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Effects of Cuniculture commercialization on household poverty status in south western Nigeria

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Abstract - This study evaluated the effect of Cuniculture commercialization on household poverty in Osun State, Nigeria. Descriptive and inferential statistics of frequency counts, Foster-Greer-Thorbecke (FGT), Household Commercialization Index (HCI) and Tobit Regression was used to analyze data collected from 120 respondents randomly selected from the register of Rabbit Farmers and Breeders Association of Nigeria (RFABAN) of Ife/Ijesha Agricultural development Project (ADP). The results of the study show that Cuniculture is a male dominated enterprise. The modal age of respondents was 18-60 with 87.5% of respondents educated. Majority of respondents earned between NGN20000 - NGN100000 monthly from Cuniculture. The study found that 16% of respondents were poor and living below the poverty line. The HCI of Cuniculture indicates that 54.2% of production was done mainly for household consumption. Access to credit and unavailability of markets were the major constraints with Household size and access to credit influencing the commercialization of Cuniculture. The study recommends that more people be encouraged to go into Cuniculture to serve as additional income to household; rabbit farmers become more market oriented beyond their present level; they organize themselves into cooperative for access to credits and market creation and that appropriate solutions be sought for the challenges encountered.

Key words: Rabbit. Farming. Profitability. Welfare. Poverty. Animal production.

Efeitos da comercialização da cunicultura na situação de pobreza das famílias no sudoeste da Nigéria

Resumo - Este estudo avaliou o efeito da comercialização da cunicultura na pobreza familiar no Estado de Osun, Nigéria. Estatísticas descritivas e inferenciais de contagens de frequência, Foster-Greer-Thorbecke (FGT), Índice de Comercialização Doméstica (HCI) e Regressão de Tobit foram usadas para analisar os dados coletados de 120 entrevistados selecionados aleatoriamente do registro da Associação de Criadores e Fazendeiros de Coelho da Nigéria, do Projeto de Desenvolvimento Agrícola Ife / Ijesha. Os resultados do estudo mostram que a Cunicultura é uma atividade dominada pelos homens. A idade dos entrevistados variou entre 18 a 60 anos, com 87,5% dos entrevistados instruídos. A maioria dos entrevistados ganhava entre NGN20000 - NGN100000 mensalmente com a cunicultura. O estudo descobriu que 16% dos entrevistados eram pobres e viviam abaixo da linha da pobreza. O HCI da cunicultura indica que 54,2% da produção foi feita principalmente para consumo doméstico. O estudo recomenda que mais pessoas sejam encorajadas a entrar na cunicultura para servir como renda adicional para a família; os criadores de coelhos tornem-se mais orientados para o mercado; se organizem em cooperativas para acesso a créditos e criação para venda e que soluções apropriadas sejam buscadas para os desafios encontrados.

Palavras-chave: Coelhos. Agropecuária. Lucratividade. Bem-estar. Pobreza. Produção animal.

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Introduction

Food production has not kept with Nigeria's 3.2% annual growth rate in her population (NBS, 2011). This has created a crisis and a wide gap between local food production and nutritional requirements and consequently led to increased dependence on food importation and exorbitant food prices have led to wide spread hunger, malnutrition and poverty (OJO, 2003). In Nigeria, the supply of animal protein has not met the demand (AKINMUTIMI; ONWUKWE, 2002). This severe deficit has birthed efforts towards the development of micro-livestock since traditional livestock is inadequate to supply the adequate amount of animal protein needed for consumption in many households especially in developing countries (OMEJE, 2014).

Generally, livestock production could lead to higher income and rise in standard of life and living of Nigerians (AKINOLA, 2009). Micro-livestock production has the advantage of growing and reproducing fast small bodied animals for meat and other purposes and can play a significant role for poverty alleviation among smallholder farming community in Nigeria (OKOLI; CHIDI; EBERE, 2002). Rabbit farming also known as Cuniculture is the agricultural practice of breeding and raising domestic rabbits for their meat, fur, or wool. It serves as a rich source of protein and of serious economic importance but production is on a low and quite new to West Africa due to lack of awareness and other factors (AGWU; ANYANWU; MENDIE, 2012; TAKASHI *et al.*, 2004). However, the health benefits of rabbit meat are its mild, savoury, extremely lean and it is the best for low cholesterol, low sodium and low-fat diets (ASIKADI, 2008). Its high levels of protein, iron and calcium is important in the treatments of arteriosclerosis, measles, epilepsy, chicken pox, asthma, poor eyesight and most importantly hypertension. They are a good source of income to several households in countries where the awareness has reached an optimal level (ODINWA; EMAH; ALBERT, 2016).

A higher percentage of the world's poor are farmers who depend on small scale farming as the main source of livelihood. As a result of this, agricultural development is touted to be a main and effective strategy for poverty alleviation globally (DE JANVRY; SADOULET, 2009; HAZELL *et al.*, 2010; WORLD BANK, 2015; OGUTU; QAIM, 2019). The commercialization of small-scale farming means a change from subsistence farming to a more profit/market-oriented production which invariably leads to income raise, employment opportunities and poverty eradication (BARRETT, 2008; BELLEMARE; NOVAK, 2017). Known as one of most efficient converter of feed to flesh, the Rabbits excel other livestock and only comes second to chicken in terms of growth rate, feed conversion efficiency (FCE) and meat quality (AGUNBIADE *et al.*, 2001). The choice for Cuniculture becomes paramount in serving as an escape route out of poverty so that farming households can tap from the economic gold mine embedded in Cuniculture and it is exploited towards the total economic liberation of farming households.

With over a third percentage of the world's population living below the 1.90 US Dollars a day (UNDESA, 2010) and up to 12.6% of the world population i.e. 854 million people are seriously malnourished

(FAO, 2006), the alleviation of poverty remains a lingering problem on the global level. WORLD BANK (2015); MURIITHI and MATZ (2015) on developing countries revealed that the commercialization of any profitable smallholder enterprise has positive impacts on the welfare, income, nutrition and other social economic development of households and thus serve as a potent tool to alleviate poverty and in improving farmer's welfare. With an estimated population of 1.7 million rabbits in Nigeria (NBS, 2011) and acceptance, popularity and profitability of rabbit production without any known religious or sentimental appeal Cuniculture in Nigeria remains in the hands of local producers who produce mainly for household consumption with little for sale to other consumers. Additionally, with the ban on importation of poultry products coupled with poor livestock production means that the supply of animal protein has not met the demand. Nontraditional meat sources are to be sourced and explored to combat these protein deficiencies in human diet. Hence the need for commercialization of this profitable agribusiness and Cuniculture interest groups step up their production.

In light of the foregoing, this study seeks to provide answers the question of: what is the poverty status of rabbit farmers; what is the level of commercialization of Cuniculture and what are the factors that influencing the commercialization of Cuniculture in the study area? Specifically, this study describes the socioeconomic characteristics of respondents, evaluate their poverty status, examine the level of commercialization of Cuniculture and identify the factors that influenced the commercialization of Cuniculture.

Origin, Domestication, Distribution and Introduction to Nigeria

The domestic Rabbits (*Oryctolagus cuniculus*) originated from the Mediterranean zones of the world with their domestication started by medieval monks raising them in cages for food (ADUKU; OLUKOSI, 1990). The United States Department of Agriculture (USDA) was instrumental in the introduction of rabbits into Western States of Nigeria in early 1960 (OBINNE, 1992) with The Directorate of Food, Road and Rural Infrastructure (DIFRRI) carrying out large scale importation pure and improved breeds into Nigeria between 1988 and 1989 (ADUKU; OLUKOSI, 1990). The imported breeds of rabbits have adapted successfully to the tropics and are now widely distributed throughout the country.

Rabbits are kept for their very nutritious, easily digestible and very low in cholesterol and sodium levels (OMOLE; OMUETI; OGUNLEKE, 2005), wool or fur production, research purpose and other factors such as their quick growth, small body size, quietness and docility, lack of cultural or religious restriction on rabbit products consumption and the less cost in of their feeding (OMEJE, 2014). FAO (2006) reports that on the average and approximate 200g of rabbit meat is need per person to balance animal protein deficiency and ensuring food security in developing countries. Variables such as increased access to education, trainings and credit to the farmers age, household size, total farm size, years of experience, distance to the nearest input and output market do affect the efficiency of Cuniculture (MUTUA; SHADRACK; MUITA, 2016) while regular

trainings and workshops in rabbit management practices, feeds, feeding and adequate disease management by the extension agents will promote Cuniculture commercialization in Nigeria (IKECHUKWU *et al.*, 2016).

Concept of Poverty

Poverty may be relative and absolute poverty and this is if relative or absolute yardsticks are adopted in determining of the basic income needed to meet basic life requirements (RAVALLION, 2004). The NBS (2012) defined absolute poverty from the perspective of minimum requirements to manage a minimum standard of living. Absolute poverty is also a state of lack of resources to maintain physical efficiency (ETIM; EDET; ESU, 2009). Size of household, dependency ratio, gender of household head, assets (such as land, farm tools and other means of production, housing and jewelry), employment and income structure, health and education of household members are determinants of household poverty (KHANDKER; HAUGHTON, 2009; AKINBODE, 2013; OBISESAN, 2012).

Concept, Impact and Constraint of Agricultural Commercialization

Commercialization of agriculture is the production of crops and animals for sale and market participation to make profit (LEAVY; POULTON, 2007; JALETA; GEBREMEDHIN; HOESTRA, 2009). Under this system, new technologies have to be adopted this include improved breeds, improved housing and efficient feeding techniques and veterinary services amongst other things to increase the profit margin of the farmer and for comparative advantage in making profits (MURICHO, 2015). Most times, commercialization is viewed from the perspective of being large scale and thus leaves out the truth that small scale farmers and poor households also participate in the market even though they produce a little surplus or perhaps there are other pressing needs of the family (NWAFOR, 2012).

Agricultural commercialization has three (3) key impacts/orders. The first order impacts are the immediate household effects on income and employment. The second order impacts are dependent on the first order impacts, second order impacts are health and nutrition both are dependent on the level of income; a first order impact of commercialization. The third order impacts are beyond the household levels. They are macro-economic and environmental impacts (JALETA; GEBREMEDHIN; HOESTRA, 2009; MURICHO, 2015). Land ownership is a key determinant of commercialization (FERRIS *et al.*, 2014) lack of access to market could discourage commercialization (CHIRWA; MATITA, 2012). The benefits of commercialization such as higher product prices and lower input costs will not be available to small holder farmers when market access is poor (OMITI *et al.*, 2009).

Materials and methods

This was carried out in the Ife/Ijesa Agricultural Development Project (ADP) zone of Osun State, Nigeria. The Osun State Agricultural Development Programme (OSSADEP) is divided into three zones

namely Osogbo, Ife/Ijesa and Iwo. Ife Central, Ife South, Ife North and Ife East are the four (4) Local Government Areas (LGA's) that make up the Ife/Ijesha Agricultural Development Programme (ADP) zone. Ife/Ijesha ADP zone has a total population of about 6, 444, 23 people and a total land area of about 1902 km². The zone experiences rainfall between April and October annually. Precipitation averages 1340mm with the minimum temperature range of 26.2⁰ C. The main stay of Ile/Ijesha economy is agriculture: crops like maize, cocoa, oil palm and livestock such as goats and chicken are produced in this area. Purposive sampling was used to collect data from a total of 120 active rabbit farmers and Breeders household's register of the Rabbit Farmers and Breeders Association of Nigeria (RFABAN), Osun State Chapter using questionnaires and only farmers with rabbits in their farms were sampled.

Descriptive statistics of Frequencies tables and percentages was used to examine socio-economic characteristics and the constraints to Cuniculture among the respondents. While Foster-Greer-Thorbecke (FGT) index, household commercialization index (HCI) and Tobit Regression model was used of analyze the poverty status of rabbit farmers, level of commercialization and factors influencing the commercialization of Cuniculture in the study area.

Model specification

Foster-Greer-Thorbecke (FGT) Model

FGT poverty index was used to evaluate poverty status among the rabbit producing households – adapted from FOSTER; GREER; THORBECKE (2010) and CELIDONI (2015) and it is specified as:

$$PG_{\alpha} = \frac{1}{N} \sum_{i=1}^q \left(\frac{z - y_i}{z} \right)^{\alpha}$$

Where:

n = total number of households in population

q = the number of poor households

z = the poverty line for the household

y_i = household income

α = poverty aversion parameter and takes value 0, 1, 2

In ascertaining the poverty index;

When α = 0 in FGT, it indicates a falls below the poverty line and identify the proportion of the population that is poor.

When α = 1 in FGT, it measures the extent to which individuals fall below the poverty line as a proportion of the poverty line

When α = 2 in FGT, it measures the squares of the poverty gaps relative to the poverty line.

Household Commercialization Index (HCI)

HCI measures the levels of commercialization of Cuniculture in the area (as adapted from VON BRUAN; KENNEDY, 1994; DUBE; GUYEYA, 2016) and it is defined as follows.

$$HCI = \frac{\text{Gross Value of rabbits sold by household H in year J}}{\text{Gross Value of all rabbit production by household H in year J}}$$

A value of zero for HCI means total subsistence while a HCI value approaching 100 is an indication of higher degrees of commercialization which implies a greater percentage of rabbit production is marketed. The advantage of using Household Commercialization Index is that it provides the level of commercialization of each household.

Tobit Regression Model

The Tobit regression model is used to describe the relationship between a non-negative independent variable and a dependent variable. The implicit functional form of the model is expressed below as adapted from OLAGUNJU; AJIBOYE, ((2010).

$$Y = f(X_1, X_2, X_3, \dots, X_n)$$

Where:

Y = influence on rabbit commercialization

X₁ = Age of the household head

X₂ = Marital status of the household head

X₃ = Educational status of household head

X₄ = Household size

X₅ = Farming experience

X₆ = Number of animals on farm

X₇ = Membership of association

X₈ = Household monthly income

X₉ = Access to credit

X₁₀ = Number of animals produced

X₁₁ = Number of trainings attended

μ = error term

Results and discussion

Socio-Economic Characteristics of Respondents

Table 1 show that 90% of the respondents were males while just 10% of them were females which indicates that Cuniculture is a male dominated activity in the area. About 91.7% of the respondents were between the ages of 18 - 60 years while only 3.3% were above 60 years. This shows that most of the respondents were in their prime. Furthermore, 80% of the respondents had a household size of between 1 - 6 while 3.2% had their household size between 12 - 17. The table also shows that 87.5% of respondents had one form of education or the other while only 12.5% had no formal education as corroborated by YUSUF *et al.*, (2013). About 42.5% of the respondents got their primary source of income from Cuniculture, 75% made between NGN20,000 and NGN100,000 (USD 1 = NGN 381.25K) as their total income monthly with about 63.3% spending above NGN20,000 on food for the family monthly. On the source of farm capital, 85.8% of the respondents made use of their personal savings; other respondents got capital from the banks, self-help groups and from friends and relatives. Only 28.1 of respondents underwent some form of training to support their technical know-how in Cuniculture. About 27.5% of respondents had access to credit facilities while 72.5% which forms the majority of the sample did not have access to any credit.

Table 1. Distribution of respondents by socioeconomic characteristics.

Variable	Frequency	Percentage
Gender		
Male	108	90.0
Female	12	10.0
Age (Years)		
18	6	5.0
18 – 60	110	91.7
>60	4	3.3
Household Size		
1-6	96	80.0
7-11	20	16.7
12-17	4	3.2
Educational Level		
No formal Education	15	12.5
Primary	5	4.2
Secondary	15	12.5
Tertiary	85	70.8

Primary Source of Income		
Cuniculture	51	42.5
Salaried Job	29	24.5
Trade and other Business	40	33.0
Total household monthly income (NGN)		
20000	17	14.2
20000 – 100000	90	75.0
>100000	13	18.8
Total amount expended on food by household (NGN)		
<20000	44	36.7
20000 – 50000	67	55.8
>50000	9	7.5
Source of Farm Capital		
Personal Savings	103	85.8
Banks	4	3.3
Friends and Relatives	7	5.8
Self-Help groups/Cooperatives	6	5.0
Underwent training		
Yes	34	28.1
No	86	71.1
Number of Training attended		
1	5	14.7
2-5	20	58.8
>5	9	26.5
Access to credit		
Yes	33	27.5
No	87	72.5

Source: Field survey (2019)

Analysis of poverty status of the respondents using FGT Poverty Index

The poverty line calculated was NGN35,755.55 therefore any household below the amount in the poverty line was considered as been poor while any household whose income is above or exactly on the poverty line is described as non-poor. Table 2 show the poverty incidence (P_0) was 0.16. This implies that 16% of the respondents were below the poverty line and were relatively poor. The poverty gap (P_1) was 0.38. This indicates that those that were poor required a 38% improvement in their income to reach the poverty line

hence become non- poor. The poverty intensity or severity (P_2) was 0.04. This value indicated that 4% of the respondents in the study were severely poor.

Table 2. Summary of the Poverty Indices for the Respondents in the Study Area.

Poverty FGT Class	Index
P_0	0.16
P_1	0.38
P_2	0.04

Source: Field survey, 2019

Description of the poverty status of the respondents' households

Table 3 show the level of poverty of the households involved in Cuniculture. All respondents whose FGT index was 0 were considered as poor while those whose index is 1 were regarded as non-poor. The results in the table above show that 86.7% of the respondents were non-poor in that their income was above the poverty line hence they could provide for themselves and their household basic amenities for proper livelihood. About 13.3% of respondents were considered poor as their income was below the poverty line.

Table 3. Description of the poverty status of households.

Poverty Level	Category	Frequency	Percentage
1	Non-poor	104	86.7
0	Poor	16	13.3

Source: Field survey (2019)

Determination of Level of Commercialization

Table 4. Distribution of respondents by Household Commercialization Indices (n=120).

Commercialization Indices	Frequency	Percentages	Minimum	Maximum
≤ 30.0	65	54.2	0	30.0
30.1 – 40.0	10	8.3	33.3	40.0
40.1 – 50.0	8	6.7	43.8	50.0
50.1 – 60.0	12	10.0	51.2	60.0
60.1 – 70.0	7	5.8	62.5	70.0
70.1 – 80.0	10	8.3	70.5	80.0
>80	8	6.7	82.5	90.0

Source: Field survey (2019)

Challenges in Rabbit Production

The Household Commercialization Indices (HCIs) of the respondents ranged from 0 - 100.0%. Further analysis revealed that those whose HCIs were 0% were 2.5%, implying that such rabbit farmers produced mainly for household consumption (as food, gifts or storage) only. The modal group were those whose HCIs indices were less than or equal 30%. The mean household commercialization index of the farmers was 34.8%. Analysis of the results also revealed that those whose commercialization indices fell below this average were 54.2% while 37.5% of the farmers had their commercialization indices greater than or equal to this average. The mean household commercialization index (34.8%) as obtained in the study area implies that the Cuniculture practitioners still have a gap of 65.2% to achieve full commercialization in the production of rabbit. The implication of these results is that more than half (65.2%) of the rabbit produced by the rabbit farming households is used for household consumption while the remainder (34.8%) constitutes the product being channeled to the markets.

Table 5 shows the challenges the farmers face in their production endeavor. Access to credit facilities (33.3%) was the prominent constrain to Cuniculture in the area while prevalence of diseases was the least constraints. However, inadequate markets, access to forage and abortion were other constraints of concern to productive Cuniculture in the area.

Table 5. Percentage Distribution According to Constraints in Cuniculture.

Challenges	Frequency	Percentage
Abortion	20	16.7
Access to forage	20	16.7
Inadequate market	24	20.0
Access to credit	40	33.3
Prevalence of diseases	16	13.3

Source: Field survey (2019)

Factors affecting Commercialization of Cuniculture in Area

Table 6 shows estimates of factors that influence commercialization of Cuniculture in the study area. Household size and access to credit were found to be significantly related to Cuniculture commercialization at 5%. Household size had a negative coefficient (-0.0217249) implying that an increase in the composition of the farming household would result in about 21.7% decrease in the ability of the household to be more commercialized as it pertains to Cuniculture. This may mean that the demand for meat and food is more in a large household than a smaller one according to *a priori* expectation. Therefore, rabbit production oriented towards the market will reduce as a result of increase in the consumption of the products at the home level. Furthermore, access to credit also had a negative coefficient (-1.458412). As reported from the study, most

rabbit farmers in the area made use of personal savings as their source of capital for the business with no external source of funding. This implies that lack of assistance in the form of credit and loans to the farmers would lead to a decrease in commercialization of rabbit by farmers. The model had a Pseudo R² value of 0.2878. This represents a good fit as the independent variables explain 28.7% of the variation in the dependent variable while other factors which were not considered by the model were logged up in the error term.

Table 6. Regression Estimate for factors affecting commercialization of rabbit.

Variables	Coefficient	Std error	T	P>t
Age	0.354699	0.981632	0.36	0.719
Gender	-0.0260595	0.0926693	-0.28	0.779
Household size	-0.0217249	0.0106309	-2.04	0.043**
Farm experience	-0.0014245	0.0044542	-0.32	0.750
Training	0.0378364	0.659123	0.57	0.567
Access to credit	-1.458412	0.0702176	-2.08	0.040**
Cost of Rabbit pen	1.55e-06	1.25e-06	1.24	0.217
Cost of Young rabbit	3.38e-08	3.29e-06	-0.16	0.873
Cost of feed	-4.55e-07	2.84e-06	-0.16	0.873
Drugs	0.0000225	0.000014	1.61	0.111
Labour	-9.16e-06	5.71e-06	-1.61	0.111
FGT	0.1392687	0.0871988	1-60	0.113
Constant	0.302809	0.2091966	1.45	0.151

Number of obs = 120
Pseudo R² = 0.2878
Log likelihood= -26.381116
LR chi2(13)= 21.33

Source: Field survey, (2019)

** = significant at 5%

General recommendation

Conclusively, this study reveals that 86.7% of respondents were non poor while 13.3% were poor. On the whole, Cuniculture still had about 65.2% gap to fill in order to achieve full commercialization in the area due to the fact that more than half of the current production is consumed at the household level. Inaccessibility to credit facilities is the major constraint among others to Cuniculture while household size and access to credit are the factors affecting rabbit production in the area. Based on the findings from this study, it is recommended that Cuniculture be encourage and sustained as an off-farm activity that would serve as an

additional source of family income, that rabbit farmers become more market oriented beyond their present level of consumption at household levels, Cuniculture practitioners organize themselves into interest groups for easy access to credit facilities and create markets. This study also recommends that the right and appropriate solutions be sought to mitigate the challenges encountered by rabbit farmers.

Conflict of interests

The authors declare that the research was conducted in the absence of any potential conflicts of interest.

Ethical statements

The authors confirm that the ethical guidelines adopted by the journal were followed by this work, and all authors agree with the submission, content and transfer of the publication rights of the article to the journal. They also declare that the work has not been previously published nor is it being considered for publication in another journal.

The authors assume full responsibility for the originality of the article, and may incur on them, any charges arising from claims, by third parties, in relation to the authorship of the article.

Authors declare on the approval of the Ethics Committee for studies involving human beings including studies with questionnaires, that such studies do not need the approval of the Ethics committee in any University in Nigeria but subject to the respondents willingness to voluntarily provide what is requested of them and the researchers' guarantee of confidentiality and use of collected data solely for research purpose.

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