

Economic aspects of Grasscutter Farming in Southwest Nigeria: Implications for Sustainable Adoption and Conservation

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Abstract— Economic aspects of grasscutter farming and their implications for sustainable adoption and conservation were studied in Ondo, Osun and Oyo States, southwest Nigeria. Data were collected through questionnaire administration from 4 Local Government Areas in Ondo and Osun States while they were collected in 5 Local Government Areas in Oyo State where grasscutter farming has been adopted. Thirty grasscutter farms were randomly selected from 150 farms in the three states, thus, 20% of the farms were selected. Data were on demographics of the grasscutters' farmers, amount invested and income generated from 2003 to 2005. Analyses of data were through descriptive statistics, student's t-distribution, multiple regression and cost benefit analysis. Rate of return on investment and its trends for the enterprise were also determined. The results indicated that the enterprise was below poverty line in each of the three states. Osun State had the highest cost benefit ratio with 3.64 while Ondo State had the least with 1.77. Also, Osun State had the highest rate of return on investment while Ondo State had the least. The trend in the rate of return on investment showed that Oyo State had the highest with R^2 of 0.9934, while Ondo State had the least with R^2 of 0.7135. The study concluded that grasscutter farming is relatively young and as such profitability and its poverty alleviation potentials may take several years of investment to materialize.

Index Terms— Economic, grasscutter farming, poverty line, sustainable adoption, conservation.

1 INTRODUCTION

RURAL communities in many parts of Africa, Asia, central Europe and the Americas are increasingly concerned about losing self-sufficiency as their local wild populations of animals used for bushmeat dwindle because the wildlife biomass of tropical forests is generally low [1]. Wildlife hunting may be sustained but only where human population densities are low [2]. It has been suggested that for people depending exclusively on wild meat, hunting may not be sustainable if human population densities are greater than 1 or 2 person/km² [3]. Unrestricted access to valued but vulnerable species may provide a high initial harvest, but this will merely be a temporary "bonanza" followed by loss of local self-sufficiency and higher effort or prices to get the species elsewhere [1].

The shortage of animal protein in the third world countries can be ameliorated by improving the existing conservation programme of wildlife particularly the domestication of rodents that are tractable, prolific, and widely accepted to the public for consumption [4]. Captive breeding of game species as a possible way to satisfy local demand without compromising the wild stock has also been recommended by several authors [5, 6, 7, 8].

This has obvious attractions where bushmeat fetches a high price [9], and logically, it could lead to reduced demand for wild caught specimens [8]. Again, captive rearing of rodents and enclosures might augment the bushmeat supply from the wild [10]. Grasscutter or canerat has been suggested as one of the minilivestock having potential for domestication. Grasscutter rearing has been stated to have health related advantages including better nutrition from consumption of meat [11]. There is also strong evidence that local diets in some parts of Africa frequently include non-conventional livestock such as canerats that make significant contributions to the nutritional well-being of marginal households [12, 13].

Economic viability of grasscutter farms depends on the socio-economic context of the farm. If the farm is placed near urban centers where bushmeat prices and demand are high, a middle-sized cane rat farm can certainly be profitable [14]. In Libreville, Gabon's capital city, for example, wild cane rat meat is sold at 2.8 US\$/kg (1 US\$= 695 FCFA) but farmed animals are sold at 5 US\$/Kg without any difficulty [14]. A World Bank study showed that small-scale cane rat farming with a yearly stock of 260 animals (40 reproductive females) was the most profitable system of animal exploitation in Ghana, followed by poultry and rabbit farming [15].

A farm of this size could easily reach a profitability threshold of between 350 and 400 US\$/year with the sale of 14 to 20 animals for meat at 5 US\$/Kg [14]. Several authors in different African countries seem to agree that a small-scale farm of 40 reproductive does is the most profitable scale of production for that species and that well managed cane rat farms can substantially contribute to local economies and produce enough profit to make a living [16, 17]. It has been noted that grasscutter breeders generally earn two (2) times more than what they invested in the grasscutter husbandry [18]. This is a crucial point for the development of grasscutter farm-

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ing in Africa that deserves further analysis or investigation [14]. Generally speaking, canerat farming profits are variable depending on the country and the area where the farm is based and show better prospects of economic success in peri-urban areas where demand for bushmeat is higher, transport costs are limited and game is sold at high prices. In rural areas, hunting management of wild canerats certainly shows more promise than farming since these rodents are abundant, and their capture reduces predation on and damages to feeding crops. Moreover, prices in rural areas are at least two times lower than those paid in urban centres [19] and spending money in producing animals that are abundant in the wild seems unrealistic, unless hunting is prohibited and respect of the law can be guaranteed [14]. Studies indicate that grasscutter farming possesses environmental related advantages such as reduction in poaching and bushfires [11]. It also reduced bushfires caused by poachers [11, 20, 21].

There is a large body of literatures on grasscutter domestication, especially in the last twenty years and some enterprises specialized in its rearing are already in existence in Nigeria and other parts of West Africa. In the savanna area of West Africa, people have traditionally captured wild grasscutters and raised them at home. As an extension of this, organized grasscutter husbandry has been initiated. Many researchers have reported the potential inherent in domesticated grasscutter in West Africa [22, 23, 24, 25] and reported various degrees of successful domestication of grasscutter in Ghana, Benin and Nigeria. It has also been reported that grasscutter contributes to both local and export earnings of countries like Kenya, Benin Republic and Nigeria [26]. Its meat, said to resemble suckling pig, often sells for more per kilogram than chicken, beef, pork or lamb. It is the preferred, and perhaps most expensive meat in West Africa. Indeed, in Ivory Coast it sells for about US\$9 per kilogram [27]. With prices like that, grasscutter is culinary luxury that only the wealthy can afford. If domestication of this wild species is successful in providing meat at a price similar to that of poultry, markets would be unlimited. In an effort to capitalize on the markets for this delicacy, agricultural extension services of Cameroon, Ghana, Ivory Coast, Nigeria and Togo and particularly Benin are already encouraging farmers to rear grasscutter as backyard livestock. The need to evaluate the profitability and economic viability of grasscutter farming as well as the implications for sustainable and continued adoption of the technology and conservation justifies the present study.

2 MATERIALS AND METHODS

The study areas-Ondo, Osun and Oyo States are in Southwest of Nigeria. Ondo State lies between latitudes $5^{\circ} 45'$ and $6^{\circ} 05'$ E. It is bounded on the east by Edo State and Delta States, on the north by Ekiti and Kogi States and to the south by the Bight of Benin and the Atlantic Ocean. Osun State covers an area of approximately 14,875 square kilometers, lies between longitude $04^{\circ} 33'$ E and latitude $07^{\circ} 28'$ N, and is bounded by Ogun, Kwara, Oyo, and Ondo States in the South, North, West, and East respectively. Oyo State also lies between latitude $07^{\circ} 00'$ N and longitude $03^{\circ} 00'$ E. Oyo State is bounded by the States of

Kwara on the north, Osun on the east, Ogun on the south and by Republic of Benin on the west.

The climate of southwest Nigeria is tropical in nature and it is characterized by wet and dry seasons. The temperature ranges between 21°C and 34°C while the annual rainfall ranges between 1250mm and 3000mm. The wet season is associated with the southwest monsoon winds from the Atlantic Ocean while the dry season is associated with the northeast trade winds from the Sahara desert. The vegetation of southwest Nigeria is made up of freshwater swamp and mangrove forest at the coastal belt, the lowland rainforest stretches to Ogun and parts of Ondo State while secondary forest is towards the northern boundary where derived and southern Guinea savanna exist [28].

Data were collected through questionnaire administration from 4 Local Government Areas in Ondo and Osun States while they were collected in 5 Local Government Areas in Oyo State where grasscutter farming has been adopted. Thirty grasscutter farms were randomly selected in the three states, thus, 20% of the farms were selected in each of the States. Analyses of data were through descriptive statistics, and multiple regression. Rate of return on investment for the enterprise was also determined. In order to determine if the profits made from grasscutter farming are able to lift the farmers above the poverty lines, analysis using the Student's t Distribution was carried out. In order to determine whether the cost exceeds benefits from grasscutter farming, cost benefit analysis was also carried out. Since enterprise costs and benefits occurred over a period of time, direct comparison is not appropriate. This is because value is intimately associated with time [29]. Therefore, an adjustment factor (discount rate) also referred to as interest rate is applied. The Central Bank of Nigeria pegged interest rate on agricultural loans at 14 percent since March, 2006 [30]. Therefore, 14 percent discount rate was used in the analysis.

3 RESULTS AND DISCUSSION

The demographic Characteristics of the selected grasscutter farmers are presented in Table I. All the farmers were male (100%), majority were in the age range of 26-50 years (83.3%). This indicates that they are in their active age. Majority had tertiary education (76.7%) while large percentage was teachers and civil servants respectively (23.3%), and crop (16.7%), and poultry farmers (10.0%). Higher level of education is needed in grasscutter farming; this is because it requires high technical knowledge and skills to be successful in its domestication. In addition, Grasscutter farming is adopted as a secondary occupation.

TABLE I
DEMOGRAPHIC CHARACTERISTICS OF THE GRASSCUTTER FARMERS (N=30)

Variable	Frequency	%
Gender		
Male	30	100
Age		
1-25	4	13.3
26-50	25	83.3
>50	1	3.3
Marital Status		
Single	7	23.3
Married	23	76.7
Education		
Primary	4	13.3
Secondary	3	10.0
Tertiary	23	76.7
Primary Occupation		
Lecturing	2	6.7
Teaching	7	23.3
Civil Servant	7	23.3
Trading	2	6.7
Medical Practitioner	1	3.3
Construction worker	1	3.3
Crop Farming	5	16.7
Poultry Farming	3	10.0
Pig Farming	1	3.3
Applicant	1	3.3

TABLE II
FARMING AND PRODUCTION CHARACTERISTICS OF GRASSCUTTER FARMERS

Variable	Frequency	%
Experience (In Years)		
1-5	19	63.3
6-10	7	23.3
11-15	2	6.7
16-20	2	6.7
No of Workers		
Full-Time	45	60.8
Part-Time	29	39.2
Amount Invested (In Naira)		
1000-50000	19	63.3
60000-100000	3	10.0
110000-150000	5	16.7
160000-200000	1	3.3
>200000	2	6.7
Source of Capital		
Personal savings	23	76.7
Loan from Cooperative	5	16.7
Friends and family	2	6.6
Land Acquisition		
Inheritance	4	13.3
Tenancy	15	50.0
Leasehold	1	3.3
Purchase	8	26.7
Institutional Land	2	6.7

Table II presents the farming and production characteristics of grasscutter farmers. In terms of experience, majority (63.3%) of the selected farmers had relatively few years of experience in grasscutter farming. This might not be unconnected to the fact that domestication of grasscutter in Nigeria is relatively new, spanning few decades. In addition, the 30 farmers had 74 workers with 60.8% of the workers constituting full-time and 39.2% as part time workers. This is also an indication that grasscutter farming is becoming a source of employment for the people. Furthermore, 63.3% of the farmers invested between ₦1000 (US\$6.2) and ₦50000 (US\$3086.4), this might have resulted from the scale of the farms involved. More than 76% of the farmers' source of income was personal savings. This is not surprising since farmers tend to avoid obtaining loans from commercial banks due to high interest rates being charged (this might range from 14%-25%). The source of land acquisition by the large number of the farmers was through tenancy (50.0%). This is in contrast from various studies that indicated that land acquisition in Nigeria is through inheritance [31].

A family of grasscutter consists of a male and four females. According to the majority of the farmers, the cost of producing a family in three months was between ₦17000 (US\$104.9) and ₦18000 (US\$111.1), ₦20000 (US\$123.5) and ₦21000 (US\$129.6) in six months, and ₦26000 (US\$160.5) and ₦30000 (US\$185.2) in nine months. This is an indication that grasscutter farming requires high capital outlay for production. In addition, majority of the farmers (60.0%) sold a family of 3 months old grasscutters for ₦28000 (US\$172.8), between ₦30000 (US\$185.2) and ₦31000 (US\$191.4) for a 6 months old family and between ₦35000 (US\$216) and ₦37000 (US\$228.4) for a 9 months old family of grasscutters. However, a matured grasscutter was sold for between ₦3000 (US\$18.5) and ₦5000 (US\$30.9). This is an indication that grasscutter farming is profitable (Table III).

Table III
COST AND RETURNS FROM INVESTMENT IN GRASSCUTTER FARMING

Variable	Frequency	%
Cost of Production/Family (In Naira)		
3 Months Old		
15000-16000	10	33.3
17000-18000	20	66.7
Six Months Old		
18000-19500	9	30
20000-21000	17	56.7
>21000	4	13.3
9 Months Old		
20000-24000	14	46.7
26000-30000	16	53.3
Matured Grasscutter/Month		
1200-2700	20	66.7
2500-2700	4	13.3
2800-2900	6	20.0
Selling Price/Family (In Naira)		
3 Months Old		
26000-27500	12	40.0
28000	18	60.0
6 Months Old		
28000-29500	7	23.3
30000-31000	22	73.3
>31000	1	3.3
9 Months Old		
30000-34000	2	6.7
35000-37000	28	93.3

The study showed that Oyo State had the highest mean annual profitability from the enterprise among the three states considered with ₦509,642 (US\$3145.9) while Ondo State had the least with ₦309,583.30 (US\$1911). With poverty line of \$1/day for 6 people/year at ₦291,270 (US\$1798); the enterprise in each of the three States was above poverty line. However, when the 3 States were grouped together, the mean annual profitability was ₦287,464 (US\$1774.5) which was below the poverty line of ₦291,270 (US\$1798) of \$1/day for 6 people/year. Also, if the poverty line of \$2/day for 6 people (₦582,540, US\$3595.9) is considered, then, the enterprise was below poverty line (Table IV). This might be due to high capital involved in the establishment of grasscutter farm. Heavy financial investment is required in the procurement of foundation stocks, housing, and establishment of feed farms. This might make the enterprise not profitable to the farmers. Considering the cost of acquisition of a family (one male, four females) at ₦6000.00 per animal, and the selling price of between ₦1500 (US\$9.3) and ₦3500 (US\$21.6) when culled or to be sold in the rural area, investment in grasscutter farming

may not be profitable, although, they may command higher prices in the cities, which can make the investment to be attractive.

From the cost benefit analysis (CBA), Osun State had the highest cost benefit ratio (CBR) of 3.64 while Ondo State had the least (1.77). When the three States were grouped, they had 1.97 as their cost benefit ratio (Table V). These are indications that grasscutter farming is economically viable since none of the ratios was below 1. For rate of return on investment (RORI), Osun state also had the highest rate of return on investment from year 2003 to 2005 while Ondo State had the least. The trend in the rate of return on investment shows that Oyo State had the highest trend ($R^2=0.9934$) while Ondo State had the least ($R^2=0.7135$) (Fig1-3). This underscores that the enterprise is young and is undergoing development. The profitability of the enterprise (grasscutter farming) considered across the three states was significantly affected by the demographic characteristics of the entrepreneurs (Table VI).

TABLE IV
PROFITABILITY OF GRASSCUTTER FARMING IN ONDO, OSUN AND OYO STATES

State	Standard Deviation	Mean Annual Profit (₦)	Poverty Line(\$1/Day) 6 People/Yr. (₦)	Poverty Line(\$2/Day) 6 People/Yr (₦)
Ondo	98186.4	309583.3	291270	582540
Osun	7267.8	43166.7	291270	582540
Oyo	132032.7	509642	291270	582540
Across the states	44402.8	287464	291270	582540
	Student's t Distribution (\$1/Day)	Student's t Distribution (\$2/Day)		
Ondo	0.19	-2.78		
Osun	-34.14	-74.21		
Oyo	1.65	-0.55		
Across the states	-0.09	-6.65		

TABLE V
ECONOMIC ANALYSIS OF GRASSCUTTER FARMING IN ONDO, OSUN, AND OYO STATES

State	Cost/Benefit Ratio	RORI (%)		
		2003	2004	2005
Ondo	1.77	67.25	74.04	78.06
Osun	3.64	159.26	233.33	331.82
Oyo	2.09	30.43	89.73	134.33
Across the States	1.97	49.52	88.44	106.81

TABLE VI
EFFECT OF DEMOGRAPHIC FACTORS ON PROFITABILITY OF ENTERPRISES INVESTIGATED ACROSS THE STATES

	Functional Form (Model)				
	linear	semi log	Exponential	double	log
Enter-prises					
Cane rat Farming	3.34*	2.82	5.61*	3.69*	

* = significant at p = 0.05

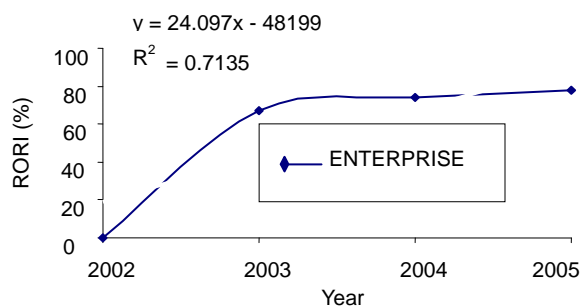


Fig. 1: Trend in Grasscutter Farming (RORI) in Ondo State

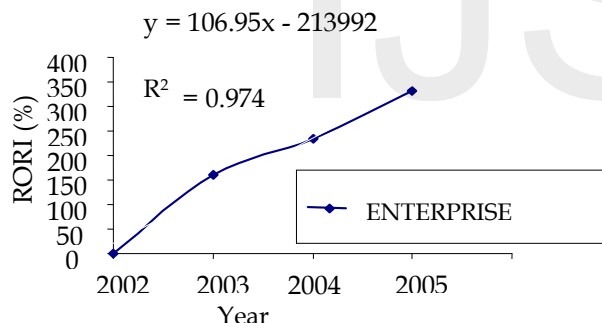


Fig. 2: Trend in Grasscutter Farming (RORI) in Osun State

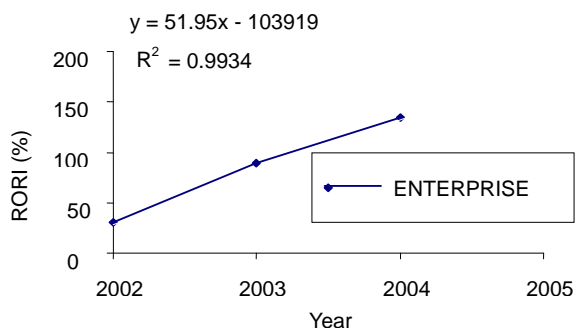


Fig. 3: Trend in Grasscutter Farming (RORI) in Oyo State

4 IMPLICATIONS FOR SUSTAINABLE ADOPTION AND CONSERVATION

Domestication of grasscutter serves conservation purpose and the continued and sustainable adoption of the technology is paramount to the conservation of the wild populations. Like farming of most wildlife species, grasscutter domestication and rearing require substantial investments of time and money [32, 33]. The cost of even small-scale wildlife farming may still be significant for the poor, remote, or landless people often envisioned as wildlife farmers [34, 35, 36, 37]. Most systems of keeping wildlife in captivity require an initial capital investment in infrastructure to hold animals-wire fencing, concrete, or cage materials may be prohibitively expensive for farmers [37]. This high capital involvement in wildlife farming may make adoption to be less attractive. One issue of long-standing discussion and debate has been the relative importance of economic factors as drivers of adoption.

There are several important influences on adoption, and economic benefit (broadly defined) is one of them [38]. Economists typically assume that decision to adopt a specific farming practice is based on profit-maximizing behaviour [39]. It has been observed that profit expectations are an important influence on investment plans (and thus on adoption decisions). Lack of financial viability would be expected to inhibit adoption of innovations by reducing the capacity to adopt, rather than the benefits of adopting [40]. In addition, it has also been found that short-term expectations about variables related to profitability influenced the adoption of conservation practices [41]. It has been indicated that actual and perceived returns from a particular 'conservation' practice is one of the factors affecting the adoption and continuing use of sustainable agricultural practices [42]. Also, wildlife farming is only likely to be widely embraced, therefore, if production costs and efforts are lower than hunting [37, 43]. To be economically attractive, wildlife farming would have to offer returns per unit investment equivalent to rearing domestic species [32]. However, returns from wildlife farming are long-term, sometimes requiring several years of investment before significant returns are forthcoming. Widespread adoption of grasscutters farming may be substantially affected if profitability from the investment on the enterprise is low.

Various factors were also identified in the literature regarding adoption of sustainable technologies. Major constraints to adoption identified were little or no financial benefit and associated financial factors, and complexity of technology considered [44]. Innovations will not be adopted if the farmer perceives them to be too risky financially, too complex, and to not fit with the farmer's situation or available resources [44]. The importance of profit as one of the drivers for most farmers has strong implications for conservation practices [38]. Among those farmers with a focus on profit, the farm-level economics of a proposed conservation practice will be important. Those conservation practices that are not profitable at the farm level will tend to be adopted only by farmers with stronger conservation goals. The lower the perceived profitability, the stronger the conservation goals need to be for adoption to occur. Unprofitable conservation practices are likely to be more widely adopted if they are able to generate conserva-

tion benefits when adopted at a small scale.

5 CONCLUSION

The analysis of grasscutter farming in Southwest Nigeria clearly shows that although the adopter of the technology has a relatively few years of experience, the investment is worthwhile and profitable, and serves as a source of employment for a considerable number of people. The enterprise however requires large capital outlay, which may not be within the reach of large number of the rural communities, particularly the support zone communities of Nigeria's protected areas who are the main target of this technology thus reducing its potential for adoption. It should also be noted that grasscutter farming as an enterprise in Nigeria is relatively young and as such, profitability and its poverty alleviation potentials may take several years of investment to materialize.

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