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Relevance of Farmers' Cultivation of Jatropha Plant for Sustainable Environment in Lagelu Community Oyo State

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ABSTRACT

The unabating environmental degradation from heavy consumption of fossil fuel and chemicals by the masses has compelled the potential use fullness of Jatropha plant to engender a sustainable environment. This study examined the relevance of farmers' cultivation of Jatropha plant for sustainable environment in Lagelu community Oyo State. A simple random sampling technique was used to select 120 Jatropha farmers from 175 trained farmers in the study area. Data collected were analyzed using both descriptive and inferential statistics. Results revealed that the majority (66.7%) were males, married (90%), possession of formal education (91.7%), and had various livelihood activities (86.7%). There was a significant association between the personal characteristics of the respondents and Jatropha cultivation for the sustainable environment. There was also a correlation between the cultivation management practices engaged by farmers and the relevance of farmers' cultivation of Jatropha plant for the sustainable environment ($r=0.453$, $p \leq 0.05$). The study further revealed that there was a correlation of relevance of farmers' cultivation of Jatropha for sustainable environment in the study area. Therefore, the government and non-government organizations should encourage the development and massive cultivation of Jatropha through awareness and provision of credit facilities for farmers to engender a sustainable environment.

INTRODUCTION

The environment may be understood to be our surroundings. It can be divided into non-living and living components. It provides a resource that supports life on earth and which also helps in the growth of a relationship of interchange between living organisms and the environment in which they live. The past has seen a clean environment until the advent of industrial change and development which have resulted in environmental decay and pollution, biodiversity loss, and the greenhouse effect (Kumar, 2012). Environmental sustainability seeks to sustain the global life-support system indefinitely (Goodland, 1995). The need for the sustenance of the people living in a geographical location is based on the environment whereas its degradation can lead to the extinction of lives. Furthermore, environmental degradation sets in as a result of human activities through greater use of energy. When the environment becomes less valuable or damaged, environmental degradation has occurred. Many forms of it range from destroyed habitat to biodiversity loss or depletion of natural resources.

In Nigeria, like many developing nations, the environmental problems are massive in aggravated soil erosion, flood disasters, and desertification due to the effect of shifting cultivation on fragile soils, deforestation, bush burning, animal over-grazing, water pollution, air pollution, and land pollution due to fumes and improper disposal of industrial and domestic waste as a result of consumption of fossil fuels and agrochemicals with effect on man's well-being (Etuonovbe, 2009). In view of these environmental problems, the impact of energy crops on environmental sustainability had been explored. The development of sustainable bioenergy from energy crops is considered an important factor in reducing greenhouse gas emission, acid deposition

in soils, and chemical runoffs, and improving the environment for both man and wildlife through deliberate forestation projects (Olaoye, 2009).

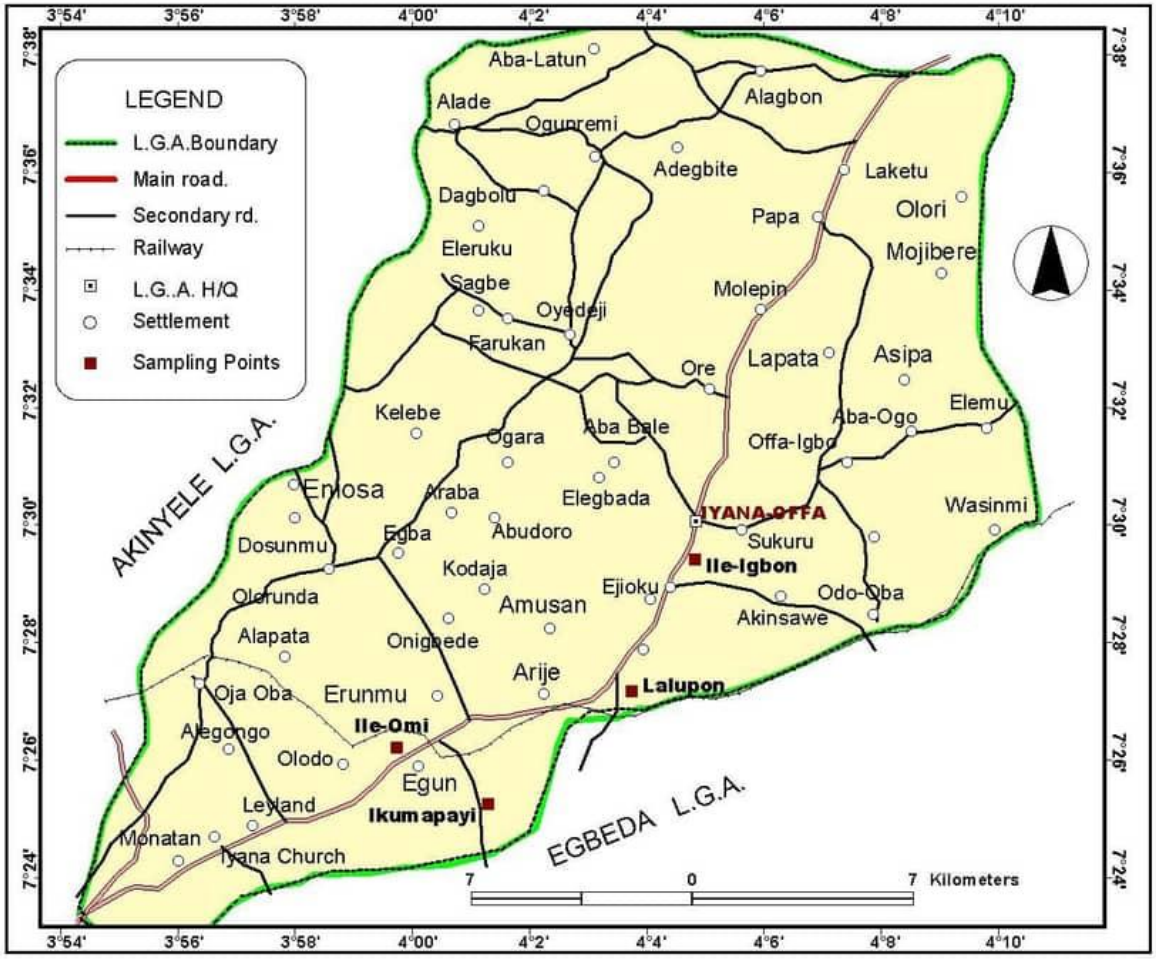
According to Chachage (2003), Jatropha is a plant that has many potential contributions to a sustainable environment in the area of wind and soil erosion control which also serves as organic fertilizer for all soil types, facilitates water erosion, controls, and helps in solving deforestation problems in the developing countries. However, several studies had been carried on the impact of renewable energy crops such as cassava, sugarcane, and maize in Nigeria and around the world basically for biofuel production as an alternative to fossil fuels to reduce the effect of global warming on the environment. But these studies have shown less concentration on the utilization of inedible energy plants which are critical for mitigation of environmental degradation. The pressing problem of environmental degradation which manifests in land deformation, agricultural stagnation, and population explosion in Nigeria can be combated and overcome by agroforestry practice through intercropping of arable crops with shrubs and trees (Bankole, et al., 2012). This is further reposed by Mandal and Mirtha (2004) that cultivation of Jatropha could help in strengthening sustainable land development, environment, improving the soil quality, and livelihoods of the smallholders. Jatropha is a plant that potentially improves the soil quality and enhances the reduction of soil erosion when cultivated on marginal lands (Raswant et al., 2008).

Therefore, the cultivation of Jatropha will serve as a renewable energy plant in ensuring a sustainable environment. The purpose of the study is to investigate the relevance of farmers' cultivation of Jatropha plant for sustainable environment in Lagelu Community in Oyo State with the following specific objectives: To examine the personal characteristics of respondents in the study area and management practices of Jatropha plant by the respondents in the study area.

MATERIALS AND METHODS

Study Area

The research was carried out in Lagelu Local Government Area of Oyo state. Lagelu LGA in Oyo State has its headquarters in Iyana Offa. It is an area of 338 Km² with a population of 147,957 at the 2006 census. Itis divided into 14 wards which Ajara/Opeodu, Apatere/Ogunbode/Kuffi/Ogo, Arulogun/Kelebe, Ejioku/Igbon, Lagelu/Kajola/ Gbena, Lagun, Lalupon I, Lalupon II, Lalupon III, Ofa-Igbo, Ogunjana/Olowode/Ogburo, Oyedeji/ Olode/Kutayi, Ogunremi/Ogunsina, and Sagbe/ Pabiekun. It lies between longitude 4°04' 34′69"E and latitude 7°49'49"N. It is located in the forest belt zone and supports mostly food crops. It has relatively high humidity and average daily temperature ranges between 25 °C and 35 °C throughout the year with a rainfall of about 1800mm annually (Yusuf et al., 2011). The climate favors the cultivation of crops. The soil is extensively fertile and it is suitable for agriculture. The basic occupation of the people is farming. There are large hectares of grassland which are suitable for animal rearing, vast forest reserves, and rivers. The inhabitants of the area grow varieties of cash crops such as banana, plantain, cocoa, kola nuts, palm oil, timber, and arable crops like maize, yam, cassava, vegetables, etc. The area is also suitable for a wide range of edible fruits.



Sampling Procedure and Data Analysis

The target population for the study comprises trained Jatropha from the study area. A simple random sampling technique was used to select 120 respondents from 175 trained Jatropha farmers in the study area. The primary data were collected with the use of a well-structured questionnaire as a testing instrument designed to cover the salient areas of the research. The copies of the questionnaire were distributed to 120 respondents and retrieved for coding. The statistical analytical tools used for the study were frequency, percentages, Chi-square, and Pearson Product Moment correlation. The data collected were analyzed with descriptive (frequency distribution, percentages) and inferential (Chi-square and Correlation) statistics. The models for inferential analytical tools are as follows:

Chi-square

$$\chi^2 = \frac{\Sigma(O-E)}{E} \quad \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Where:

χ^2 = Chi-Square

Σ = Summation

O = Observed values of frequencies of nominal variables like sex, religion, marital status; that is the socio-economic variables for the study.

E = Expected values are frequencies determined from response categories.

Pearson Product-Moment Correlation

$$r = \frac{n\Sigma XY - (\Sigma X)(\Sigma Y)}{\sqrt{((n\Sigma X)^2 - (\Sigma X^2)(n\Sigma Y^2) - (n\Sigma Y)^2}} \quad \ldots\ldots\ldots (2)$$

Where:

r = correlation coefficient

n = sample size

Σ = summation sign

X = independent variables for the study, that is; the cultivation management practices of the respondents

Y = dependent variable for the study, that is; the cultivation of Jatropha.

Hypotheses testing

$H_0$1: There is no significant association between the personal characteristics of respondents and the cultivation of Jatropha for a sustainable environment.

$H_0$2: There is no significant relationship between the cultivation management practices and the cultivation of Jatropha for a sustainable environment.

RESULTS AND DISCUSSION

The result in Table 1 shows that 83.3%of respondents in the study area are between 31-60 years signifying the majority, 21-30 years (7.5%), while above 60 years (9.2%). The result implies that respondents in the study area that cultivate Jatropha are predominantly dominated by farmers who are still in their average and active working age. This result corroborates with the submission of Okpeke *et al.*, (2015) that most farmers involved in the cultivation of Jatropha are in their economic active age. Among the 120 respondents, the result shows that 66.7% are males whereas 33.3% are females which implies that there are more male farmers cultivating Jatropha in the study area. This concurs with the submission of Okpeke *et al.*, (2015) that males are predominantly involved in Jatropha cultivation than females.

The result reveals that the majority of the respondents are married (90%) which depicts that farmers in the study are responsible men in their respective households. The result further reveals that 91.7% of the respondents have formal education. This implies that the majority of them are progressive farmers which culminate into having a positive influence on Jatropha cultivation for a sustainable environment. This agrees with the findings of Bemire *et al.*, (2007) that education improves the management ability and competence of farmers in the production of Jatropha. The result also reveals that 48.3% of respondents practiced farming as their primary occupation. This concurs with the findings of Okpeke *et al.*, (2015) that occupation plays a significant role in the lives of the farmers in the study area. The respondents are also engaged in social participation in the study area (52.5%).

This implies that social participation could expose the farmers to the innovation of improved practices necessary for a sustainable environment. Finally, based on religion, 51.7% were Christian and 48.3% were Muslim. This implies that religion does not have a negative effect on the cultivation of Jatropha for a sustainable environment.

Table 1. Distribution of respondents' personal characteristics

Personal characteristics	Frequency	Percentage (100%)
Age		
≤ 30	9	7.5
31-40	39	32.5
41-50	39	32.5
51-60	22	18.3
>60	11	9.2
Sex		
Male	80	66.7
Female	40	33.3
Marital status		
Single	10	8.3
Married	108	90
Widow(er)	2	1.7
Education status		
No formal education	8	6.7
Adult education	2	1.7
Primary	9	7.5
Secondary	42	35
Tertiary	59	49.2

Occupation		
Farming	58	48.3
Other livelihood occupation	62	51.7
Social participation		
Participation	63	52.5
No participation	57	47.5
Religion		
Christianity	62	51.7
Islam	58	48.3

Source: Field survey, 2020

The result in table 2 reveals that all the respondents in the study area (100%) indicated that Jatropha cultivation begins from the nursery, nursery practice is done early in the morning (91.7%), germination of seeds starts on the 6th day in the nursery (98.3%), transplanting of seedlings to the field (91.7%). The result further revealed that the majority (99.2%) prefer hybrid species of Jatropha for cultivation. The result concurs with Saverys *et al.* (2008) and Parajuli (2009) that Jatropha is pre-cultivated in the nursery beds as seedlings before been transplanted into the field. Some of the respondents (74.2%) indicate that manual clearing is enough during cultivation of Jatropha, preference of seedlings for Jatropha cultivation (95.8%), planting of 1000 seedlings per 1 acre (71.7%), and planting distance of 2m x 2m / 3m x 3m which allows for intercropping (97.5%). The result further shows respondents signify that regular weeding is crucial for fruiting of Jatropha plant (97.5%), pruning enhances quick fruiting (90.8%), and that fruiting of Jatropha is within 6-8 months after establishment in the field (99.2%). The result above align with Gour (2006) that good field management practices enhance the production of more luxuriant branches and stimulate abundant and healthy fruiting and seed yield. The result revealed that 85.8% of respondents indicated that four (4) tons of Jatropha seeds are being harvested in 3 years after cultivation. This result implies that the majority of the respondents are immersed in the cultivation of Jatropha.

Table 2. Respondents' cultivation management practices of Jatropha

Cultivation practices	**Yes**		**No**	
	Frequency	**Percentage**	**Frequency**	**Percentage**
Jatropha cultivation begins from the nursery	120	100		
Nursery practice is done early in the morning	110	91.7	10	8.3
Seed germination starts on the 6th day in the nursery	118	98.3	2	1.7
Seedlings are transplanted to the field after 2 months in the nursery	110	91.7	10	8.3
Preference for the planting of hybrid species of Jatropha than local species	119	99.2	1	0.8
Manual clearing is enough for the plant management	89	74.2	31	25.8
Ploughing is done once or twice based on soil types	97	80.8	23	19.2
Utilization of seeds for Jatropha cultivation	23	19.2	97	80.2
Preference of seedlings in Jatropha cultivation	115	95.8	5	4.2
1000 seedlings is cultivated per 1 acre	86	71.7	34	28.3
Planting distance of 2m x 2m or 3m x 3m allows for intercropping	117	97.5	3	2.5
Regular weeding is crucial to fruiting of Jatropha	117	97.5	3	2.5
Pruning enhances the quick fruiting of the plant	109	90.8	11	9.2
Harvesting of Jatropha seeds begins at 10 months	120	100		

Fruiting of Jatropha is between 6-8months in the field after its establishment	119	99.2	1	0.8
Jatropha requires sufficient sunlight to increase fruiting	120	100		
Two (2) tons of seeds are harvested in the first year	97	80.8	23	19.2
Four (4) tons of seeds are harvested in the third year	103	85.8	17	14.2

Source: Field survey, 2020

The result in Table 3 reveals majority of the respondents agreed that Jatropha cultivation is useful for flood control (68.3%), Jatropha can be used for soil erosion control (96.7%), Jatropha cultivation is vital for wind erosion and desertification control (94.2%), Jatropha removes carbon from the atmosphere (99.2%), the by-product (Jatropha cake) does not contaminate the soils and underground water compared to inorganic fertilizer (99.2%). The result implies that there is a correlation between the cultivation of Jatropha and a sustainable environment. This is in line with Chachage (2003) that Jatropha contributes to the control of soil and wind erosion, flood, desertification, helps in solving deforestation, removing carbon (iv) oxide from the atmosphere, and uses as a source of organic fertilizer in developing countries.

Table 3. Respondents' cultivation of Jatropha for a sustainable environment

Jatropha cultivation for a sustainable environment	**Agree Frequency**	**Percentage**	**Disagree Frequency**	**Percentage**
Jatropha is only useful for hedges or fences around farms/houses	20	16.7	100	83.3
Flood control is possible through Jatropha cultivation	82	68.3	38	31.7
Jatropha can be used for soil erosion control	116	96.7	4	3.3
Jatropha cultivation is vital for wind erosion and desertification control	113	94.2	7	5.8
Jatropha plant grows on infertile soils but does not help improve soil fertility	39	32.5	81	67.5
Jatropha is edible for both man and animals	18	15.0	102	85.0
Jatropha plant removes carbon (iv) oxide from the atmosphere	119	99.2	1	0.8
The by-product (Jatropha cake) is useful as organic fertilizer as well as organic pesticides	119	99.2	1	0.8
Jatropha cake does not contaminate the soil and underground water as compared to organic fertilizer	119	99.2	1	0.8

Source: Field survey, 2020

The result in Table 4 shows that age ($\chi 2$ = 22.814, $p < 0.05$), marital status ($\chi 2$ = 18.782, $p < 0.05$), occupation ($\chi 2$=47.169, $p<0.05$), and social participation ($\chi 2$=31.725, $p<0.05$) are significantly associated with Jatropha cultivation for sustainable environment. The result reflects that both young and old alike are involved in Jatropha cultivation for a sustainable environment. This implies that age, marital status, occupation, and social participation have an influence on the cultivation of Jatropha plants for a sustainable environment.

Table 4. Chi-square analysis of personal characteristics of respondents and cultivation of Jatrophafor sustainable environment

Variables	χ^2	df	p-value	Remarks
Age	220.814	117	0.000	Significant
Sex	2.644	3	0.450	Not Significant
Marital status	18.782	6	0.005	Significant
Religion	5.857	6	0.439	Not Significant
Education status	15.066	12	0.238	Not Significant
Occupation	47.169	27	0.009	Significant
Social participation	31.725	3	0.000	Significant

$\chi 2$ = Chi-square coefficient, df = degree of freedom, p = probability level of significance, $p \leq 0.05$
Source: Data analysis, 2020

The result in table 5 reveals that there is a significant relationship between cultivation management practices of Jatropha and cultivation of the plant for a sustainable environment ($r=0.453, p<0.05$). Therefore, it implies that cultivation management practices of Jatropha have relevant cultivation of Jatropha for a sustainable environment.

Table 5. PPMC analysis of cultivation management practices of Jatropha and cultivation of Jatropha plant for a sustainable environment.

Variables	r-value	p-value	Remark
Cultivation management practices and cultivation of Jatropha for a sustainable environment	0.453**	0.000	Significant

r = correlation coefficient, p = probability level of significance, $p \leq 0.05$ (significance)**
Source: Data analysis, 2020

CONCLUSION

The research revealed that most of the respondents were within the active working-age in farming occupation; the majority were married with formal education and also involved in social participation which influences a sustainable environment. The respondents in the study area were engaged in cultivation management practices such as nursery practices, use of hybrid seedlings, transplanting, manual clearing, regular weeding, pruning, planting distance, and harvesting. This readily showed that Jatropha farmers were deeply immersed in the cultivation practices of Jatropha. This research depicted a positive influence of cultivation management practices of Jatropha for a sustainable environment. Therefore, cultivation management practices of Jatropha had a strong relevance for the cultivation of Jatropha for a sustainable environment. It is recommended that Government and non-governmental organizations should step up support for the development and massive cultivation of Jatropha through awareness and provision of credit facilities and seedlings for the farmers in the study area to actualize a much-needed sustainable environment.

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