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PERCEIVED GENERATION OF CAPITAL ASSETS FROM THE UTILIZATION OF JATROPHA AMONG RURAL HOUSEHOLDS OF THE OYO STATE

Abstract. The study assessed the perceived generation of capital assets from the utilization of Jatropha among rural households of the Oyo state, Nigeria. The purposive sampling technique was used to select respondents from the population of registered Jatropha growers living in rural households located in the area under study. All seventy-five (75) sampled individuals were registered members of the Jatropha Growers Association. A well-structured questionnaire was used as a test instrument to collect data from the respondents. Both descriptive and inferential statistical tools were applied to analyze the data collected for the study. The findings revealed that the majority of respondents believe that it is possible to generate physical capital from the utilization of Jatropha as a live fence (84.0%), which is useful with regard to environmental vulnerabilities (88.0%). Also in terms of financial capital, about 38.7% of persons under study believe that high income could be generated from the sale of Jatropha seeds. The majority of respondents (86.7%) perceive the cultivation of Jatropha for mitigation and reduction of soil erosion as natural capital. In relation to human capital, the results showed that about 73.3% believe Jatropha is useful in treating skin diseases. The test of the hypothesis using Pearson's product-moment correlation showed that there was a significant relationship between the perceived generation of capital assets and the utilization of Jatropha among rural households ($r = 0.432$, $P = 0.012$). In conclusion, the utilization of Jatropha is highly relevant for the generation of capital assets, which is directly proportional to the improvement of the livelihood of rural households in the Oyo state, Nigeria.

Keywords: rural households, utilization, Jatropha, capital assets

INTRODUCTION

The environment and livelihood of people in any society are deeply encapsulated in development and growth sustainability. Both items are inseparable. In other words, the environment is essential to the sustenance

of people's livelihood in the world at large. The need for sustenance of people living in any geographical location depends on the environment, whose failure will affect human lives, livelihood, and social well-being adversely (Kabir and Serrao-Neumann, 2020). Jatropha cultivation is a vital element of livelihood activities managed

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by farming households (Favretto et al., 2014). However, initial research carried out at the local level across Asian, African and Indian farming systems, revealed that the effects of *Jatropha* cultivation for improving livelihoods are contrasting (Hodbod and Tomei, 2013). According to Scoones (2009), a livelihood is sustainable when it can cope with and recover from stresses and shocks and maintain or enhance its capabilities and assets, both now and in the future, without undermining the natural resource base. This enumerates the key role played by social capital in sustaining the livelihoods of the poorest households. It positively influences other forms of capital (particularly human), by sustaining the livelihood of people. This indicates that the wealthier and resource-rich households must have access to a wider range of livelihood activities. Households must also pursue a variety of off-farm activities intended to generate financial capital (Okoye et al., 2016). In respect of the value placed on *Jatropha*, there are concerns mostly based on large-scale biofuel plantation projects, small-scale cultivation of the oil-bearing, "drought resistant", non-edible tree *Jatropha curcas* (in the paper referred to as *Jatropha*) has been identified as a promising livelihood diversification strategy for the poor people from rural areas and a route to help alleviate energy demands (Gilbert, 2011; Palliere and Fauveaud, 2009), restore degraded ecosystems (Garg et al., 2011) and generate income (Achten, 2010; Dyer et al., 2012). Wealthier households can afford higher financial investments, which allow the establishment of small-scale businesses as they generate returns from *Jatropha* business. Diversification options for vulnerable and poor households are more limited, with the most common off-farm activities mainly being seasonal labor, and another financial source in the form of remittances. While seasonal labor offers a source of income, it also reduces the availability of work on the farmer's own land, which means reduced human and natural capital. Furthermore, in some African countries, *Jatropha* cultivation plays a substantial role in the production of organic fertilizers and pesticides. It is used as an ethnomedicinal treatment in households and constitutes a revenue source with an impact on biodiversity, soil erosion, carbon emission and sustainable food production (Abaid, 2014). However, the activities carried out in the processes of production generally in the environment have resulted in poor outcomes in productivity, living standard, and the total well-being of the population. The study aims to examine the perceived generation of assets, with

particular emphasis on the following objective: to examine the utilization of *Jatropha* for capital assets among rural households of the Oyo state.

LITERATURE REVIEW

Knowledge and utilization of *Jatropha* among farmers

According to Vel (2014), the scientific challenges in Jarak, Indonesia, were meant to fill the gap on claims and the existing knowledge regarding *Jatropha* among the smallholder farmers. The gap is far wider for *Jatropha* than any of the other biofuel crops in the country because this plant has the potential to become a new commercial crop. Most of the available knowledge on biofuels technology is based on the large-scale farming of sugarcane and corn, but newer energy crops, such as *Jatropha*, are not yet easily accessible for cultivation (Ejigu, 2008). Nyamai et al. (2007) established that *Jatropha curcas* lends itself greatly to many rural households due to its multiple uses that directly respond to the needs of smallhold farmers. *Jatropha* is an excellent hedging plant, generally grown as a live fence for protection of agricultural fields against damage by livestock as palatable to cattle and goats (Kumar and Sharma, 2008). Yammama (2009) stated that *Jatropha* is planted in the form of hedges around gardens or fields to protect the crops against animals, such as cattle or goats, in a free-range system. *Jatropha* is rich in Nitrogen. Its seed cake is an excellent source of nutrients, used also as a fertilizer with properties compared to those of other organic fertilizers, such as nitrogen, phosphorus and potassium (Kumar and Sharma, 2008). Glycerin, which is a by-product of biodiesel, can be used to make soap and soap can be produced from *Jatropha* oil itself. In either case, soft and durable soap, well adapted to the household needs, is produced (Kumar and Sharma, 2008). *Jatropha* soap is said to have antiseptic characteristics and is therefore used by people with various skin diseases and sensitivity to regular soap. Warra (2012) stated that the physicochemical properties of the seeds have contributed to the creation of an organic product. Oil and aqueous extracts from *Jatropha* have insecticide potency, which has been used in the control of pests of cotton, including cotton bollworm, leguminous plants, potato and corn (Kaushik and Kumar, 2013). The physicochemical properties of *Jatropha* oil showed a high level of acid, peroxide and

iodine. Moreover, ten sterols and thirteen triterpene alcohols were identified in the oil, which suggested that the *Jatropha curcas* has anti-oviposition and ovicidal effects on *callosobruchus maculatus*, therefore making it a viable pesticide for grain legumes (Adebowale and Adedire, 2006). Yammama (2009) states that the *Jatropha* plant is useful for various medicinal purposes, such as treatment of constipation by laxative substances from the seeds, treatment of wound by latex or sap from the plant and treatment of malaria by tea made from the leaves. Heller (1996), Kaushik and Kumar (2013) established uses of different parts of *Jatropha curcas* in medicines in Table 1 below:

Table 1. Medicinal use of *Jatropha*

Plant parts used	Diseases
Seeds	arthritis, gout and jaundice
Tender twigs / stem	toothache, gum inflammation, gum bleeding, pyorrhea
Plant sap	dermatomucosal diseases
Plant extract	allergies, burns, cuts and wounds, inflammation, leprosy, leucoderma, scabies, small pox and wound healing
Aqueous extract from branches	HIV, tumor

Source: Kaushik and Kumar (2013).

Jatropha oil is regarded as a potential fuel substitute. The substance is an environmentally safe, cost-effective and renewable source of non-conventional energy as a promising substitute to hydropower, diesel, kerosene, coal and firewood (Parajuli, 2009). *Jatropha* oil can be used as fuel in diesel engines directly and by blending with methanol (Gübitz et al., 1999).

METHODOLOGY

Study area

The empirical area of the study is the Oyo state, located in Southwest Nigeria, with a special focus on rural households. The southwestern part of Nigeria is one of the six geo-political zones in the country and the hometown of the Yoruba people, with a land size of 114,271 km², which is approximately 12 percent of Nigeria's total land area, and a population of about 28.61 million,

which is approximately 20.44 percent of Nigeria's total human population. This zone consists of six states: Ekiti, Lagos, Ogun, Ondo, Osun and Oyo. It lies within latitude of 40–14° N and longitude of 3–14° E and exhibits the typical tropical climate of averagely high temperature and high relative humidity. The temperature is quite high during the dry season, with an average of around 33°C, while low temperature is experienced during the rainy season, with an average around 24°C. The distribution of rainfall varies from about 1,000 mm to about 2,000 mm. The southwestern part of Nigeria has three main types of vegetation – mangrove forest, tropical rainforest and guinea savannah.

Data collection procedure

A purposive sampling technique was used to select respondents from the population of registered *Jatropha* growers living in rural households located in the study area. About seventy-five (75) of the studied *Jatropha* farmers were selected from the group of ninety-nine (99) members of the *Jatropha* Growers Association living in the selected local government areas of the Oyo state using simple random sampling (Adeoye, 2014).

Data analysis

The data collected was subjected to both descriptive analyses, including frequencies and simple percentages, and inferential statistics, such as Pearson's product-moment correlation.

Pearson's product-moment correlation

$$r = \frac{n \sum XY - (\sum X)(\sum Y)}{\sqrt{(n \sum X^2 - (\sum X)^2)(n \sum Y^2 - (\sum Y)^2)}} \quad (1)$$

where:

r = correlation coefficient

n = sample size

Σ = summation sign

X = independent variables for the study, that is; the utilization of *Jatropha* among the respondents

Y = dependent variable for the study, that is; perceived generation of capital assets.

Hypotheses testing

H₀1: There is no significant relationship between the perceived generation of capital assets and the utilization of *Jatropha* among rural households.

RESULTS AND DISCUSSION

Perceived generation of capital assets from the utilization of *Jatropha* among rural households

The result from Table 2 shows rural households' perception regarding the generation of capital assets from the utilization of *Jatropha*. The findings are grouped according to the perceived contribution of *Jatropha* to each of the five capital assets, i.e. physical, financial, natural, human and social capital, respectively.

Physical capital

The results from Table 2 show that the majority of the respondents (84.0%) were sure of the traditional use of *Jatropha* as live fences around the houses and the demarcation of farms. This finding indicates that *Jatropha* is useful as a natural protective wall around peoples' apartments and farms against roaming herbivores. This is corroborated with the publication by Kumar and Sharma (2008), which states that *Jatropha* is an excellent hedging plant protecting farms from free-range livestock. About 88.0% of the respondents believe *Jatropha* is also useful for environmental vulnerabilities like erosion and loss of crops. This indicates that *Jatropha* is a nature-based solution for the management of environmental degradation, such as soil erosion, which influences crop production. This is in line with Favretto et al. (2014), who claim that *Jatropha* is utilized to manage environmental vulnerabilities and protect land and crops from degradation. About 77.3% of the respondents agree that it is easier to cultivate *Jatropha* for the overall sustainability of the environment, which in turn is corroborated by Pandey et al. (2012) who state that *Jatropha* is a potential source of energy conducive to sustainable environmental development.

Financial capital

The results from Table 2 reveal that approximately 38.7% of the respondents agree with the idea that it is possible to generate high income from the sale of *Jatropha* seeds. This finding indicates that less than half of the rural households could generate high income from sales of *Jatropha*. It negates the outcome from the study by Favretto et al. (2014), which showed that most interviewed inhabitants of rural areas generate high revenue from *Jatropha* seeds. Furthermore, about 51.0% of the respondents feel that money generated from sales of chewing sticks, extracts, saps and *Jatropha* soaps helps

to reduce households expenses. It indicates that *Jatropha* could significantly contribute to the reduction of households expenditures in order to support livelihood survival. This is validated by Favretto et al. (2014), who believe that some rural inhabitants generate revenue from *Jatropha*, which reduces household expenses.

Natural capital

The results included in Table 2 reveal that the majority of the studied individuals (86.7%) agree with the notion that assumes cultivation of *Jatropha* as a live fence/hedge, which can reduce soil erosion. It indicates that most rural households believe *Jatropha* can mitigate and reduce the impact of this phenomenon. This finding corroborates with Yammama (2009) who claims *Jatropha* is planted in form of hedges around farms to protect crops from soil erosion. Moreover, it shows that 61.3% of the respondents believe that *Jatropha* oil cake is rich in nitrogen, phosphorus and potassium, which contribute to the replenishment of infertile soils. This implies that the oil cake from *Jatropha* seeds is a useful source of organic fertilizer. This is further in line with Kumar and Shamar (2008), who stated *Jatropha* has a very high level of nitrogen, phosphorus and potassium, which qualifies it as an excellent source of natural fertilizer. About 54.7% of the respondents agree on by-products of *Jatropha* being useful as pesticides for pest control. This implies that by-products of *Jatropha* have biochemical compounds which make them good pesticides. This concurs with the paper by Adebowale and Adedire (2006) who stated that *Jatropha* has physicochemical properties, such as peroxides and acids, which render it a viable pesticide.

Human capital

Table 2 shows that the majority of the respondents (73.3%) perceive *Jatropha* as useful for the treatment of arthritis, gout and jaundice. This indicates that *Jatropha* has natural medicinal physicochemical properties, which help to cure these conditions. This finding is corroborated with Prasad et al. (2012) who stated that *Jatropha* has active compounds that are effective in the ethnomedicinal treatment of patients. About 57.3% of individuals under study strongly believe that the use of *Jatropha* as chewing stick is very good and effective in the treatment of toothache, inflammation and bleeding of gum. It indicates that *Jatropha* could be a viable, nature-based cure for dental sores, wounds, and/or mouth ulcers in humans. This result corroborates with the work

Table 2. Distribution showing perceived generation of capital assets from the utilization of Jatropha among rural farming households

Capital assets	Agree F %	Neutral F %	Disagree F %
Physical capital			
I strongly believe that the tradition to use Jatropha as a live fence around houses and to demarcate farms is beneficial	63 (84.0)		12 (16.0)
I believe Jatropha is useful for protection against environmental vulnerabilities, such as erosion, loss of crops and greenhouse gases	66 (88.0)		9 (12.0)
I think Jatropha contributes to power generation from Jatropha biofuel as a replacement for petroleum products	37 (49.3)		38 (50.7)
I believe that Jatropha seed residue is beneficial as organic fertilizer for soil fertility improvement	56 (74.7)		19 (25.3)
I feel that Jatropha protects crops when intercropped with arable crops	32 (42.7)		43 (57.3)
I think it is easier to cultivate Jatropha for sustainable environment	58 (77.3)		17 (22.7)
Financial capital			
I strongly believe it is possible to generate high income from the sale of Jatropha seeds	29 (38.7)	30 (40.0)	16 (21.3)
I can contribute to the financial improvement of my household's situation as a result of my involvement in Jatropha cultivation	35 (46.6)	20 (26.7)	20 (26.7)
I feel that money generated from the sale of Jatropha chewing sticks, extracts and soaps will help to reduce household expenses	38 (50.7)		37 (49.3)
The little income from my diversification will encourage more expanse cultivation and generate more income beyond my arable production	48 (64.0)		27 (36.0)
Natural capital			
Cultivating Jatropha as a live fence/hedge can reduce soil erosion	65 (86.7)		10 (13.3)
It can also help to restore degraded land and environmental pollution from greenhouse gases	52 (69.3)		23 (30.7)
It is useful in removing carbon from the atmosphere (which makes the plant important in combating climate change)	40 (53.3)		35 (46.7)
The oil cake from Jatropha is rich in nitrogen, phosphorus and potassium, which helps to replenish infertile soil	46 (61.3)		29 (38.7)
The by-products of Jatropha cake are also useful as pesticides for pest control	41 (54.7)		34 (45.3)
Human capital			
I feel Jatropha seeds are useful for the treatment of arthritis, gouts and jaundice	55 (73.3)		20 (26.7)
I strongly believe that the twigs/stem of Jatropha are very effective chewing sticks for everyday treatment of toothache, gum inflammation and gum bleeding	43 (57.3)		32 (42.7)
Jatropha sap and extracts are very useful in treating burns, cuts, wounds, skin diseases and dermatomucosal diseases	48 (64.0)		27 (36.0)
Social capital			
I feel valued by people for my involvement in Jatropha cultivation and business		75 (100)	
People in my neighborhood ask questions on the significance of Jatropha with regard to livelihood		75 (100)	
I belong to the Jatropha Growers Association	75 (100)		
I have huge returns in terms of money from the Jatropha business	25 (33.3)		50 (66.7)
The little returns I earn from Jatropha have helped to reduce my household expenses	50 (66.7)		25 (33.3)
I have received business information and transaction from the government		75 (100)	
I only receive business information from private organizations involved in the production of biofuel and pesticides	35 (46.7)		40 (53.3)

NB: F = Frequencies, % = Percentages in parentheses
Source: Field survey, 2020.

of Anyanwu et al. (2018), in which the author finds that Jatropha owes its folkloric benefits from its twigs, which in the form of chewing sticks treat oral ulcers and toothache when used properly. Most of the respondents (64.0%) perceive Jatropha sap and extract as very useful in the treatment of burns, wounds, and skin diseases. This indicates that sap and extract from Jatropha have significant health benefits and cure all kinds of human skin diseases. This in line with Pasil et al. (2013), who claims that Jatropha is used to treat skin diseases and soothe the pain from rheumatism.

Social capital

The results from Table 2 reveal that all respondents (100%) belong to the Jatropha Growers Association. This finding implies that the selected rural households are registered Jatropha farmers. This is corroborated with Adeoye (2014), who stated that the selected population included in the study on the knowledge on Jatropha in terms of sustainable environment in the Oyo state were registered Jatropha growers. About 66.7% of the surveyed individuals strongly believe that small profit from the sale of Jatropha helps them reduce household expenses. It indicates that that proceeds from Jatropha would facilitate solving financial challenges of the households. This result is in line with the publication by Favretto et al. (2014), in which the author claimed that households generate income from Jatropha cultivation, which helps them alleviate energy demand and meet other pressing needs. About half of the respondents (46.7%) receive business information from private organizations specialized in biofuel and pesticides production. This means that there are business transactions between the growers of Jatropha and agro-allied industries involved in the production of Jatropha biodiesel, pesticides, organic fertilizers and other domestic products. This is corroborated with Brittain and Litaladio (2010) who found that most organizations involved in Jatropha energy business are non-government organizations and private sector business investors.

The results included in Table 3 reveal the existence of a significant relationship between the perceived generation of capital assets and the utilization of Jatropha among rural households ($r = 0.432$, $p = 0.012$). This indicates that the perceived generation of capital assets correlates with the utilization of Jatropha in these units. This means that the utilization of Jatropha contributes to the generation of capital assets among rural households located in the area under study.

Table 3. Relationship between the perceived generation of capital assets and the utilization of Jatropha among rural households

Variables	r-value	p-value	Decision
Perceived generation of capital assets and utilization of Jatropha	0.432**	0.012	significant

r = correlation coefficient, p = probability level of significance, $p \leq 0.05$ (significant) ** Correlation coefficient (r) significant at 0.01 level of significance.

Source: Data analysis, 2020.

CONCLUSION AND RECOMMENDATIONS

The study revealed the high level of perceived generation of capital assets from the Jatropha utilization. It has a nature-based solution for the management of environmental degradation, such as soil erosion, which has an effect on crop production as physical capital in the Oyo state. The finding exemplified that less than half of the rural households could generate high income from sales of Jatropha based on the financial capital. With regard to the natural capital, it was revealed that most rural households believe that Jatropha can mitigate and reduce the impact of soil erosion, while most respondents claimed that Jatropha can contribute to the restoration of the environment from the effect of greenhouse gases. In terms of human capital, Jatropha was believed to possess natural medicinal physiochemical properties, effective in the treatment of skin diseases. In view of the social capital, the selected rural households belong to a registered Jatropha Growers Association. Businesses involved in Jatropha biofuel and pesticides production, as well as other businesses related to Jatropha are being conducted by private organizations. Finally, a high rate of Jatropha utilization was perceived to be relevant for capital assets generation, with direct influence on the improvement of livelihood of the rural households in the Oyo state. It was recommended that all five capital assets, i.e. physical, financial, natural, human and social, must be widely explored by the farmers with strong support from the government and the private sector. Awareness concerning the expansion of the Jatropha value-chain for more wealth generation should be spread. Both small-scale and large scale production should be encouraged to enable farmers to engage in large-scale cultivation of Jatropha.

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KORZYŚCI FINANSOWE, ŚRODOWISKOWE ORAZ ZDROWOTNE UPRAWY JATROFY W OCENIE WIEJSKICH GOSPODARSTW DOMOWYCH ZE STANU OYE W NIGERII

Abstrakt. Badanie polegało na ocenie przez wiejskie gospodarstwa domowe w stanie Oye potencjału ekonomicznego uprawy jatrofy. Próby badawczej wybrano spośród populacji wiejskich gospodarstw domowych zarejestrowanych plantatorów jatrofy w stanie Oye. Wszystkie wylosowane próbki, tj. siedemdziesiąt pięć (75), stanowiły gospodarstwa domowe będące zarejestrowanymi członkami Stowarzyszenia Plantatorów Jatrofy. Jako instrument badawczy wykorzystano kwestionariusz ankiety. Do analizy zebranych danych użyto zarówno opisowych, jak i inferencyjnych narzędzi statystycznych. Wyniki badań ujawniły, że większość respondentów uważa, że możliwe jest generowanie kapitału z wykorzystania jatrofy jako żywopłotów (84,0%), pożytecznych ze względu na zagrożenie środowiska (88,0%). Ponadto ustalono, że około 38,7% respondentów uważa, że wysoki dochód może być generować sprzedaż nasion tej rośliny. Większość respondentów (86,7%) postrzegała uprawę jatrofy za kapitał naturalny umożliwiający łagodzenie i redukcję erozję gleby. W odniesieniu do kapitału ludzkiego, wynik pokazał, że około 73,3% respondentów uważa, że jatrofa jest przydatna w leczeniu chorób skóry. Test hipotezy przez korelację Pearsona wykazał, że istniał znaczący związek między postrzeganiem generowania aktywów i wykorzystania jatrofy wśród wiejskich gospodarstw domowych ($r = 0,432$, $p = 0,012$). Jatrofa jest bardzo istotna dla wytwarzania aktywów, które wprost proporcjonalnie przyczyniają się do poprawy dobrobytu wiejskich gospodarstw domowych w stanie Oyo, Nigeria.

Słowa kluczowe: wiejskie gospodarstwa domowe, użytkowanie jatrofy, aktywa kapitałowe