



## **Availability and Utilization of Crop by-products as Livestock Feeds for Small Ruminants in Khana Local Government Area, Rivers State, Nigeria**

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### **Authors' contributions**

*This work was carried out in collaboration between all authors. Author GAK designed the study, managed the analyses of the study and wrote the protocol. Authors SE supervised the work and wrote the first draft of the manuscript. Author BBO managed the literature searches and edited the manuscript. All authors read and approved the final manuscript.*

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**Case Study**

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### **ABSTRACT**

A survey was conducted to investigate the availability and utilization of crop by-products as livestock feeds for small ruminants in Khana Local Government Area of Rivers State, Nigeria. One hundred and fifty copies of structured questionnaire were administered to crop (40.00%), livestock (8.00%) and crop-livestock farmers (52.00%). The socio-economic characteristics of the respondents revealed that 54.00% and 46.00% of farmers were males and females respectively with majority (42.00%) falling within the age brackets of 35 – 44 years. Greater proportions (52.00%) were crop – livestock farmers who rear goats as their most preferred livestock. The predominant crop by-products in order of availability and utilization as livestock feeds are cassava peels, yam peels, sweet potato peels, plantain peels, banana peels, cocoyam peels, maize sievate and fried garri sievate. Their use is highly recommended because of their ready availability,

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cheapness and acceptability that can help to solve the problems of food deficits for small ruminants in the area.

*Keywords: Crop by-products; crop by-product availability; utilization; small ruminant; livestock feeds.*

## 1. INTRODUCTION

Among all the livestock that makes up the farm animals in Nigeria, ruminants, comprising sheep, goats and cattle, constitute the farm animals largely reared by farm families in the country's agricultural system. The larger proportion of these animals' population are however largely concentrated in the Northern region of the country than the Southern region [1]. This is predicated by the fact that the drier tropics or the semi-arid regions are more favourable to the ruminants. However, notwithstanding this situation, certain breeds of sheep and goats, particularly the West African Dwarf (WAD) species, are adapted to the Southern humid (South-south geo-political) zone in Rivers State of Nigeria. No breed of cattle is peculiar to the Southern humid region in Rivers State of Nigeria. The available cattle in the region were largely due to settlement of the Hausa/Fulani pastoralists, who constitute the main cattle keepers, in the region [1].

The most difficult problem in ruminant production in the tropics is the scarcity of energy and protein feedstuffs during the dry season [2]. During this period, available forage are dry, the protein content is very low, there is marked decrease in voluntary intake and digestibility and the animals lose substantial weight. This has led to the search for cheap sources of energy and protein feed stuffs to supplement the low quality forages of the dry season [2]. Furthermore, there is competition between ruminant species with humans for the utilization of cereals and cereal by-products as feed resource. This condition is further exacerbated by limitations in the availability of land and inadequate production of feeds to meet the annual requirements of animals [3].

Crop by-products are available in large quantities in the rural areas of Cross River State as potential feed resources [4]. Similarly, a variety of feed resources derived from crop harvest and processing abound in Khana Local Government Area of Rivers State which are not tapped by crop and livestock farmers.

Unfortunately, little is known about the availability of these crop by-products that can be utilized as

livestock feeds for small ruminant (sheep and goat) in the area. A number of constraints to the utilization of these feed materials may include: The lack of knowledge of where the crop by-products could be gathered in reasonable quantities for utilization by sheep and goats, the seasonality of their production, their alternative uses as composting and mulching materials by most crop farmers, the difficulty and expense of collecting, handling and storing large quantities of these bulky crop by-products and the lack of knowledge of the nutritive value of the materials as feed resources for ruminant livestock.

### 1.1 Objectives of the study

The broad objective of this study is to provide information on the availability and utilization of crop by-products as livestock feeds for small ruminants in Khana Local Government Area, Rivers State, Nigeria. The specific objectives are:

1. To identify the predominant crop by-products available and utilized as small ruminant feeds in Khana Local Government Area of Rivers State, Nigeria.
2. To ascertain the factors that may militate against or favour their utilization in Khana Local Government Area of Rivers State, Nigeria.

## 2. MATERIALS AND METHODS

### 2.1 Research Design

A survey was conducted to investigate the availability and utilization of crop by-products as feed resources for Small Ruminants in Khana Local Government Area of Rivers State, Nigeria.

### 2.2 Population and Location of Study Area

The population of the study includes livestock farmers, crop farmers and crop-livestock farmers who reside in ten (10) villages: Okwale, Sogho, Kaani, Taabaa, Loo-re, Luebe, Wiiyaakara, Eeke, Luawii and Zaakpor were randomly selected among the villages within Khana Local Government Area of Rivers State, in the South-south geo-political zone of Nigeria. Maps showing the location of the study areas during the conduct of the survey are presented in Figs. 1 and 2.

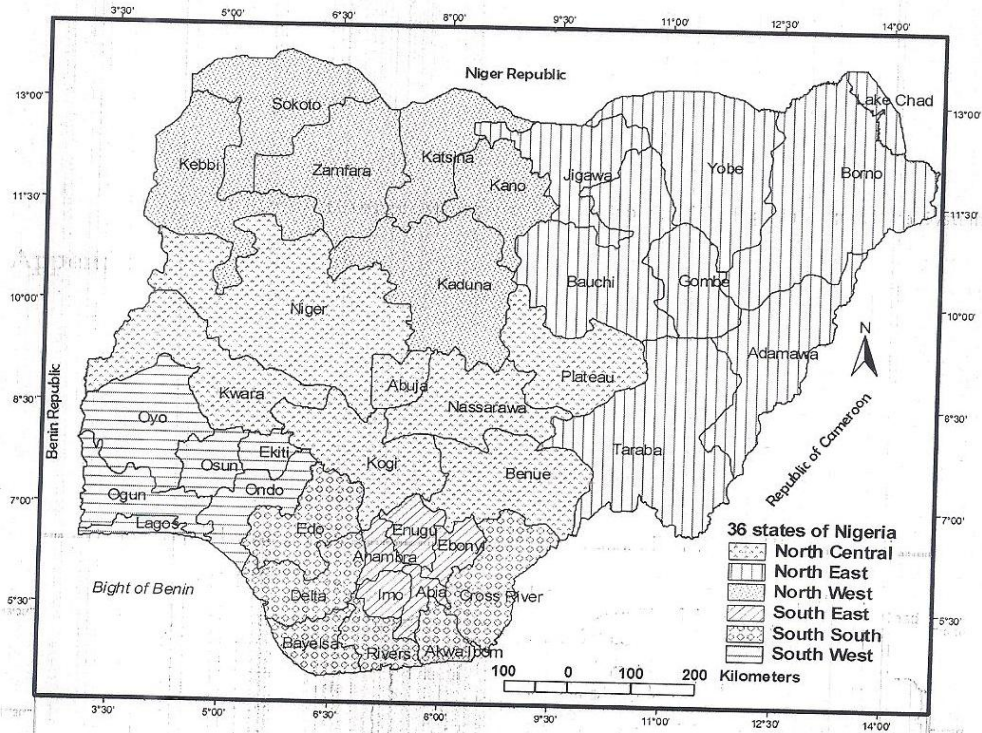


Fig. 1. Map of Nigeria showing the South-south geo-political zone and the location of Rivers State

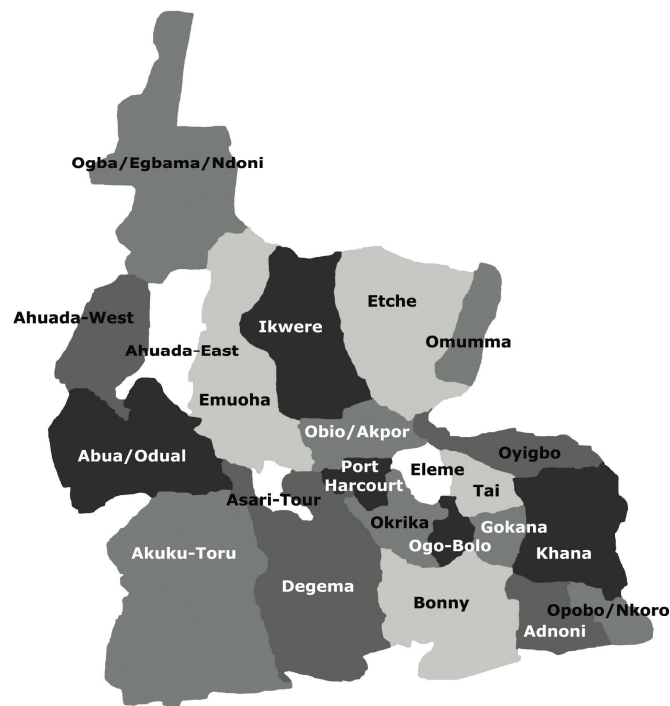


Fig. 2. Map of Rivers State showing the location of Khana Local Government Area

### **2.3 Study Sample and Sampling Technique**

A total of one hundred and fifty (150) farmers within the villages and categories of farmers described above were selected as sample size for the study. Fifteen (15) persons each per village were selected at random. It was from this population that inferences on the study for the entire Khana Local Government Area, Nigeria were drawn.

### **2.4 Methods of Data Collection**

Primary data for this study was collected from different categories of farmers (crop, livestock and crop-livestock). The instrument used for data collection was a structured questionnaire. This instrument was designed and distributed to the different categories of farmers. Section A of the research instrument provided information on the Socio-economic characteristics of the farmers. Section B provided information on the food crops and crop by-products available and utilized in Khana Local Government Area. Section C provided information on the scope of farm animal husbandry in the area.

### **2.5 Data Analysis**

Data for this study were analysed mainly through the use of descriptive statistics such as frequency distribution tables and percentages.

## **3. RESULTS AND DISCUSSION**

### **3.1 Socio-economic Characteristics of the Farmers**

Table 1, revealed that a greater proportion of persons in the various categories of the farmers outlined were males (54.00%) as against females (46.00%). This is in agreement with the fact that in the rural areas, farmers exercise a stricter gender division of labour, where men owned and controlled all land and property and women engaged in additional burden of household work. This situation makes men to be more engaged in agriculture than women. Out of these farmers engaged in this study, the highest numbers (42.00%) of respondents were within the age brackets of 35 – 44 years. This was within the age range reported by [5] for farmers engaged in small ruminant livestock production. Similarly, the farming population interviewed during this investigation comprised of 2.00% illiterates and

98.00% literates. This literate farmers can at least read and write. It therefore, implies that the promotion of increased productivity of crops and/or livestock will be enhanced with the intervention of extension agents that can bring about better innovations and improve productivity [4]. Majority of the farmers (52.00%) were involved in crop - livestock farming, while 40.00% and 8.00% of the farmers were engaged in crop farming and livestock farming alone respectively. It is important to note that, the involvement of farmers in crop-livestock farming within the study area will be a better innovation, since crop–livestock integration is a common and efficient pathway for intensification of agriculture in developing countries, especially in the tropical semi-arid and sub-humid environments [6]. This is also in support of reports by some workers that in recent times resource-poor farmers are adopting and improving crop–livestock systems as they see clear benefits from food–feed crops which provide humans with food, secure livestock feed as well as manure and draft power. Farmers also in addition can obtain cash income to purchase farm inputs as well as carter for household expenses (food, health, education, etc.) [7]. The system will also provide insurance during times of crisis and uncertainty to farmers [7].

The investigation of farming systems in Khana Local Government Area revealed that small scale farmers (58.00%) were more than large scale farmers (42.00%). This percentage reported for small scale farmers in this study is lower than that (80%) reported by [8] as the population of farmers involved in small scale or subsistent farming in Nigeria.

### **3.2 Food Crops and Crop by-products Availability and Utilization in Khana Local Government Area**

Table 2 represents the food crops and crop by-products available and utilized in Khana Local Government Area. The crops cultivated/harvested in this area in the order of decreasing percentages were yam > cassava > maize > cocoyam > sweet potato > rice > groundnut. These crops represent the list of some staple food crops cultivated in the South-south region of Nigeria [9]. Majority of these crops (61.84%) were cultivated within the months of February – April, while others: 9.21%, 17.11% and 11.84%, were within the months of May – July, August – October and November – December respectively. These months were divided

basically into two seasons (rainy and dry) of which the rainy season depicts the peak periods for the cultivation of these crops [10]. Further response from the farmers revealed that some of the crops were cultivated either once (70.00%), twice (22.00%) or thrice (8.00%) in the year [10]. The food crops harvested in the order of decreasing percentages were: maize > cassava tuber > yam tuber > sweet potato > plantain > coco yam. The finished products derived from these crops were: 'fufu' > garri > 'tapioca' > 'agidi' > cassava flour > corn meal. This is in agreement with reports by [9] on finished products derived from some staple food crops grown in Nigeria. Similarly, the crop by-products derived in the order of the responses reported by the respondents were: maize sievate > cassava sievate > fried garrisievate > peels derived from yam, cassava, plantain and sweet potato > corn cobs.

Some of these materials have been reported as readily available and cheap sources of feed stuffs recommended for inclusion as feed ingredients for both ruminants and monogastrics in Nigeria [11,12] and Ghana [13]. Furthermore, 34.65% of the respondents reported that these materials could be used in feeding their livestock, while 21.78%, 29.70% and 13.86%, reported that they could be gathered and used as mulch materials in the soil during crop farming, thrown away as waste and in some cases used as food sources for humans as could be observed for

yam peels used in the production of a Yoruba meal called 'amala' respectively. Consequently, the high percentage recorded for the use of crop by-products as feed stuffs may be attributed to their availability at almost no cost to the farmer, their low costs which can help to decrease feeding cost during the dry season as well as their little food value to man which reduces competition for the products with farm animals [12,14].

### 3.3 Scope of Farm Animal Husbandry in Khana Local Government Areas of Rivers State

Table 3 shows the scope of farm animal husbandry in Khana Local Government Areas of Rivers State. Out of the respondents interviewed during the study, 82.00% keep livestock, while 18.00% do not keep livestock. Consequently, the types of livestock kept by the respondents in order of preference were goats, fowl, sheep, pigs, ducks and cattle. The high percentage (46.59%) of goat keepers recorded in the study is in agreement with the reports by [15] which during a survey in South Western Nigeria indicated that over 70% of the rural households in some villages keep goats. The study further revealed that a greater proportion (59.34%) of the keepers of these livestock manage them in mixed populations, while 40.66% keep them in single populations. Similarly, 72.00% of them

**Table 1. Socio-economic characteristics of the respondents (farmers) (N = 150)**

Variables	Response	Frequency	Percentage
Sex	Male	81	54.00
	Female	69	46.00
	Total	150	100.00
Age	Below 24 years	12	8.00
	25 – 34 years	42	28.00
	35 – 44 years	63	42.00
	45 years and above	33	22.00
	Total	150	100.00
Education	Illiterate	3	2.00
	Literate	147	98.00
	Total	150	100.00
Type of farming	Crop farming	60	40.00
	Livestock farming	12	8.00
	Crop/Livestock farming	78	52.00
	Total	150	100.00
Scale of farming	Small	87	58.00
	Large	63	42.00
	Total	150	100.00

Field Survey, 2014

**Table 2. Food crops and crop by-products availability and utilization in Khana Local Government Area**

<b>Criterion</b>	<b>Response</b>	<b>No. of respondents</b>	<b>Percentage</b>
Crop harvested	Yam	135	29.61
	Maize	117	25.66
	Sweet potato	15	3.29
	Cocoyam	57	12.50
	Rice	0	0.00
	Groundnut	0	0.00
	Cassava	132	28.95
	Total	456	100.00
Month of year crop cultivated	Feb – April	141	61.84
	May – July	21	9.21
	Aug – Oct	39	17.11
	Nov – Dec	27	11.84
	Total	228	100.00
Season of year crop cultivated	Rainy season	81	54.00
	Dry season	69	46.00
	Total	150	100.00
Number of times crops are grown	One time a year	105	70.00
	Two times a year	33	22.00
	Three times a year	12	8.00
	Total	150	100.00
Farm products harvested	Sweet potato tuber	69	15.27
	Yam tuber	98	21.68
	Cassava tuber	102	22.57
	Maize	129	28.54
	Plantain	54	11.95
	Ground nut	0	0.00
	Rice	0	0.00
	Total	452	100.00
Finished products derived	Garri	126	32.31
	Fufu	129	33.08
	Tapioca	78	20.00
	Corn meal	9	2.31
	Agidi	21	5.38
	Cassava flour	21	5.38
	Corn flour	6	1.54
	Total	390	100.00
Crop by-products derived	Peels	60	20.83
	Cobs	9	3.13
	Maize sievate	81	28.13
	Cassava sievate	78	27.08
	Fried garrisievate	60	20.83
	Total	288	100.00
Utilization of crop by-products	For animal feeding	105	34.65
	As mulching material in soil	66	21.78
	Thrown away as waste	90	29.70
	As human feed	42	13.86
	Total	303	100.00

*Field Survey, 2014*

reported that they were sole owners of their farm animals, whereas 28.00% own them on contractual agreement basis. Sole ownership here implies that they had probably purchased

these animals from both neighbouring local markets and government farms or received them as gifts [16]. The utilization of feed stuffs by the respondents in order of greatest use in feeding

their animals especially goats and sheep within their households were yam peels, cassava peels, cassava leaf, plantain peels, grass, fried garri sievate, cocoyam peels, maize sievate, sweet potato peels, banana peels and sweet potato leaf. The greater use of these crop by-products in the order stated above may be attributed to their ready availability and cheapness. Similarly, [17] has reported cassava peels, yam peels, banana peels and maize fermented wastes as most

commonly fed household wastes to sheep and goats in Ogun State, Nigeria. It was further reported that these crop by-products are not sufficient (82.00%) in terms of nutrient supplies, thus small ruminant farmers rely on the use of alternative sources. These feed sources in order of increasing percentages are: 12.36%, 22.47%, 32.58% and 32.58% for commercial feeds, garri, cassava and yam tubers respectively.

**Table 3. Scope of farm animal husbandry in selected villages in Khana Local Government Areas of Rivers State**

Criterion	Response	No. of respondents	Percentage
Keeping of livestock	Yes	123	82.00
	No	27	18.00
	Total	150	100.00
Type of farm animal kept	Goat	123	46.59
	Sheep	24	9.09
	Fowl	75	28.41
	Duck	18	6.82
	Pig	24	9.09
	Cattle	0	0.00
	Total	264	100.00
Keeps farm animals in mixed population	Yes	89	59.34
	No	61	40.66
	Total	150	100.00
Mode of ownership of farm animals	Sole ownership	108	72.00
	Borrowed/care taking	42	28.00
	Total	150	100.00
Materials used to feed the farm animals	Cassava peel	69	18.50
	Yam peel	81	21.71
	Sweet potato peel	6	1.61
	Maze sievate	15	4.02
	Plantain peel	57	15.28
	Banana peel	2	0.54
	Cocoyam peel	15	4.21
	Fried garrisievate	30	8.04
	Grass	38	10.19
	Cassava leaf	60	16.09
	Sweet potato leaf	0	0.00
Total	373	100.00	
Are these feed materials sufficient?	Yes	27	28.00
	No	123	82.00
	Total	150	100.00
Alternative feed sources used	Commercial feed	33	12.36
	'Garri'	60	22.47
	Yam tuber	87	32.58
	Cassava tuber	87	32.58
	Total	267	100.00

Field Survey, 2014

#### 4. CONCLUSION AND RECOMMENDATIONS

Crop by-products abound in Khana Local Government Area of Rivers State. This study revealed that they could be utilized as valuable livestock feeds for small ruminants such as goats as reported in this investigation. Goats in this study have been observed to be one of the valuable livestock raised by small-holder livestock keepers within the area.

The predominant crop by-products in their order of availability and utilization in this area by small ruminants (especially goats) are the cassava peels, yam peels, sweet potato peels, plantain peels, banana peels, cocoyam peels, maize sievate and fried garri sievate.

The use of these crop by-products is highly recommended in the study area because:

1. They are readily available and cheap within the reach of crop-livestock farmers.
2. They are readily acceptable by small ruminants in the area.
3. They can help to solve the problems of food deficits for small ruminants especially goats in the area.

#### COMPETING INTERESTS

Authors have declared that no competing interests exist.

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