Availability and estimation of crop by-product yields for small ruminant production in Cross River State, Nigeria

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Abstract

A study was carried out in some Local Government Areas of Cross River State of Nigeria to identify and ascertain the availability, level of production and the yields of crop by-products derived from commonly cultivated crops that can serve as feed for small ruminants. The results show that the various staple crops commonly grown in Cross River State produce the following crop by-products in a decreasing order of yields- cassava peels> yam peels> corn cobs> maize sheaths> plantain peels> maize offal> rice offal> cassava sievets> banana peels> fried garri sievets> groundnut haulms> sweet potato peels. The annual yield of crop by-products per Local Government Area is estimated as follows: cassava peels 89,226.40, yam peels 32,318.80, maize sheaths and offal 358,050.00, rice offal 37,140.00, cowpea haulms 34,064.00, groundnut haulms 41,872.00, banana peels and rejects 18,420.00, plantain peels 7,598.40, cocoyam peels 11,944.00, sweet potato peels and rejects 8,024.00 tonnes per selected LGA. The total amount of crop by-products (638,657.60 tonnes) generated each year from the staple food crops will go a long way in solving the problem of feed scarcity for ruminants during dry season.

Key words: crop by-products, dry season feeding, small ruminants.

Introduction

One of the most difficult problems in ruminant production in the tropics is the dry season feeding of ruminant animals. During this period, there is, generally, scarcity of green fodder. The roughages are usually dry, deficient in protein and energy content. There is a marked decrease in voluntary intake and digestibility. Consequently, the animals lose substantial weight. This has been the situation in Cross River State every year. In some more advanced countries like Brazil, with a similar tropical condition, this problem of scarcity is well managed by harnessing the agro by-products to feed ruminants at lean period (Devendra, 1989, Devendra and Seville, 2002, Williams *et al* 1997, Henning *et al* ;

2006).

In Nigeria, millions of tonnes of crop by-products are generated every year in our rural communities as unavoidable crop by-products or residues. These constitute waste and a nuisance to the environment if they are not properly disposed. However, their use in feeding ruminants will not only solve the problem of environmental pollution but also will provide the population with the much needed meat and milk.

There is limited information on the availability, quantity, quality and utilization of the locally produced wide range of crop by-products by small-holder goat farmers in Cross River State. Furthermore, the demand for conventional sources of proteins has exceeded supply. Consequently, wastes generated from

harvesting and processing of staple food crops may serve as useful alternatives to conventional protein feed sources. The objective of this paper, therefore, is to estimate the quantity of crop by-products produced in Cross River State which could be harnessed for dry season feeding of ruminants.

Materials and Methods

The information on the values of crop yields and farm animal population were obtained from farmers by means of questionnaire administered randomly to selected farmers representing the selected Local Government Areas of Cross River State in the three senatorial districts. Two (2) Local Government Areas each were selected from these senatorial districts and four (4) villages each making a total of twenty-four (24) villages were randomly selected for the study.

The study was carried out through the use of structured questionnaires. A total of three hundred and sixty (360) questionnaires were used for the study and they were randomly distributed to household of fifteen (15) per village. The questionnaires were distributed to the farmers while they were on the field or at home. A hundred percent recovery rate of the questionnaires was achieved owing to the aggressive follow up of the respondents. Relevant information was collected through these questionnaires and where difficulties were encountered by the respondents, direct interviews were adopted. Completed questionnaires were retrieved and analyzed through descriptive statistics using simple percentages and the results were presented in tables.

The yield of crop by-products was estimated from the target crops using multipliers formulated by El-Wouby 1991 and Rosillo-Calle, *et al.* (2008). The authors

established the following values as residue production coefficient (or multipliers) on air dry basis for some crops. The values are 4, 1.3 to 3, 1.0, 0.55, 0.4 and 0.3 for beans, cereals, vegetables and melons, sugar cane, root and tubers and sugar beet respectively.

Results and Discussions

The summary of the food crops and associated finished products produced within the selected Local Government of Cross River State is shown in Table 1. The crops cultivated through mono and mixed cropping systems in the order of decreasing percentages include yam > maize > cassava > plantain > cocoyam > banana > groundnut > rice > benniseed > sweet potato > cowpea > sorghum > millet. These crops represent the list of some staple food crops cultivated in the South-South Region of Nigeria. Majority of these crops (80.06%) were cultivated within the months of February and April, while others : 13.10%, 4.76% and 2.08% were within the months of May-July, August-October and November-December respectively.

The food crops harvested in the order of decreasing percentages were as follows: Cassava tuber > maize > yam tuber > plantain > cocoyam > banana > sweet potato > rice. The finished products derived from these crops were garri > fufu > corn meal > tapioca > agidi > cassava flour > cassava chips > groundnut cake > local brewed beer (brukutu) > groundnut oil.

Table 2 shows the total yield of the various crops in the selected Local Government Areas of Cross River State as well as the total quantity of land required to produce each of these crops.

It revealed that cassava recorded the highest yield (4460.70 tonnes) with a total land equivalence of 109.012 hectares, while cocoa recorded the least yield (61.5 tonnes) with a total land equivalence of 3.003

Table1: Food crops and associated finished product produced in the selected LGA (Local Government Area) of Cross River State

Criterion	Response	No. of respondents	Percentage
Cropping system adopted	Mono cropping	60	32.6
	Mixed cropping	124	67.4
	Total	184	100
Crops cultivated	Yam	129	21.11
	Maize	110	18.00
	sweet potato	19	3.11
	Cocoyam	45	7.36
	Rice	29	4.75
	Groundnut	42	6.87
	Cassava	94	15.38
	Cowpea	12	1.96
	Benniseed	21	3.44
	Millet	0	0.00
	Sorghum	5	0.82
	Plantain	61	9.98
	Banana	44	7.20
	Total	611	100.00
Months of the year cultivated	Feb.-April	269	80.00
	May- July	44	13.10
	August – October	16	4.76
	Nov. – Dec.	7	2.08
Total		336	100

hectares.

Table 3 shows the estimated values of crop residues obtained from the yield of each crop using crop residue coefficients or multipliers (Kossila 1986, EL-Nouby

1991, Rosillo-Calle *et al.*, 2008). The rankings revealed that higher crop residues or by-products were generated from the first four crops: maize, cassava, groundnut and rice. The order of ranking in decreasing

Table 2: Estimated total crop yields and associated land equivalence in the Local Government Areas investigated in Cross River State

Parameters	CSV	YM	MZ	RE	COWP	GRDN	BA	PLT	CCY	BNS	COC	SWP	Total
Total yield (tonnes)	4460.7	807.9	1193.5	247.6	85.2	104.7	460.5	189.9	298.6	79.8	61.5	200.6	8190.5
Total land (hectare)	109.0	39.5	58.3	12.1	4.2	5.1	22.5	9.3	14.6	3.9	3.0	9.8	291.3
Average land per LGA (hec.)	18.2	6.6	9.7	2.0	0.7	0.9	3.8	1.6	2.4	0.6	0.5	1.6	

CSV=cassava; YM=yam; MZ=maize; RE=rice; COWP=cowpea; GRDN=groundnut; BA=banana; PLT=plantain; CCY=cocoyam; BNS=benniseed; COC=cocoa; SWP=sweet potato.

yield was maize > cassava > groundnut > rice > cowpea > yam > banana > cocoyam > sweet potato > plantain.

The crop by-products used in livestock feeding in order of decreasing importance as responded by livestock farmers include cassava peels > yam peels > corn cobs > maize sheath > plantain peels > maize offal > rice offal > cassava sievets > banana peels > fried gari sievets > groundnut haulms > sweet potato peels.

These material have been reported as readily available and cheap sources of feedstuffs for both ruminants and non-ruminants in Nigeria (Oyenuga, 1978; Tewe and Kasali, 1986; Farrell *et al.*, 2000; Idowu *et al.*, 2005; Olurunmisomo *et al.*, 2005; Dawang, 2006) and Ghana (Tuah *et al.*, 1994).

The higher quantity of crop residues and by-products recorded by cassava and maize from the study may be attributed to higher

rate of production of the two crops, and the variety of residues or by-products generated from either of the crops- peels, sievets from cassava tubers and cobs, offal, and sheath from maize.

The quantity of crop by-products produced annually in Cross River State is so large that if it is not utilized for animal feed or farm yard manure may constitute environmental hazard in the State.

Table 4 shows the estimates of farm animal population in a single and mixed herd owned by farmers in different households in the study area. The information from this table showed that the 80 farmers who kept their farm animals in single population keep average of 3.04 (approximately 3) goats, 1.59 (approximately 2) sheep, 2.11 (approximately 2) fowls with little or no numbers of duck, pig and cattle by approximation.

Table 3: Yields of crop by-products estimated from crop yields

Crop	Total crop yield (tonnes)	Crop residues production coefficient or multipliers	Potential residue and by-product yield (tonnes)	Ranking
Cassava	4460.7	0.4*	1784.3	2
Yam	807.9	0.4*	323.2	6
Maize	1193.5	3.0**	3580.5	1
Rice	247.6	1.5**	371.4	4
Cowpea	85.2	4.0*	340.8	5
Groundnut	104.7	4.0*	418.8	3
Banana	460.5	0.4*	184.2	7
Plantain	189.9	0.4*	75.9	10
Cocoyam	298.6	0.4*	119.4	8
Benniseed	79.8	nil	Nil	nil
Cocoa	61.5	nil	Nil	nil
Sweet potato	200.6	0.4*	80.2	9
Total	8190.5		7278	

Assumptions: *crop residue coefficients or multiplier (tuber and root crops) adopted from Rosillo-Calle *et al.* (2008);

crop residue coefficients or multipliers (cereals) adopted from EL-Nouby (1991); *crop residue coefficients or multipliers (oil seed and pulses) adopted from Kossila (1986). Potential crop residues or by-product yield = total crop yield x crop residue coefficient multipliers.

Table 4: Estimates of farm animal population in a single and mixed herd owned by farm Household in the Local Government Area of Cross River State investigated

Criterion	Total No. of respondents	Farm animal	Animal population	Average animal population per household*	%
Single farm animal population	80	Goat	243	3.04	44.1
		Sheep	127	1.59	23.0
		fowl	169	2.11	30.6
		Duck	12	0.15	2.2
		pig	0	0.0	0.0
		cattle	1	0.01	0.1
		Total	552	6.9	100
Mixed farm animal population	96	Goat	881	9.18	41.6
		sheep	469	4.89	22.2
		fowl	610	6.35	28.8
		Duck	91	0.95	4.3
		pig	34	0.35	1.6
		cattle	32	0.33	1.5
		Total	2117	22.05	100

*average animal population per household = Animal population / Total respondents

It is concluded that the quantity of crop by-products generated in the State is sufficient to sustain dry season feeding of small ruminants. This will ensure unretarded growth, reproduction, milk and carcass yield which, on the other hand, are the usual occurrence during dry season when green forage is scarce.

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Received: 20th November, 2010

Accepted: 18th July, 2013