

## Information Flow among Cassava Processors and Goat Keepers in an Integrated Farming System in Ogun State, Southwest Nigeria

A. A. Shobowale<sup>1</sup>, O. J. Ladebo<sup>1</sup>, K. Adebayo<sup>1</sup>, S. O. Iposu<sup>2</sup> and A. K. Aromolaran<sup>1</sup>

<sup>1</sup>*Department of Agricultural Extension and Rural Development, <sup>2</sup>Department of Animal Production and Health Production, Federal University of Agriculture, Abeokuta, P.M.B. 2240, Ogun State, Nigeria*

**KEYWORDS** Cassava Processing. Goats Keeping. Information Flow. Information Source. Integrated Farming

**ABSTRACT** This study explored the flow of information in the integrated cassava processing-goat keeping farming systems in Ogun State, Nigeria. A multi-sampling technique was used to select a sample of 160 cassava processors and 80 goat-keepers. Data were collected using an interview guide and analyzed using descriptive and inferential statistics. The results showed that respondents sourced agricultural information from multiple sources. Friends and fellow farmers are prominent information sources of the cassava processors (79.2%). Goat keepers obtain information from radio, OGADEP (68%) and extension agents (66%). The pattern of information flow among farmers is multidimensional, an indication that information flows in many directions: top-down as well as horizontally. The main constraint to information flow was poor interaction between village extension agents and farmers. It is recommended that extension managers should design effective communication strategies on dissemination of information in ways that promote multi-dimensional interactions amongst stakeholders in the target value chain.

### INTRODUCTION

Cassava plant is a short lived erect perennial shrub that regenerates vegetatively from hard wood stem cuttings and produces enlarged tuberous roots (Rajeshwarisivaraj et al. 2001). There are over 100 cultivars and variation in the form of the plant. The height ranges from about 1 to 3m or more. The crop is about the most important in Africa, serving as a source of staple food reserve and income, especially in the drought-prone areas. It tolerates poor soils and has the ability to survive and recover rapidly from damage, diseases, insect pests and animals. The roots are rich in carbohydrates and the leaves are good sources of protein. Research show that the protein value of cassava leaves is equal to that of eggs, therefore, a combination of the roots and leaves can offer a balanced diet (Babalaye 2001).

*Address for correspondence:*

A. A. Shobowale  
Department of Agricultural Extension and Rural Development,  
Federal University of Agriculture, Abeokuta,  
P.M.B. 2240, Ogun State, Nigeria  
Telephone: 08062456382  
E-mail: jokkyfun@yahoo.com

Nigeria is currently a world leading producer of cassava (*Manihot esculenta*), producing about 40 million metric tonne per annum (International Conference on Agrarian Reform and Rural Development 2006). Cassava roots are used in various forms, such as *gari*, *pupuru* (a smoked, ball moulded fermented cassava dough), *fufu*, *lafun*, starch, baking flour, chips and tapioca that generate a higher income as value-added cassava products. Industrially, cassava is processed into edible starch, cold water starch for textile finishing and home laundry, glues and adhesives and in the manufacture of drugs and paints (Lasekan et al. 2004; Chinaka et al. 2003). In Nigeria, it is traditionally consumed by processing the fresh roots into *gari*, *fufu* and *lafun* (Adebayo et al. 2003a; Adebayo 2003b).

Cassava has wastes such as foliage (leaves), peels and chaff that can be fed to livestock. Cassava peel is produced from processing cassava (Rajeshwarisivaraj et al. 2001). It constitutes approximately 11 percent of the dry weight of the root and its annual production is about 3.6 million tonnes and the peels when collected was about 400,000 tonnes dry matter basis. This would be available annually for livestock feeding (Baah et al. 1999) if properly channeled. A

major benefit from using the cassava peels as livestock feed in Nigeria is the availability throughout the year. Large quantities of cassava peels produced daily from the activities of cassava processors turn out to be huge cassava peel wastes that are dumped and burned most of the times. These cassava peels have potentials that are of benefit to both cassava possessors and goat keepers. Excess cassava peels could be used as supplement in the feeding of goats while dry, and sale of it could serve as source of income for cassava processors. Supplementary feeding is a common strategy for increased supply of dietary protein for ruminants. An intensive feeding system based on locally available by-products as feedstuff is a promising feeding system to rear ruminants economically (Aregheore 2000).

For cassava processors and goat keepers to be aware about innovations for their activities and then accept them, an understanding of the way information flows through the farming system is important. This can then be used to identify appropriate communication channels and strategies for disseminating the innovations among the target audience. Feeding cassava peels to goats as supplementary feed has neither been widely adopted nor commercialized. This may be due to lack of information about its nutritional composition that may meet goats' requirement for growth and maintenance. In addition, many goat keepers have not explored the processes of adding value to the cassava peels fed to goats through drying. It is therefore necessary that information is needed to enlighten goat keepers on benefit of supplemental feeding; and cassava processors on the environmental effects of dumping and burning of peels as well as the economic benefit they could derive from the sale of the dried peels.

Thus, this study examined the various information flows that exist between disseminators of agricultural technologies, cassava processors and goat keepers. The study was guided by the following specific objectives which are to:

#### **Objectives of the Study**

1. Describe of the socio-economic characteristics of cassava processors and goat-keepers.
2. Identify the major sources of information to cassava processors and goat keepers.
3. Assess the awareness of goat keepers about the use of dried cassava peels as a

supplement for feeding goats and technology involved.

4. Examine the information flow in cassava processing/goat keeping of integrated farming systems.

It was hypothesized that there is no significant relationship between personal characteristics of goat keepers and their awareness of using cassava peels as supplements for feeding goats.

## **METHODOLOGY**

### **Study Area**

The study was carried out in Ogun State, which is located in the Southwest agro-ecological region of Nigeria. Ogun State is composed of 20 local government areas. The State has an Agricultural Development Programme known as Ogun State Agricultural Development Programme (OGADEP) where extension agents serve to disseminate information from research institutes through media, face-to-face, and/or group methods to the farmers. The programme conducts training on processing and utilization of unfermented cassava flour used in baking bread and producing confectioneries. For ease of administration in the agricultural sector, the state is divided into four operational zones comprising Abeokuta, Ilaro, Ijebu-Ode and Ikenne, covering the 20 Local Government Areas of the State.

### **Sampling Procedure and Sample Size**

The population for the study consisted of cassava processors who were involved in the processing of cassava into various products and drying of cassava peels, and the goat keepers who were involved in keeping goats and feeding them with dried cassava peels. The four zones of the State ADP were used for this study. From each zone, one local government area was selected using simple random sampling method. Four villages were selected from each of the selected LGAs to give a total of 16 villages using purposive sampling techniques. Ten cassava processors and five goat-keepers were selected from each of the villages using purposive sampling techniques. This gave a total of 160 cassava processors and 80 goat-keepers. An interview schedule was used to elicit information from the cassava processors and goat keepers in the study area.

## Data Analysis

Descriptive statistics involving the use of frequencies, percentage, mean were used to present the data in tables and charts. Chi-square analysis were used to ascertain for any association between personal characteristics of goat keepers and their awareness of using cassava peels as supplements for feeding goats.

## RESULTS AND DISCUSSION

### Personal Characteristics of the Respondents

Table 1 focused on the socioeconomic characteristics of the respondents. It revealed that the mean age of the cassava processors was 45.7 years while that of goat keepers was 46.0 years. This shows that these people are in their

active age and tend to seek for more information that will boost their productivity; hence they will be productive in their cassava processing activities (Amao et al. 2007; Ayoade and Adeola 2009; Oluwemimo 2010). Table 1 also shows that most (70.3%) of the cassava processors were female and 56 percent of the goat keeper were male while 44 percent were female. This implies that there more female in cassava processing but almost average proportion of the goat keepers were male and female. The mean income of the cassava processor was ₦49, 399.01 while that of goat keepers ₦50, 960.00. The low mean income made by the cassava processors, when compared with that of the goat keepers could be increased if the cassava processors could access more information on value addition to by-products such as cassava peels they can produce to generate further income. This finding is

**Table1: Socio-economics characteristics of cassava processors and goat keepers**

Characteristics	Cassava processors		Goat keepers	
	Frequency	Percentage	Frequency	Percentage
<i>Age</i>				
Less than 10	-	-	-	-
11-30	11	11.0	5	10.0
31-50	59	58.9	27	54.0
51-70	31	31.0	17	34.0
Above 70	-	-	1	2.0
Mean = 45.71years (cassava processors), 46.02 years (goat keepers)				
<i>Sex</i>				
Male	30	29.7	28	56.0
Female	71	70.3	22	44.0
<i>Income Level (₦)</i>				
1,000 -50,000	71	70.6	35	70.0
51,000-100,000	23	23.0	12	24.0
101,000-150,000	1	1.0	1	2.0
151,000-200,000	5	5.0	1	2.0
Above 200,000	1	1.0	1	2.0
Mean = ₦49399.01 (cassava processors), ₦50,960.00 (goat keepers)				
<i>Educational Level</i>				
No formal education	21	20.8	13	26.0
Adult education	5	5.0	5	10.0
Primary education	42	41.6	16	32.0
Secondary education	25	24.8	9	18.0
Tertiary education	8	7.9	7	14.0
<i>Years of Experience</i>				
1-10	41	40.8	25	50.0
11-20	36	35.6	12	24.0
21-30	15	14.9	4	8.0
31-40	6	6.0	7	14.0
41-50	3	3.0	2	4.0

Mean = 16.30 years (cassava processors), 16.32 years (goat keepers)

Source: Field survey, 2010

in line with the findings of Oluwemimo (2010) that the respondents' level of income is below fifty thousand Naira (₦50, 000) per annum.

Some (32%) of the goat keepers had primary school education while 41.6 percent of the cassava processors also had primary school education. This indicates that the respondents could read and write which was necessary in order to be able to obtain and interpret useful agricultural information from print media. This will enable them to accept new innovations. This is in line with the work of Agbamu (2006) that formal education usually aids farmers and leads them to accept new farm technologies more readily to enhance their income than those farmers without a formal education. This result also agrees with the findings of Onditi et al. (2007) that majority of goat keepers had primary education as their highest level of education. Their mean year of experience was 16.32 years. This indicates that both the goat keepers and cassava processors had more than fifteen years of experience which could also enhance the seeking and the flow of information among the respondents. This experience helps them to be knowledgeable about the advantages and disadvantages in their business in order to be able to manage the risks and uncertainties in the business considering information available to them.

### Sources of Information of the Respondents

Table 2 shows that most (79.2% ) of the cassava processors obtained information from their

friends/fellow farmers while more than fifty percent obtained their information from government extension agents, radio and contact farmers. Only 9.9 percent obtain information from research institutes and 73.3 percent of the processors obtain information from Ogun State Agricultural Development Programme (OGADEP). This implies that information flows more easily among fellow and friends probably because of their homogeneous characteristics. Also, extension agents and OGADEP are used most often to source information; this is probably because dissemination of agricultural information is their primary and traditional function (Apantaku and Enitan 2006).

Conversely, Table 2 shows that 68 percent of the goat keepers use both radio and OGADEP as their sources of information, while 66 percent and 64 percent obtain information from Government Extension Agents and Non-Governmental Organization respectively. The use of radio may be, because they use it daily for the purposes of news and entertainment, this is in line with the work of Agbamu (2006) that says farmers in Ogun State used radio often probably because the Ogun State Agricultural Development Programme (OGADEP) produces a weekly Yoruba language farm radio programme called 'Agbe Afokosoro' while NGOs may be, because of the contact they have with the organization especially during dissemination of the technologies. The use of OGADEP and extension agents may be, because dissemination of agricultural information is their primary and traditional function (Apantaku and Enitan 2006).

**Table 2: Sources of information of cassava processors and goat keepers**

<i>Sources of information</i>	<i>Cassava processors</i>		<i>Goat keepers</i>	
	<i>Frequency</i>	<i>Percentage</i>	<i>Frequency</i>	<i>Percentage</i>
Staff of NGO	50	49.5	32	64
Government Extension Agents	60	59.4	33	66
Research Institute	10	9.9	14	28
Radio	54	53.5	34	68
Television	29	28.7	17	34
Posters	28	27.7	9	18
Newspaper	7	6.9	3	6
Magazines/Bulletin	10	9.9	7	14
Friends/Fellow farmers	79	79.2	28	56
Co-operative Societies	29	28.7	9	18
Group Meetings	52	51.2	20	40
Contact farmers	51	50.5	26	52
Agricultural shows	18	17.8	5	10
OGADEP	74	73.3	34	68

*Source:* Field survey, 2010

\*Multiple Responses provided

### Awareness of the Technologies

Table 3 indicates the cassava processor's awareness of technologies. It shows that 74.3 percent of the processors were aware of the efficient concrete sun-drying platform while 25.7 percent were not, this simple technology is constructed in a form that it can easily drain water in case of rainfall so as to achieve dried cassava peel that can be acceptable to peel goat. In addition to this, 73.3 percent of cassava processors were aware of the black plastic sheet for drying while 26.7 percent were not. The black plastic sheet is spread in the sun with cassava peel and it can be easily removed. Their reason for awareness of technologies is based on the sources of information used. The various sources of information used helped in creating awareness through interaction and dissemination of innovation to the cassava processors. Those who were not aware may merely know about the existence of these technologies but lack details about them. Although, cassava processors are aware of this technology but cassava peel are still found litter everywhere mostly around cassava processing centers. This is indication that cassava processors do not apply or utilize this technology better still they did not have information on value addition to cassava peel wastes which can make it a potential source of additional income for them.

Also, 88 percent of the goat keepers were aware of using cassava peels to feed goats while 12 percent were not. Interestingly, large proportion of the goat keepers were also aware of this but this has not led to disappearance of this cassava peel which is an indication that this cassava peel are not yet readily available in the form that cassava processors which accept it to feed their goat. Supplementary livestock feeding is progressing rapidly and significant increases in

meat production are foreseen in many countries. The use of cassava peels as livestock feed is believed to be the most efficient way to meet the shortage of both free range and home-grown natural fodder and to increase efficiency in the raising of goats, milk cows, beef cattle, broilers and laying hens, and pigs. Value additions to cassava peel wastes will help to turn cassava peel to a potential source of income for cassava processors and in the process solve the problem of limited access to supplementary feed.

### Pattern of Information Flow of Respondents

Entries in Table 4 are cassava processors' patterns of information flow scores in different categories. In Table 4, patterns of information flow of cassava processors and goat-keepers were categorized into nine, based on their scores. About 54.46 percent of cassava processors were not sure whether their pattern of information flow was horizontal, 65.35 percent were not sure whether their pattern of information flow was vertical and 64.36 percent indicated that the combined pattern of information flow was predominant. Also, about 64 percent of goat-keepers were not sure whether their pattern of information flow was horizontal, 58 percent were not sure whether their pattern of information flow was vertical and 54 percent indicated that the combined pattern of information flow was predominant.

The result obtained implied that the majority of the respondents were unsure of the exact pattern of information flow they used. This could be because they probably combined both vertical and horizontal patterns of information flow as evident in higher score indicated by combining information flow pattern. Therefore, since both patterns of information flow exist in the community, new knowledge will be learnt and effective communication will be enhanced especially through horizontal flow.

**Table 3: Distribution of cassava processors and goat keepers about their awareness of technologies**

<i>Technologies</i>	<i>Aware</i>		<i>Not aware</i>	
	<i>Frequency</i>	<i>Percentage</i>	<i>Frequency</i>	<i>Percentage</i>
<i>Cassava Processors</i>				
Drying platforms	119	74.3	41	25.7
Black sheet	118	73.3	42	26.7
<i>Goat Keepers</i>				
Cassava peels	70	88	10	12

Source: Field survey, 2010

**Table 4: Distribution of cassava processors and goat-keepers according to pattern of information flow scores**

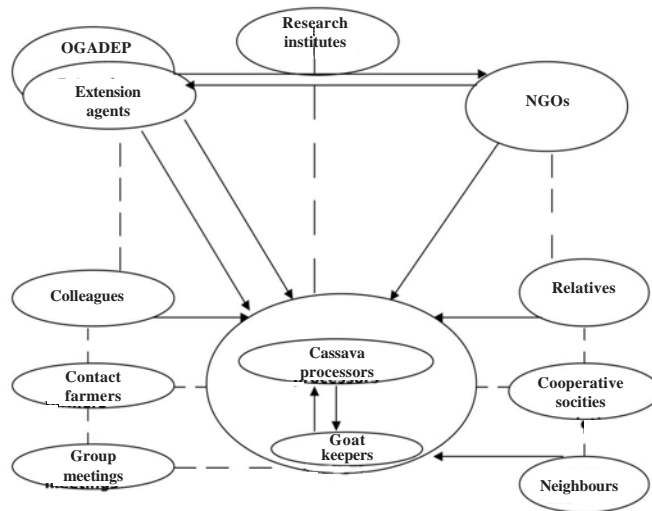
Category	Cassava processors		Goat keepers	
	Frequency	Percentage	Frequency	Percentage
<i>Horizontal Pattern</i>				
Predominant	3	2.97	16	32.00
Indefinite	55	54.46	32	64.00
Not predominant	43	42.57	2	4.00
<i>Mean = 4.46 (cassava processors), Mean = 9.00 (goat-keepers) Min. = 6.00 Max. = 30.00</i>				
<i>Vertical Pattern</i>				
Predominant	2	1.98	19	38.00
Indefinite	66	65.35	29	58.00
Not predominant	33	32.67	2	4.00
<i>Mean = 2.02 (cassava processors), Mean = 4.08 (goat-keepers) Min. = 4.00, Max. = 20.00</i>				
<i>Combined Pattern</i>				
Predominant	65	64.36	27	54.00
Indefinite	34	33.66	21	42.00
Not predominant	2	1.98	2	4.00
<i>Mean = 6.48 (cassava processors), Mean = 13.08 (goat-keepers) Min. = 10.00 Max. = 50.00</i>				

Source: Field survey, 2010

**Information Flow among Cassava Processors and Goat Keepers**

It was found out that information flowed from research institutes to OGADEP and extension agents and from OGADEP through extension agents to cassava processors. This implied that OGADEP and extension agents are intermediaries between research institutes and cassava pro-

cessors (Iwena 2008). Agbamu (2006) attested to this when he said that packaged information by extension workers to contact farmers may not get to other farmers because of the heterophily gap arising from differential socio-economic status. Figure 1 shows the pattern of information flow of cassava processors and goat-keepers in the integrated farming system. Information flowed in both vertical and horizontal direc-



**Fig.1. Information flow among cassava processors and goat-keepers in the Integrated farming system**

Note: Dotted lines indicate no information flow; Thick lines indicates information flow

Source: Author

tions among sources and receivers of message though the degree of different sources the receivers make use of varies. Also, there is an exchange of information between cassava processors and goat-keepers. This is evident in goat-keepers as they buy cassava peels from the cassava processors.

### Hypothesis

***H<sub>0</sub>***: There are no significant associations between socioeconomic characteristics of goat keepers and their awareness of using cassava peels as supplements for feeding goats

Entries in Table 5 also showed that there was no significant association between age, income level, educational level, location and keepers' awareness of using dried cassava peels as supplements for feeding goats. This implies that keepers' age, income level, educational level and location do not predict their awareness of using dried cassava peels as supplements for feeding goats. This means that irrespective of the age and the level of income of the keepers, whether or not he/she is educated, the awareness of using dried cassava peels as supplements for feeding goats is not predicted. Also, the result showed that there was no association between years of experience of the keepers and their awareness of using dried cassava peels as supplements for feeding goats. This meant that a keeper who is just starting with the business of goat keeping has information about using dried cassava peels as supplements for feeding goats.

**Table 5: Chi-square analysis of socioeconomic characteristics of goat keepers and their awareness of using cassava peels as supplements for feeding goats**

<i>Socioeconomic characteristics</i>	<i>Awareness (<math>\chi^2</math>-value)</i>	<i>Decision</i>
Age	4.64 (P = 0.098)	NS
Sex	8.68 (P = 0.003*)	S
Educational level	5.17 (P = 0.270)	NS
Income level	1.27 (P = 0.737)	NS
Years of experience	6.76 (P = 0.422)	NS
Location	1.70 (P = 0.636)	NS

Source: Field survey, 2010

However, there was a significant association between sex of the keepers and their awareness of using dried cassava peels as supplements for feeding goats. This implied that sex had effect

on keepers' awareness of using dried cassava peels as supplements for feeding goats. This may be due to the nature of their activities which is usually carried out by both sexes, though males are more involved. Sex, especially male, may predict awareness because of the 100 percent response rate while the 73 percent of female may not predict awareness because of the 27 percent of the females that were not aware may be because they merely know about its usefulness as supplement for feeding goats. Also, most household especially in rural areas usually have or possess goats for various reasons such as to raise family income, to serve as family pets, or to keep for exchange of vows, among other reasons.

### CONCLUSION

Conclusively, effective communication will be enhanced if both horizontal and vertical patterns of information flow exist among the respondents. This will also facilitate effective interaction between extension personnel and goat-keepers; and between processors and extension personnel; in order to add value to cassava peels which is a potential feed supplement in goat keeping. The excess cassava peel produced by the cassava processors will cease from being regarded as a waste, having no value and allowed to rot in the open, consequently resulting in health hazards and also constituting an additional source of environmental pollution from the smokes being emitted with the strong offensive smell produced when it is being burnt. The information flow in an integrated farming system between cassava processors and goat keeper will further help the goat keepers to combat inadequate supply of feed in the required quantity and quality that could account for the low productivity of livestock in the tropics due to seasonal fluctuations in feed supply and pasture quality available for feeding goats.

### RECOMMENDATIONS

It is recommended that a good communication skill for extension officers is required for effective dissemination of new innovation. Extension service managers should design effective communication strategies on dissemination of information in ways that promote multi-dimensional interactions amongst stakeholders in the target value chain. Proper information flow

in cassava processing and goat keeping integrated system will to trigger a market between cassava processor and goat keepers thereby moping increasing cassava wastes as a result of increase in cassava production. This will also facilitate adoption of technology that could add value to cassava waste.

### REFERENCES

- Adebayo K, White L, Morris MJ, Dipeolu AO, Ayinde IA, Wandschneider TS, Sanni LO, Oyewole OB, Tomlins K, Westby A 2003a. Innovativeness and stakeholder ship in the *fufu* processing systems in Southwest Nigeria. *International Journal of Agricultural Sciences, Science, Environmental and Technology Series A*, 3(4): 15-27.
- Adebayo K, Anyanwu AC, Osiyale AO 2003b. Perception of environmental issues by cassava processing in Ogun State, Nigeria. Implications for environmental extension education. *Journal of Extension Systems*, 19: 103-112
- Agbamu JU 2006. *Essentials of Agricultural Communication in Nigeria*. Malthouse.
- Amao JO, Adesiyani OI, Salako BA 2007. Economic analysis of cassava processing into *gari* in Ogo Oluwa Local Government Area of Oyo State, Nigeria. *Pakistan Journal of Social Sciences*, 4(2): 266-270.
- Apantaku SO, Enitan OA 2006. Analysis of information sources on arable crops post-harvest storage technologies in Lagos State, Nigeria. *ASSET Series A*, 6(2): 65-75
- Aregheore EM 2000. Chemical composition and nutritive value of some tropical by product feedstuffs for small ruminants-in vivo and in-vitro digestibility. *Animal Feed Science and Technology*, 85(1/2): 99-109.
- Ayoade AR, Adeola RG 2009. Constraints to domestic industrialization of cassava in Osun State, Nigeria. *Ocean Journal of Social Sciences*, 2(2): 83-87.
- Baah J, Tait RM, Tuah AK 1999. The effect of supplementation with ficus leaves on the utilization of cassava peels by sheep. *Journal of Bioresource Technology*, 67: 47-51.
- Babalaye T 2001. Cassava: Cash crop and staple food. *Journal of African Farming and Food Processing*, 1: 17-18
- Chinaka EC, Tokula MH, Okwusi MC 2003. Effectiveness of value addition training among women cassava farmers in Imo State, Nigeria. *Journal of Sustainable Development*, 6(1): 58-62.
- Iwena OA 2008. *Essential Agricultural Science for Senior Secondary Schools*. Ogun State: TONAD Publisher Ltd.
- Lasekan OO, Babajide JM, Tuwase OO 2004. Nutrient composition and acceptability of soy-pupuru flour and dough. *Nigerian Food Journal*, 22: 78-79.
- National Report of International Conference on Agrarian Reform and Rural Development 2006. *Conference* held at Porto Alegre, 7-10 March, 2006.
- Oluwemimo O 2010. Stimulating rural employment and income for cassava (*Manihot* sp.) processing farming households in Oyo state, Nigeria through policy initiatives. *Journal of Development and Agricultural Economics*, 2(2):18-25.
- Onditi SJ, Silayo RS, Kimera SI, Kimbita EN, Mbilu TJ NK 2007. Preliminary Studies on Prevalence and Importance of Goat Trypanosomosis in Selected Farms in Morogoro District, Tanzania. *Livestock Research for Rural Development*, 19(5): 17-22. From <<http://www.lrrd.org/lrrd19/5/ondi19065.htm>> (Retrieved on 30 March 2010).
- Rajeshwarisivaraj S, Senthilkumar P, Subburam V 2001. Carbon from cassava peel, an agricultural waste, as an adsorbent in the removal of dyes and metal ions from aqueous solution. *Bioresource Technology*, 80(3): 233-235.

---

**Paper received for publication on March 2016**  
**Paper accepted for publication on November 2017**