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Gross Margin Analysis of Medium Scale Cane rat Production in Selected States of South-west Zone of Nigeria

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ABSTRACT : There have been calls by various Research Scientists for mass production of cane rat in order to bridge the gap between intake of animal protein and its supply and to contribute to economic empowerment in Nigeria, without adequate economic information on its production. The objective of this work therefore was to carry out economic evaluation, of medium scale cane rat production in south-west Nigeria so as to provide adequate economic information on return to investment to prospective investors in cane rat farming in Nigeria as a way of encouraging greater investment in its production. Three states (Oyo, Osun and Ogun), eighteen LGAs and seventy-two cane rat farmers were randomly selected for the study. The study adopted questionnaire method of survey research which was administered on the selected cane rat farmers. Data collected covered years of experience, number of colonies, cost of production, output of cane rat, and constraints to production. Data collected were analysed using simple descriptive statistical tools and gross margin analysis. Given the medium scale production of Cane rat studied, the highest average cost was ₦1,807.22, and the lowest ₦1,149.84 was per year. Ogun state had the highest margin of ₦118,637.00 per colony. This farm also had the lowest cost of production of ₦38,735.80 per colony across the three states selected. Oyo State recorded the lowest average gross margin of ₦82,157.80 per colony. In general terms the differences in gross margin between the states rests on imperfect market for inputs and management of cane rat in captivity. The study recommends that research activities should be directed towards getting appropriate ration, durable affordable materials for housing, and health management for maximum cane rat output for economic empowerment , reduction in poverty, enhanced food security.

Keywords: Gross margin, cane rat production, economic empowerment and food security.

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I. INTRODUCTION

Cane rat or grasscutter, known as 'Gebgi' in Hausa, 'Nchi' in Ibo and 'Oya' in Yoruba languages respectively belong to the family that contain a single genus. This genus has six species which is widely distributed in Africa, south of the Sahara. Akinbile (2002) stated that cane rat originated from the savanna ecological zones and penetrated the forest zones of Nigeria. Onadeko (1996) reported that cane rats are found mostly in secondary grown degraded forests and farm lands in the rainforests, derived and guinea savanna zones of Nigeria. Cane rat is generally accepted as it has no known taboo. Meduna (2000;1994) and Spore (1993) separately stated that cane rat has no barrier in its acceptability in Nigeria and West Africa and that its flesh is considered a delicacy in most parts of Nigeria and Africa, free of any religious / or cultural prohibitions. It was further reported that due to the delicacy and acceptability of cane rat flesh, it is used to appease mother-in-laws in some communities in Benue and Kogi states of Nigeria. Cane rat meat meets the taste of all categories of people both poor and rich alike. Apart from these, Annon (1993) and Asibey (1970) emphasised on cane rat as a valuable source of animal protein. FAO (1991) reported that wildlife, cane rat inclusive, can provide nutritionally important source of animal protein and that the nutritional value of wild meat is comparable to that of domestic meat and therefore could enhance food security. Nsibambi (2002) stated that food security means access to adequate amount of nutritious food for all at all times. This means that when people do not have access to adequate amount of nutritious food, they are malnourished or undernourished and hence such a situation can constitute food insecurity. Ibe (2004), Ezike and Nwoye (2004) stated that protein as one of the major components of nutritious food is being consumed in Nigeria at a level less than 10gram per caput, a level far below the FAO recommended minimum intake level of 35gram caput daily. This is a position which Onwuka *et al* (1995) and Oyejide (1988) also reported. Jachande (2002) observed that malnutrition has detrimental effects and negatively influences learning capacity, physical development in children, lower adult productivity and

consequently economic development. Hadded (2002) stated that common sense and hard empirical evidence shows that the malnourished have their ability to learn and earn impaired throughout their life time and livelihood options are severally curtailed. Also, that they are not only physiologically and physically maimed, but are economically maimed as well. It is therefore argued that since the labour force of the country or society which contributes meaningfully to the GDP are not excluded from low intake of animal protein, the attainment of food security through adequate animal protein intake and national development are mutually inclusive issues. According to Ozo (2004) insufficient intake of protein of animal origin has negative impact on the Nigerian socio-economic health and has aggravated Nigeria's classification as an underdeveloped country. It is in this realisation of the role of animal protein in human nutrition to ensure food security, that the national policy on livestock production with the objective of self-sufficiency in livestock production was formulated. Akinbile (2002) opined that lower consumption rate of animal protein in Nigeria is as a result of the cost of animal protein. Meduna (2000) attributed the low intake of animal protein in Nigeria to low production in the face of increasing human population. One important point that can be deduced from the results of these observations is that there is low intake of animal protein by Nigerians, contributing to food insecurity.

Ajayi and Tewe (1978) pointed out that much of the shortfall in animal protein intake in Nigeria could be met by revitalising some of our most popular wildlife species such as rodents a class which cane rat belongs. However, human activities has resulted in the destruction of the natural habitat of wildlife, unsustainable exploitation and other anthropogenic impacts evident in various ecological zones of Nigeria, cane rat like other wildlife is threatened with extinction. Awake (2005) stated that one of the main threats to endangered species (wildlife) is human activities. Lameed *et al* (2005), corroborating this stated that as human population increases, there is more pressure on wildlife resources with the attendant result of wildlife depletion thereby bringing some species close to extinction. From the foregoing, Ogunyemi (2005) advocated wildlife domestication as a means of resource conservation and adequate supply of animal protein. Lameed *et al* (2005) submitted that to meet the national policy on food security, wild animals should be bred in captivity and suggested cane rat as being among potential wildlife species for domestication. Akinbile (2002) contributing to the issue of supply of animal protein to ensure food security in Nigeria, submitted that glasscutter (cane rat) rearing is one of the recent urban agricultural practices that mitigate the inadequacy of animal protein in Nigerian markets and households. He therefore called for its domestication and mass production.

Meduna (2000) reported that the traditional harvesting control method of cane rat enhances protein supply to the rural communities, but argued that its domestication and production can be a means of ensuring constant supply of care rat meat. It is on the basis of the need for food security through the consumption of adequate quantity and quality of animal protein, to avoid malnourishment, and the place of cane rat in meeting these needs that this research work was conceived. This study therefore was carried out to determine the gross margin of cane rat production as an agricultural project that is worth investing in.

Analysis of gross margin is an aspect of financial analysis of an enterprise that has to do with the returns that accrue to an investment. In this case, it deals with the returns that accrue to the cane rat farmer from the sale of cane rat. It gives an indication of the profitability level or otherwise of the farms having considered both the costs of production and the returns. According to Ferguson (1972), whether a profit is made or a loss incurred can be determined by comparing price and average total cost. If price exceeds unit cost, the entrepreneur will enjoy a profit and if unit cost exceeds price, a loss must be made. On this premise, gross margin analyses were carried out to determine the status of cane rat production at medium scale in the study area.

II. MATERIALS AND METHODS

Area of Study: The geographical location of the study area is commonly referred to as South-west zone of Nigeria. It lies between latitudes 6^0 and 9^0 N of the Equator and approximately between longitudes 2^0 and 7^0 E of the Greenwich Meridian. The zone covers about 114,271km^2 which is approximately 12% of Nigeria total land area (Anamayi,2009). Agricultural sector forms the base of the overall development thrust of the zone. The "engine of growth" in the agricultural sector has traditionally been export crops such as cocoa, palm produce and rubber which have historically been the major source of government revenue and foreign exchange earnings of this agro-ecological zone.

The humidity of the zone can be divided into humid, very humid and ultra-humid regions. Generally, the humidity in the region varies between 40% in January/March to 90% in May/October. The mean annual rainfall of the zone varies between 880mm in the northern belt of Ondo, Oyo and Osun states, while in the southern belt i.e Ogun and Lagos states its 2600mm

Sampling Technique: A reconnaissance survey of the south-west zone of Nigeria was carried out to identify the locations with reasonable number of cane rat farmers. The study area was stratified along the existing political arrangements starting with the states and then the Local Government Areas. Three states (Oyo, Osun and Ogun) were randomly selected for the study. Five LGAs were randomly selected from each of the three

states to give a total of 15 LGAs. This was followed by purposive sampling of two medium scale cane rat farmers from each of the 15 LGAs who have spent at least five years in cane rat production with adequate production records. This gave a total of 10 cane rat farmers from each state and a total of 30 farmers that were sampled. Questionnaire was administered on each of the farmers. According to Anamayi (2009), farmers with cane rat holding stock of 6-10 colonies were classified as medium scale farmers. A colony is made up of one male cane rat known as Buk and four females referred to as Does.

Table 1: States and LGAs Selected for Study.

State	Local Government Areas
Oyo	Ibadan South-west, Ibadan north, Ogbomosho South, Olorunsogo and Ido
Osun	Ola-Oluwa, Iwo, Ife-east, Ilesha-west and Oshogbo
Ogun	Yewa-south, Odeda, Abeokuta-north, Ijebu-north and Abeokuta-south

Field Survey, 2016.

Data collection: The study relied on primary data collected from cane rat farmers in the study area. A formal survey approach involving the use of questionnaire providing a systematic and ordered way of obtaining precise statistical data from respondents was used. The survey consisted of visits to cane rat farmers, purposely to obtain relevant production information. Structured questionnaire was thereafter administered on the selected farmers. Data collected covered such areas as number of colonies, costs of production, output in terms of number of weaned/matured cane rat, selling price and constraints encountered in the production process. Relevant information were also obtained from few available literature on cane rat production.

Methods of Data Analyses: Data from each of the three states were analysed separately and later pooled and analysed. Data collected were subjected to simple descriptive statistic such as frequency distribution table, mean and percentage. Gross margin analysis was also employed to evaluate the efficiency of individual enterprise (cane rat production) as defined by Olukosi and Erhabor and adopted by Anamayi (2009), defined as the difference between the gross farm income (GI) and the total variable cost (TVC). It is expressed as follows;

GM = GI - TVC ..... (1)

Where;

GM = Gross Margin.
GI = Gross Income.
TVC = Total Variable Cost.

III. RESULTS AND DICUSSION

This section considered the results of the analyses of gross margin for medium scale cane rat production in the three selected states on the basis of individual farm enterprise and later on pooled data at each state level then a comparison between the states was done

Analysis of Gross Margin for Medium Scale Cane rat Production

Table 2 shows the gross margin of medium scale cane rat production in Oyo state with farm Oym_5 earning the largest total gross margin of ₦1,096,325.19 which incurred relatively lower total cost when its stock size is compared to the rest farms. Farm Oym_7 followed with a total gross margin of ₦105,792.73, and farm Oym_3 came next with a total gross margin of ₦854,954.41. Farm Oym_6 earned the lowest gross margin of ₦232,308.28. The variations in the farms' gross margins are tied to their costs of production in relation to stock sizes held.

Table 2: Gross margin for medium scale cane rat farms in Oyo State.

S/N	No. of colony	No. of cane rats	No. of cane rats sold	Total revenue (₦)	Total cost (₦)	Gross margin (₦)	Margin / Colony(₦)
Oym_1	6	222	170	850,000.00	292,323.45	557,676.55	92,946.09
Oym_2	6	222	172	860,000.00	302,919.47	557,080.53	92,846.76
Oym_3	8	296	242	1,210,000.00	355,045.59	854,954.41	106,869.30
Oym_4	6	222	177	885,000.00	307,430.60	577,569.40	96,261.57
Oym_5	10	370	307	1,535,000.00	438,674.81	1,096,325.19	109,632.52
Oym_6	10	370	310	1,550,000.00	1,317,691.72	232,308.28	23,230.83
Oym_7	10	370	308	1,540,000.00	482,072.73	1,057,927.27	105,792.73
Oym_8	8	296	246	1.230,000.00	549,752.23	680,247.77	85,030.97
Oym_9	10	370	309	1,545,000.00	699,156.88	845,843.12	84,584.31
Oym_{10}	10	370	311	1,555,000.00	1,113,677.24	441,322.76	44,132.28

Total	**84**	**3,108**	**2,552**	**12,760,000.00**	**5,858,744.72**	**6,901,255.28**	**841,494.02**
Average/ respondent	**8.4**	**310.8**	**255.2**	**1,276,000.00**	**585,874.48**	**690,125.53**	**84,149.40**
Average/ Colony	**-**	**37.0**	**30.4**	**151,904.76**	**69,746.96**	**82,157.80**	

Field Survey, 2016

From the results in Table 2, farm Oym_5 had the highest return per colony of ₦109,632.52 per year. This is followed by farms Oym_3 and Oym_7 with return of ₦106,869.30 and ₦105,792.73 per colony respectively as second and third highest return per colony earners. Farm Oym_6 recorded the least margin of ₦23,230.83 per year, while the average margin per colony per year is ₦82,169.35. The reason for the abysmal low unit return by farm Oym_6 is the very high cost of production in which the fixed cost item accounted for over 70 percent of the total cost of production with relatively low animal stock of 370 cane rats with high mortality rate that left the farm with 310 cane rats sold.

Under the medium scale cane rat Production in Osun state, the average gross margin is ₦109,568.86 per colony per annum. Farms Osm_9,Osm_{10} and Osm_5 earned total gross margins of ₦1,117,708.75, ₦1,140,142.45and ₦895,773.09 with total costs of ₦419,857.55, ₦422,291.25 and ₦359,226.91 respectively. The three farms also recorded the largest stock sales at this level of production in the state.

Table 3 shows that average margin per colony is ₦109,568.86 per year. On individual farm enterprise analysis, the result indicates that farm Osm_9 had the highest margin per colony of ₦114,014.25.

Table 3: Gross margin for medium scale cane rat farms in Osun State.

S/N	No. of Colony	No. of Cane rats	No. of Cane rats sold	Total Revenue (₦)	Total Cost (₦)	Gross Margin (₦)	Margin / Colony(₦)
Osm_1	8	296	251	1,255,000.00	369,784.40	885,215.60	110,651.95
Osm_2	7	259	218	1,090,000.00	337,987.18	752,012.82	107,430.40
Osm_3	7	259	215	1,075,000.00	338,208.51	736,791.49	105,255.93
Osm_4	6	222	187	935,000.00	270,037.19	664,962.81	110,827.14
Osm_5	8	296	251	1,255,000.00	359,226.91	895,773.09	111,971.64
Osm_6	6	222	182	910,000.00	274,112.89	635,887.11	105,981.19
Osm_7	7	259	213	1,065,000.00	337,825.21	727,174.79	103,488.11
Osm_8	8	296	247	1,235,000.00	353,866.31	881,133.69	110,141.71
Osm_9	10	370	312	1,560,000.00	419,857.55	1,140,142.45	114,014.25
Osm_{10}	10	370	308	1,540,000.00	422,291.25	1,117,708.75	111,770.88
Total	**77**	**2,849**	**2,384**	**11,920,000.00**	**3,486,197.40**	**8,436,802.60**	**1,091,533.20**
Average/ respondent	**7.7**	**284.9**	**238.4**	**1,192,000.00**	**348,619.74**	**843,680.26**	**109,153.32**
Average/colony	**-**	**37.0**	**31.0**	**154,805.19**	**45,275.29**	**109,568.86**	

Field Survey, 2016

This is followed by the earnings of farms Osm_5 and Osm_{10} with ₦111,971.64 and ₦111,770.88 per year respectively, as three topmost highest margins per colony earners. On the other hand, the lowest margin per colony of ₦103,453.54 was earned by farm Osm_7. From the result, there appears to be a fairly even distribution of income earned by the farm enterprises at this level of production in the state, while the variations noticed are attributable to either the size of stock or cost of production of each farm.

Analysis of Gross Margin for Medium Scale Cane rat Production in Ogun State.

Table 4 shows the gross margin of medium scale cane rat production in Ogun state with farm Ogm_1 earning the largest total gross margin of ₦1,186,370.07which incurred relatively lower total cost when its stock size is compared to the rest farms. Farm Ogm_3 followed with a total gross margin of ₦1,165,242.15, and farm Ogm_7 came next with a total gross margin of ₦1,156,582.08. Farm Ogm_5 earned the lowest gross margin of ₦755,527.66. The variations in the farms' gross margins are tied to their costs of production in relation to stock sizes held.

Table 4: Gross margin for medium scale cane rat farms in Ogun State.

S/N	No. of Colony	No. of Cane rats	No. of Cane rats sold	Total Revenue (₦)	Total Cost (₦)	Gross Margin (₦)	Margin / Colony (₦)
Ogm_1	10	370	313	1,565,000.00	378,629.93	1,186,370.07	118,637.00
Ogm_2	7	259	216	1,080,000.00	315,973.76	764,026.24	109,146.61
Ogm_3	10	370	314	1,570,000.00	404,757.85	1,165,242.15	116,524.22
Ogm_4	10	370	312	1,560,000.00	405,704.83	1,154,295.17	115,429.52
Ogm_5	7	259	214	1,070,000.00	314,472.34	755,527.66	107,932.52
Ogm_6	8	296	245	1,225,000.00	363,244.69	861,755.31	107,719.41
Ogm_7	10	370	313	1,565,000.00	408,417.92	1,156,582.08	115,658.21
Ogm_8	9	333	279	1,375,000.00	373,604.18	1,001,395.82	111,266.20
Ogm_9	8	296	247	1,235,000.00	349,527.84	885,472.16	110,684.02
Ogm_{10}	8	296	246	1,230,000.00	360,144.00	869,856.00	108,732.00
Total	**87**	**3,219**	**2,699**	**13,495,000.00**	**3,674,477.34**	**9,800,522.66**	**1,121,729.71**
Average/ respondent	**8.7**	**321.9**	**269.9**	**1,349,500.00**	**367,447.73**	**980,052.27**	**112,172.97**
Average/colony	**-**	**37.0**	**31.0**	**155,114.94**	**42,235.37**	**112,649.69**	

Field Survey, 2016

Under the medium scale cane rat production, result in Table 4 shows that the highest margin per colony was earned by farm Ogm_1 with ₦118,637.00. This is traceable to its low cost of production relative to other farms as reflected in their unit costs of production per year. This is followed with earnings of ₦116,242.22 per colony by farm Ogm_3 as the second highest margin earners. This farm also happens incur the second lowest production cost per colony per year. The third farm in the order of magnitude of margin earner is Ogm_7 which recorded ₦115,658.21 per year. The farm that recorded the lowest margin per colony is Ogm_6 with ₦107,719.41. This farm incurred the highest production cost per colony at this level in the state. The average margin per colony at this level stood at ₦112,649.69.

Inter-State Analysis of the Result of Gross Margins

At medium scales of production in all the states, cane rat production enterprise was profitable as indicated by the gross margins both at individual and pooled farm record levels. This is made evident from the gross margins recorded in which none is negative, though it varies from farm to farm, one level of farm holdings to another and from state to state. However, comparisons between states at this level of production scale are hereafter made.

Tables 2, 3 and 4 show the result of analyses of gross margin for cane rat production under the medium scale and results indicates that;

(i) that farm Ogm_1 from Ogun state had the highest margin of ₦118,637.00 per colony. This farm also had the lowest cost of production of ₦38,735.80 per colony across the three states selected (Tables 2,3 and 4). Farms Ogm_3, Ogm_4 and Ogm_7 follow in that order of magnitude with the margins of ₦116,242.22, ₦115,658.21 and ₦115,429.52 per colony respectively. This indicates that the farms in Ogun state at this level of production had better margin per colony than those of Oyo and Osun State. This is reflected in the average margin of ₦112,419.80 per colony in Ogun state, as against ₦109,179.25 in Osun state and ₦82,169.35 in Oyo state.

(ii) Oyo State recorded the lowest average gross margin of ₦82,157.80 per colony. This is attributed to the higher average cost of production of ₦585,874.48 as against ₦348,619.74 by Osun State and ₦367,447.73 by Ogun State (Tables 2,3 and 4). For an improvement in the profit levels of the farms especially those with unit margin lower than the average unit margin, there should be a review of costs and stock levels.

In general terms the differences in gross margin between and among states rests on:

a. Imperfect market for inputs, which according to Ferguson (1972), the physical conditions of production, the price of resources jointly determine the cost of production of a business enterprise. This revolves around imperfection in the input market. Ferguson also stated that no market has been or can be perfectly competitive. Therefore, different physical conditions of production, price differential determine cost of

production. Since cost of production taking away from revenue that accrue to an enterprise determine its margin or profit, farms that incurred high cost of production earned lower unit margins.

b. Health management of cane rat. There is an interaction between health status, local environment and the husbandry techniques in place to keep animals in captivity in a healthy and productive life (Halpin,1978). Domestication deprives wild animals of their normal unlimited and unrestricted free access to natural food items, minerals and preferred habitat. These if not adequately provided for in captivity could and does expose them to diseases (Onyeanusi and Famoyin, 2005). These could be responsible for high mortality experienced by some farms that affected their gross margins. This supported by Hill (1992) and Majiagbe and Lamorde (1997) that disease apart from unbalanced feeding constitute one major source of mortality, large scale holding of livestock and limiting factor to in many livestock enterprises. These have gone along way to support the findings of this study in which gross margins vary between states and among various farms within the states.

IV. CONCLUSION

Cane rat production is profitable in spite of the variations in the gross margins of farms within states and from one state to another. This has to do with imperfections in the market for inputs and the differences in farm sizes even among the medium scale farmers. Cane rat production could be one of the ways of solving animal protein intake deficiency, protect the species from extinction and above all contribute immensely to poverty alleviation and food security in Nigeria.

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