Figure 2 reveal the level of land use intensity among male and female ACFs in the study area. The land use intensity score was generated from the composite score of the fallow rotation index and cropping intensity. The level of land use intensity was generated from this score using the mean plus or minus standard deviation approach. The scores within the range of mean plus standard deviation were categorized as high, scores within the range of mean minus standard deviation were categorized as low, and the scores in between the two were categorized as moderate. The result of the level of land use intensity shows that about 57 and 61 percent of MAF and FAF, respectively, had moderate land use intensity, while 20.2 percent of MAF and 22.6 percent of FAF had low levels of land use intensity. About 23 percent of MAF and 17 percent of FAF had high levels of land use intensity. The findings indicated that a high proportion of male as well as female ACFs use land moderately for food production. The findings also show that female arable crop farmers had moderate land use intensity compared to their male counterparts; this might be because of their cropping intensity, which is lower compared to their male counterparts. The findings from the FGD session buttress this:

"We don't have option than to continue food crop cultivation more and more on the available land we have access to, but some of us who have access to more parcels of land could fallow land for a longer period." (A male participant at Ifaki, Ekiti State)

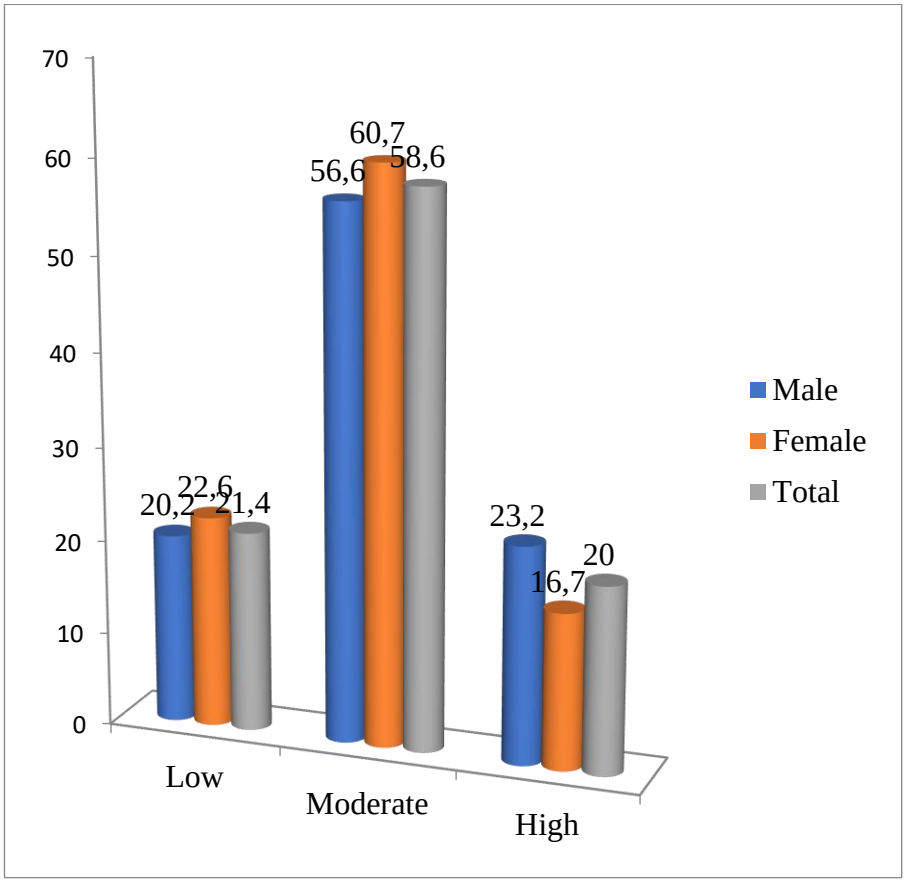

Figure 2: Distribution of respondents on level of land use intensity.

Mean= MAF (2.01) FAF (1.89) Total (1.95)

Standard deviation= MAF (0.68). FAF (0.63) Total (0.66)

Source: Field survey, 2019.

Figure 3 shows land use intensity among female and male ACFs. Decision-making among male farmers is independent while the female farmers oftentimes depend on their spouses' advice to decide on what to cultivate. There was no coercion or force by the female farmers' spouses on them in decision-making, but female farmers do submit to the advice of their spouses. In the male farmers' session, participants affirmed that the decision-making technique was dynamic because they believed that their spouses also had some responsibilities at home. This dynamism could also make the female farmers make personal decisions on the cultivation of crops that would quickly improve their finances. This is corroborated by quotations 1:53, 2:91, and 1:60. The participants also affirmed the practice of the fallow system. But on many occasions when they left the land to fallow, cassava would still be left on the plot. This was done with the aim that cassava would restore some of the nutrients that had been lost from the plot and at the same time generate income from the sales of the

cassava. Despite this, some farmers still left the plot fallow without leaving cassava or any other crop on the plot. FGD participants affirmed that they could not leave the cassava or any other crop on the plot to decay to restore lost nutrients during the period of fallow as this would be a loss to them, but rather sell the proceed to have some cash at hand for start-up in the next farming season. Continuous cropping and mixed cropping are common practices among male as well as female ACFs. Male, as well as female ACFs, use land intensively through continuous cropping and the cropping system they practice. Excerpts from the FGD from male farmers' session buttress this;

> *"Continuous cropping is a common thing among us, we practice crop rotation and fallow. Some of us do leave cassava on our land during the fallow period to regain some of the lost nutrients"* (A male participant at Erunmu, Oyo State).

Participants affirmed the practice of various land use types and cropping systems prevalent among male as well as female ACFs. These were documented by the excerpt from the session of female as well as male ACFs.

> *"We do practice mono-cropping, mixed cropping, and relay cropping. Sometimes we leave our land fallow, during this period we do leave cassava on the land to replenish the soil nutrients"* (A male participant at Ago Are, Oyo State).
>
> *"Mono-cropping, mixed cropping, and relay cropping are cropping systems we practice. We usually cultivate tomato and pepper together, tomatoes help in controlling the weeds, pepper will be on the heaps and tomatoes will be by the side."* (A female participant at Ayegbaju, Ekiti State).
>
> ''*We practiced mixed cropping as well as sole cropping, but for us to recoup our investment on the land we cultivate more than one crop on a parcel of land''* (A male participant at Ago Are, Oyo State)

Mixed cropping is commonly practiced by farmers for them to recoup their investment. Farmers also cultivate two or more crops on the farm, because one might serve as food for them when they work on the farm before the other is ready for harvest. This might increase the intensity of land usage and the resultant land degradation among male and female ACFs in the study area. This finding is in tandem with Raufu (2010) who estimated that most food crop farmers in Osun State, Nigeria cultivated two crops at a time on their plot. Various factors were responsible for increased land use intensity and continuous cropping as identified by the FGD participants, these include far distance to go to another farm location, herdsmen crisis, excavation of fine sand in some areas, and inadequate land for some families, where the land available to such family has been fragmented among the members. An excerpt from the female farmers' session reveals that:

> *"We do cultivate continuously on the land available to us. Because some of us depend on the area of land allocated to us by our spouses for crop production. We do practice fallow and crop rotation"* (A female participant at Esure, Ekiti State).

The factors responsible for increased land use intensity and continuous cropping as mentioned by female farmers were the herdsmen crisis, (they do sexually harass our female farmers, so we don't usually cultivate farther away from our husbands), the increase in population of land users, and land access inadequacy. This is buttressed by the excerpt from the FGD session:

'Even though there may be other plots of land we can acquire to cultivate when our current land is degraded, we can't just go there because we need to confirm if there are people around there already to avoid the destruction of our farm by cattle from the herdsmen' (A female participant at Lanlate, Oyo State)

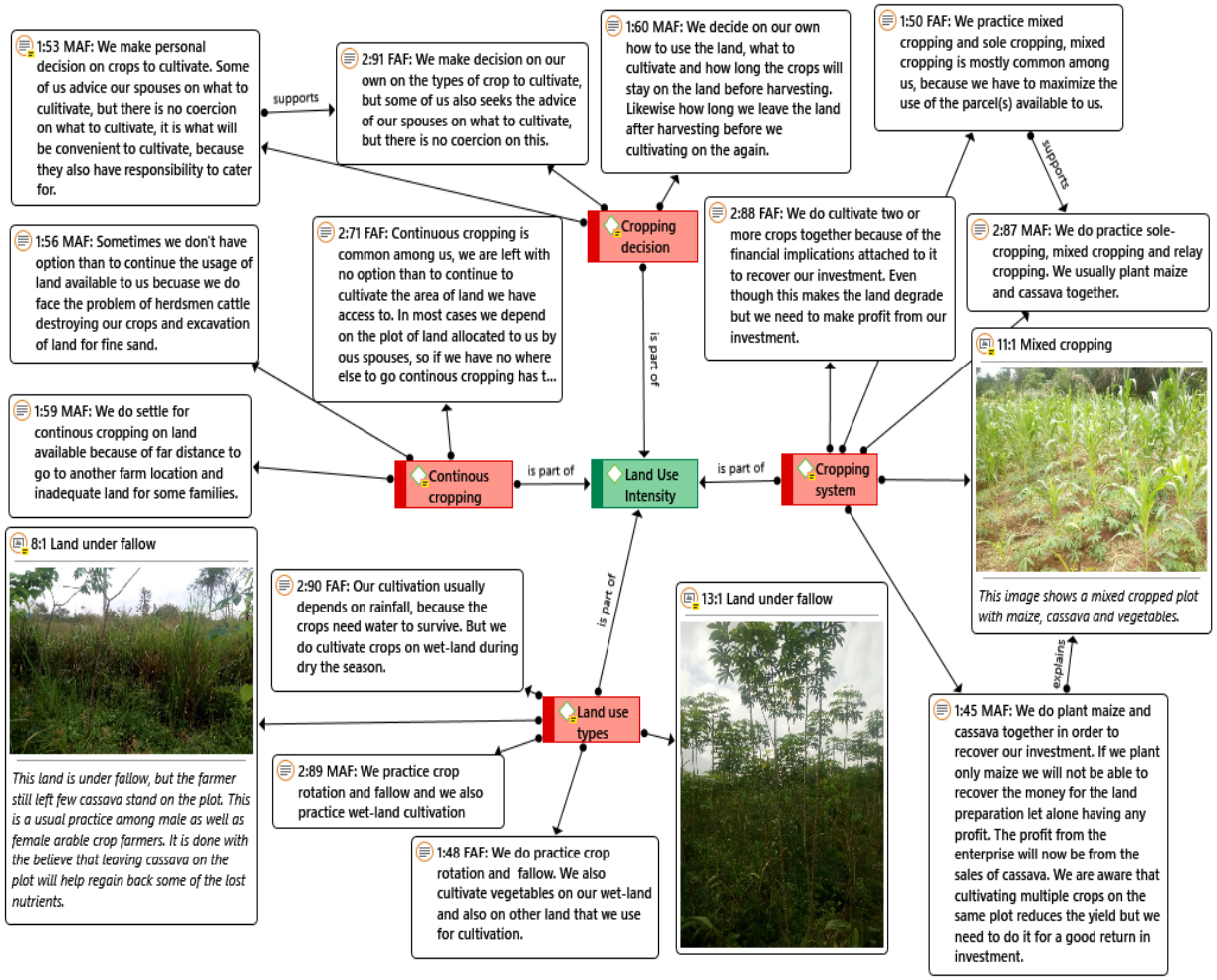

Figure 3: Network showing land use intensity among male and female arable crop farmers.

Source: Field survey, 2019

3.3 Land Degradation Intensity

3.3.1 Rank-Order of statements on causes of land degradation

To assess the frequency of practice of causes of land degradation, a list of 9 statements was presented to male and female arable crop farmers on a four-point Likert type scale of 0=Never, 1=Rarely, 2=Sometimes, 3=Always. Male and female arable crop farmers always practiced farm vegetation burning which has a mean score of 2.25±0.77 and 2.07±0.73 for male and female ACFs, respectively. This finding was buttressed by an excerpt from the FGD session:

"It's not always easy to do away with bush burning during land preparation because this makes land preparation less tedious and grants quick completion for commencement of crop cultivation" (A female participant at Esure, Ekiti State)

Male arable crop farmers also practiced increased cropping intensity (X= 2.44 σ = 0.63), contraction of fallow (X= 1.94 σ = 0.71), deforestation (X= 1.98 σ = 0.92) continuous sole-cropping (X= 1.15 σ = 0.81), indiscriminate pesticide application (X= 2.28 σ = 0.71), indiscriminate fertilizer usage (X= 1.95 σ = 0.75). However female arable crop farmers practice contraction of fallow (X= 2.02 σ = 0.67), increase cropping intensity (X= 1.89 σ = 0.77), indiscriminate pesticide application (X= 1.83 σ = 0.78), indiscriminate fertilizer application (X= 1.76 σ = 0.74), deforestation (X= 1.82 σ = 0.64), continuous mono-cropping (X= 0.90 σ = 0.81). The grand mean score was 1.58±0.89 and 1.38±0.81 for male and female ACFs respectively. About 67 percent of the mean score of male and female ACFs, respectively, were equal to or greater than the grand mean while the remaining 33 percent of the mean score of male and female arable crop farmers were below the grand mean. These findings show that the male and female arable crop farmers always practiced the activities that led to land degradation, with the practice more common among male farmers than female farmers. This implies that involvement in these activities could lead to frequent experiences of land degradation among female and male ACFs. These findings are in tandem with the various causes of land degradation as identified by Maiangwa *et al.* (2007). Findings from the FGD sessions and observations also affirm farmers' practice of these activities.

"Continuous cropping and indiscriminate use of agrochemicals cause our land to degrade. As a result of this pesticide usage various sicknesses occur, because many of what we eat today contains chemicals" (A male participant at Eko Kan, Oyo State).

"Some farmers here do allow excavation for fine sand on their farmland, this also causes land degradation, and the effect is not only felt on their land but also other neighboring farmland, such that you can only cultivate there after 10 to 15 years". (A male participant at Asin, Ekiti State).

"In this place, cattle grazing by the herdsmen also causes land degradation and it is a major problem for us. It is then very difficult for a tractor to work on the farm, as their feet compact the soil making it difficult to be cultivated". (A female participant at Ijaye-Orile, Oyo State).

Table 4: Mean scores of respondents on causes of land degradation

Causes of land degradation	Male	n=168	Female	n=168
	Mean	**SD**	**Mean**	**SD**
Forest vegetation burning (FVB)	2.25	0.77	2.07	0.73
Overgrazing (OG)	0.11	0.31	0.03	0.18
Increased cropping intensity (ICO)	2.44	0.63	1.89	0.77
Contraction of fallow (CF)	1.94	0.71	2.02	1.94
Indiscriminate fertilizer application (IFA)	1.95	0.75	1.76	0.74
Indiscriminate pesticide application (IPA)	2.28	0.71	1.83	0.78
Deforestation (D)	1.98	0.92	1.82	0.64
Continuous sole-cropping (CS)	1.15	0.81	0.90	0.81
Use of heavy machinery (UHM)	0.20	0.40	0.13	0.34
Grand Mean	1.58		1.38	
Standard Deviation	0.89		0.81	

Source: Field survey, 2019. **Rating scale:** 0= Never 1= Rarely, 2= Sometimes, 3 = Always.

3.3.2 The severity of land degradation

To assess the severity of land degradation a list of 8 statements on the effects of land degradation was presented to the farmers on a four-point Likert type scale of 0=Never occur, 1=Not severe,

2=Severe, 3= Very Severe. The degradation intensity score was generated from the severity of degradation as experienced by male as well as female ACFs. The results in Table 5 show that male and female ACFs experienced severity in reduction in soil quality through continuous cropping having a mean score of 2.16±0.63 and 2.02±0.71 for male and female ACFs, respectively. Likewise, male, and female ACFs, respectively, experienced severity in decline in crop yield because of intensive cropping having a mean score of 2.14±0.75 and 2.02±0.66. Male arable crop farmers also experienced severity in overgrazing by herdsmen cattle (X= 1.79 σ = 1.03), loss of land to the excavation of fine sand (X= 1.00 σ = 0.83), soil erosion occurrence (X= 0.94 σ = 0.85), Dry soil as a result of deforestation and excessive surface run-off (X= 0.86 σ = 0.85), contamination of soil (X= 0.77 σ = 0.85) and flood occurrence as a result of excessive removal of vegetation (X= 0.44 σ = 0.49). However female arable crop farmers experienced severity in overgrazing by herdsmen cattle (X= 1.47 σ = 1.17), contamination of soil (X= 0.75 σ = 0.78) loss of land to the excavation of fine sand (X= 0.70 σ = 0.79), soil erosion occurrence (X= 0.65 σ = 0.80), flood occurrence because of excessive removal of vegetation (X= 0.30 σ = 0.75).

The grand mean score was 1.26±0.66 and 1.06±0.67 for male and female ACFs, respectively. About 50 percent and 40 percent of the mean score of male and female ACFs, respectively, were equal to or greater than the grand mean while the remaining 50 percent and 60 percent mean scores of male and female ACFs were below the grand mean. The findings show that the female as well as male ACFs have experienced significant severity of land degradation with male farmers having the highest experience. This implies that female as well as male ACFs might find means to prevent and control land degradation based on their experience of degradation severity. Findings from the FGD and observation also revealed that degradation would always occur in as much as the land is put to continuous cultivation. Excerpts from the findings reveal that:

"There is no way we won't experience land degradation because the land is what we use for continuous cultivation. Degradation may be severe at times because various other things lead to degradation apart from continuous cropping" (A male participant at Eko Kan, Oyo State)

"Those of us who use tractors also experience land degradation, because it makes the soil lose nutrients in such that many of the top and subsoil are easily washed away and compacted" (A male participant at Iroko, Ekiti State).

Table 4: Mean scores of respondents on the severity of land degradation

Severity of land degradation statement	Male **Mean**	n=168 **SD**	Female **Mean**	n=168 **SD**
Soil erosion occurrence (SEO)	0.94	0.85	0.65	0.80
Dry soil as a result of deforestation and excessive surface run-off (DSD)	0.86	0.85	0.58	0.77
Reduction in soil quality as a result of continuous cropping (RSQ)	2.16	0.63	2.02	0.71
The decline in crop yield as a result of intensive cropping (DC)	2.14	0.75	2.02	0.66
Degradation as a result of overgrazing by herdsmen cattle (DHC)	1.79	1.03	1.47	1.17
Contamination of soil by excessive usage of pesticides and fertilizer (CSP)	0.77	0.85	0.75	0.78
Flood occurrence as a result of excessive removal of vegetation cover (FOV)	0.44	0.49	0.30	0.75
Loss of land to the excavation of fine sand (LLE)	1.00	0.83	0.70	0.79
Grand Mean	1.26		1.06	
Standard Deviation	0.66		0.67	

Source: Field survey, 2019 **Rating scale:** 0= Never occur 1= Not severe, 2= Severe, 3 = Very Severe.

Figures 4 and 5 show the causes of land degradation and land degradation intensity among male and female arable crop farmers in the study area. FGD participants attest to the practice of the causes of land degradation and have experienced degradation on their farms. The FGD excerpt reveals that;

''For me, erosion is also a major cause of land degradation. The government faults land degradation, because there is no proper monitoring of the forest, and trees are cut indiscriminately'' (A male participant at Iroko, Ekiti State)

''Overgrazing by the herdsmen cattle causes land degradation, the cattle eat up our crops and other vegetation that can serve as cover for the soil, thus exposing the soil to direct sunlight and erosion'' (A female participant at Eko Kan, Oyo State)

Participants also attested that maize spikelet causes land degradation; this is affirmed by the FGD excerpt.

''*The spikelet of maize also causes land degradation, when the spikelet drops along the heaps or on the heaps, they kill the weeds and other crops, therefore we plant cassava on the same plot before maize begins to have spikelet''.* (A male participant at Ago Are, Oyo State).

Inadequate access to and control over land, far farm distance, and other challenges female and male ACFs faced in land acquisition were factors identified by female and male farmers associated with land degradation. Farmers attested that these above-mentioned factors were responsible for the continuous usage of land year in, and year out as corroborated by quotations 2:97 and 1:74. The increased continuous land usage led to land degradation. Participants also affirmed the experience of land degradation on their farm plots. The degradation was noticed through different means as observed from the farmers' plots indicated by quotations 5:1, 7:1, and 9:1. Participants also attested

to this as indicated by quotations 2:96, 1:71, and 1:89. An excerpt from the FGD session also affirms that;

''*I have experienced degradation on my farm, as soon as I discover that the yield is reducing and that I need to add fertilizer to the soil, I already know the land is degraded*'' (A female participant at Ido-Ile, Ekiti State)

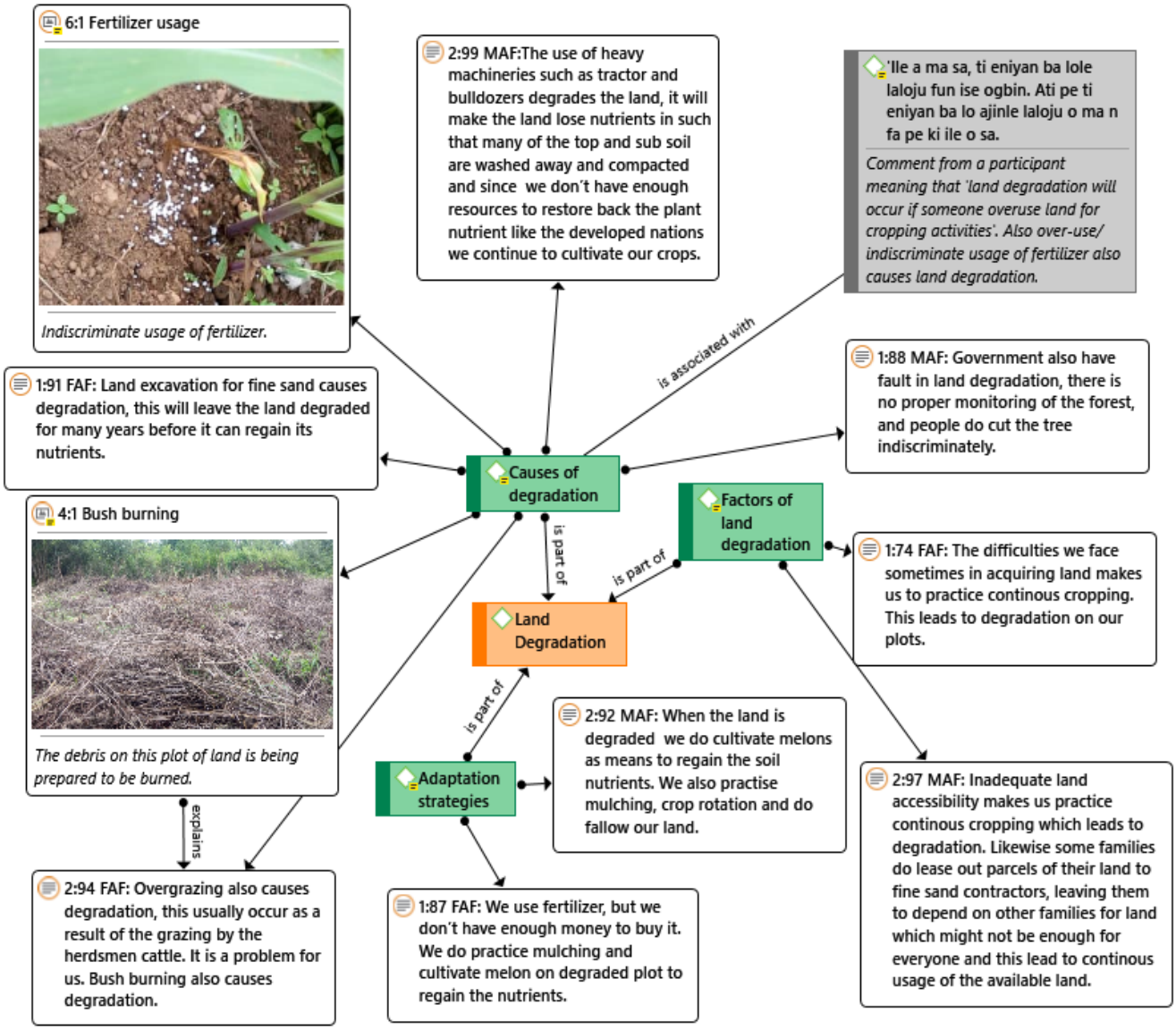

Figure 4: Network showing causes of land degradation among male and female arable crop farmers.

Source: Field survey, 2019

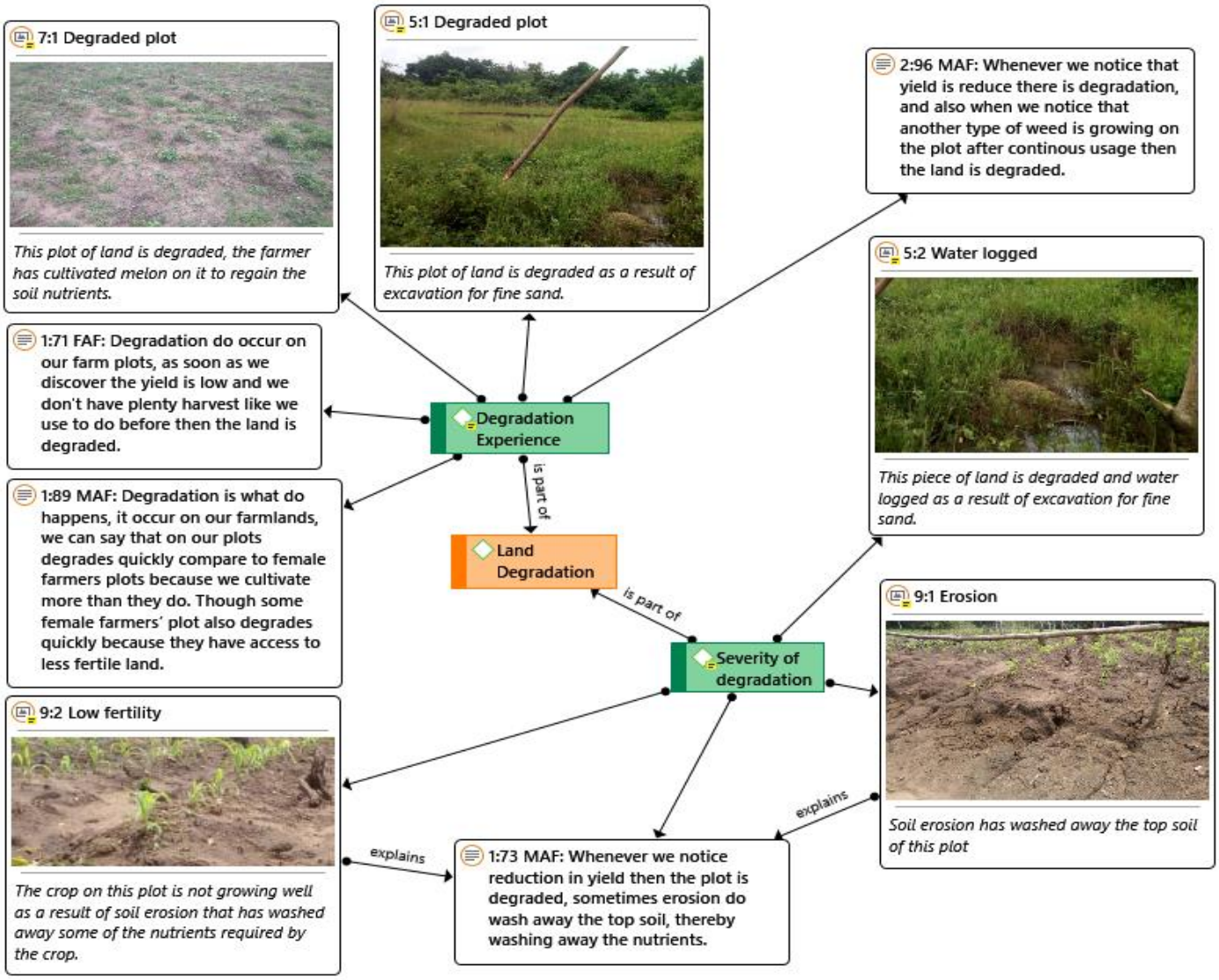

Figure 5: Network showing land degradation among male and female arable crop farmers.

Source: Field survey, 2019

4. HYPOTHESIS

Ho1: There is no significant difference between male and female arable crop farmers' land use intensity and land degradation intensity.

Results in Table 5 show that there was a significant difference F (1, 335) = 5.881, p = 0.016 between female and male ACFs' land use intensity. That is, the intensity of land usage by male ACFs significantly differs from the intensity among female ACFs. This might be because of higher cropping intensity among male ACFs compared to female farmers. These findings show that the land use intensity among both sexes differs. Findings from the FGD reveals that male farmers cultivate more than female farmers; this is corroborated with earlier findings that male farmers had higher cropping intensity compared to female farmers. An excerpt from the session reveals that:

"Continuous cropping is what we practice often because we must eat and provide for the family, what I can say is that male farmers cultivate more than female farmers because we are stronger than them, though there are few exemptions for some female farmers who even cultivate than some male farmers" (A male participant at Ifaki, Ekiti State)

The Table further shows that there was a significant difference $F(1, 335) = 30.023$, $p = 0.000$ between female and male ACFs land degradation intensity. This means that degradation intensity among male ACFs significantly differs from the intensity among female ACFs. That is the severity of degradation as experienced by male farmers on their farm plots significantly differs from the experience of the female farmers. This might be influenced by high cropping intensity, length of fallow, control over land, distance of farm to the house, and distance of the farm to a major market. These variables could influence the significant difference between male and female degradation intensity. An excerpt from the FGD session affirmed the opinion of farmers that the male farmers' plots could degrade faster than the female farmers' plots because male farmers cultivated more than female farmers.

"Degradation on our farm plots is usually more severe than on the female farmers because we cultivate a lot more than the female farmers, but some female farmers' land is also more degraded because some of them have access to less fertile land" (A male participant at Ago Are, Oyo State).

Table 5: Summary of one-way analysis of variance (ANOVA) showing the differences between male and female arable crop farmers' land use intensity and land degradation intensity.

		SS	DF	MS	F	Sig
Land use intensity	Between groups	18.731	1	18.731	5.881	0.016**
	Within groups	1063.747	334	3.185		
	Total	1082.478	335			
Land degradation intensity	Between groups	314.360	1	314.360	30.023	0.000**
	Within groups	3497.137	334	10.470		
	Total	3811.497	335			

**= significant at 0.01 level of significance

SS= Sum of Squares, **DF**=Degree of Freedom, **MS**= Mean Square

Source: Field survey, 2019

5. CONCLUSIONS AND RECOMMENDATIONS

The finding from the study shows evidence of the increasing intensity of land usage, characterized by increased cropping intensity and increased frequency of farmland cultivation among male and female arable crop farmers. Land use intensity and degradation intensity were significantly different among female and male ACFs. Fallow rotation intensity was found to be higher among female ACFs compared to male farmers, but the cropping intensity was higher among male farmers compared to

female farmers. Land use intensity among male farmers was higher than that of female farmers. The level of land use intensity among male and female arable crop farmers was moderate. Male and female ACFs practiced increased cropping intensity, contraction of fallow, deforestation, and continuous sole cropping which are the causes of land degradation. Based on these conclusions, the study recommends that the government should formulate and implement land policies that will make male and female ACFs feel emotionally attached to the land they cultivate. The practice of soil and water conservation techniques should be reinforced among female and male ACFs to reduce the degradation of land. Continuous gender-sensitive training and re-training of extension agents should be done so that the extension agents can train more male and female farmers on good agricultural practices. An increase in the farmer extension ratio is also very important; likewise, the recruitment of more female extension agents will also assist the female farmers in having a good rapport with the agents. Male arable crop farmers can also be empowered by government and non-governmental agencies or advocacy agencies to assist their spouses in household chores. This will reduce the domestic workload on female farmers and will also assist in achieving sustainable land use management.

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8. AUTHORS' CONTRIBUTIONS

Conceptualization-Olowoyo, O., & Deji, O., Methodology and Validation of Research Instrument-Olowoyo, O., & Deji, O., Investigation and Data Collection- Olowoyo, O., Deji O., & Sulaimon, W., Data Analysis- Olowoyo, O., Deji, O., & Faniyi, E., Article drafting- Olowoyo, O., Review & Editing- Olowoyo, O, Deji O, Sulaimon W, & Faniyi, E.

9. REFERENCES

Adamu, C. O. (2014). Land acquisition and types of Crops Cultivated by Farmers in Ayedaade Local Government Area, Osun State, Nigeria. *Asian Journal of Agricultural Extension, Economics & Sociology, 3*(6), 738-745.

Adekola, A. G., Adereti, F. O., Koledoye, G. F. & Owombo, P. T. (2013). Gender discrimination in Agricultural land access: Implications for food security in Ondo State, Nigeria*. Journal of Development and Agricultural Economics, 5*(2), 49-56.

Adeola, R. G. & Adetunbi, S. I. (2015). Farmers' Perception of Sustainable Agriculture in Southwestern Nigeria: Implications for Rural Economy. *International Journal of Applied Agricultural and Apicultural Research 11*(1&2), 86-92.

Ajijola, S. Saka, J. O. & Aduramigba-Modupe, V. O. (2014). Land Use Intensification Pattern among Rural Farming Household in the Derived Savannah Agro Ecologies in South-western Nigeria. *American Journal of Business, Economics and Management*, *2*(6), 163-169.

Akintonde, J. O. Lwasa, S. & Purnamita, D. (2016). Assessment Level of Use of Climate Change Adaptation Strategies among Arable Crop Farmers in Oyo and Ekiti States, Nigeria. *Journal of Earth Science and Climate Change,* (7), 369. Doi: 10.4172/2157-7617.1000369

Britwum, A. O. & Akorsu, A. D. (2016). Qualitative gender evaluation of agricultural intensification practices in northern Ghana. *International Institute of Tropical Agriculture*, www.africa-rising.net. Pg. 1-53

Dayal, E. (1978). A Measure of Cropping Intensity: *The Professional Geographer*, 3(30), 289-296

Fasakin, I. J. & Adegboyega, O. M. (2020). Rural Land Utilization and Commercial Agriculture among Female Arable Crop Farmers in Southwest Nigeria. *African Journal of Land Policy and Geospatial Sciences,* 3(2), 69-79. ISSN 2657-2664.

Ibrahim, S. B., Ayinde, A. I., & Arowolo, A. O. (2015). Analysis of Arable Crop Farmers' Awareness of Causes and Effects of Climate Change in South-western Nigeria. *International Journal of Social Economics*, 42(7). 614 – 628

Li M., Wu J. J., Deng X. (2013). Identifying Drivers of Land Use Change in China: A Spatial Multinomial Logit Model Analysis." *Land Economics,* 89, 632-654.

Maiangwa, M. G., Ogungbile, A. O., Olukosi, J. O. & Atala, T. K. (2007). Land Degradation: Theory and Evidence from the North-West Zone of Nigeria *Journal of Applied Sciences,* 7 (6), 785-795.

Matson, P. A., Parton W. J., Power, A. G. and Swift M. J. (1997). Agricultural intensification and ecosystem properties. *Science,* 277(5325), 504-509.

Olowoyo O. A. & Deji, O. F. (2020). Gender differentials on the challenges of land acquisition Among Arable Crop Farmers in Southwest Nigeria. *Journal of Land and Rural Studies*, *8*(2), 138–149. https://doi.org/10.1177/2321024920914783

Olowoyo, O. A. & Deji, O. F. (2017). Gender Perception on Health and Environmental Hazards of Pesticide Usage among Cocoa Farmers in Ekiti State Nigeria*. Journal of Health and Environmental Research. 3*(1), 1-7. https://doi.org/10.11648/j.jher.20170301.11

Oyekale, A. S. (2007). Intensive land use and efficiency of food crop production in Southwestern Nigeria. *Agricultural Journal, 2* (2), 174-179.

Oyekale, A. S. (2012). Intensive land use, land management, and efficiency of food production in the Niger Delta region of Nigeria. *Electronic Journal of Environmental, Agricultural and Food Chemistry, 11*(3), 188-204.

Raufu, M. O. (2010). Pattern of Land Use among Selected Crop Farmers in Osun State. *Research Journal of Soil and Water Management, 1*(1), 1-4

Ruthenberg, H, (1980). Farming system in the Tropics. Clarendon Press 3rd Edition, Oxford.

Saka, J. O., Okoruwa, V. O., Oni, O. A. & Oyekale, A. S. (2011). The Structure and Determinants of Land-use Intensity among Food Crop Farmers in South-western Nigeria. *Journal of Agricultural Science, 3*(1), 194-205.

Shriar, A. J. (2000). Agricultural intensity and its measurement in frontier regions. *Agroforestry Systems*. *49*(3), 301–318.

Shrestha J, Subedi S, Timsina K.P, Subedi S, Pandey M, Shrestha A, Shrestha S & Hossain M. A. (2021). Sustainable Intensification in Agriculture: An Approach for Making Agriculture Greener and Productive. *Journal of Nepal Agricultural Research Council 7*: 133-150. https://doi.org/10.3126/jnarc.v7i1.36937

Sulaimon, W. S., Deji, O. F., Olowoyo, O. A. & Faniyi, E. O. (2023). Gender-Specific Factors Associated with Forest Products' Utilization Among Rural Dwellers in Osun State, Nigeria. *Canadian Social Science, 19*(2), 67-74. http://doi.org/10.3968/12963

Tiffen, M., Mortimore, M. & Gichuki, F. (1994). More people less erosion: Environmental recovery in Kenya. Chichester, UK: Wiley.

Tsue, P. T., Nweze, N. J. & Okoye, C. U. (2014). Effects of Arable Land Tenure and Use on Environmental Sustainability in North-Central Nigeria. *Journal of Agriculture and Sustainability, 6*(1), 14-38. ISSN 2201-4357

10. KEY TERMS AND DEFINITIONS

Arable crop farmers: these are female and male farmers in the study area cultivating arable crops.

Land Degradation: this is the depletion of land quality because of the intensive use of land. It signifies the permanent or temporary deterioration in the land's productive capacity. Land degradation is the aggregate depletion of the land's productive potential because of increased intensification of usage.

Land Use Intensity: a measure of the extent to which inputs are being used on a land parcel and the extent to which it is cultivated. It involves the rate of subjection of the land to continuous cropping and the period of fallow.