

Factors Influencing the Use of Compost from Household Waste in the Centre Province of Cameroon

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ABSTRACT The Centre province of Cameroon is facing both soil degradation problem in rural areas and the household waste management problem in Yaoundé-city. However, those two problems can be solved by processing the household waste into agricultural compost. Actually, the produced compost is used by a few farmers living in the province. Thus, this article explains the factors influencing the utilization of compost by compost users and the reasons justifying the reticence of non-compost users to adopt this input. The results show that, farmers who are the most motivated to use compost are young men practising agriculture in smaller parcels of land. The attractive salaries in NGOs employing those young farmers associated with the higher productivity of compost are the main reasons justifying their motivation for using compost. However, the compost demand is less than its supply proving that some farmers are still not motivated to use this input in the province. The high price and transport cost of compost are the main reasons accounting for the non-utilization of compost by non-compost users. Therefore, in order to encourage the adoption of compost by most farmers, the government should subsidize the price and transport cost of this input.

1. INTRODUCTION

With a long tradition of foodstuff crops and vegetables cultivation, farming systems in the Centre province of Cameroon have been for many years no longer able to respond to the increasing food demand of the population of Yaoundé (the capital-city of Cameroon and county-town of the Centre province). Among the reasons accounting for that, is the soil degradation problem due to the increasing population density exacerbated by a continuous exploitation of land without fallow or application of sufficient fertilizers and organic matter quantities. As a matter of fact, because of their ferrallitic nature, soils in the Centre province of Cameroon present a potential of variable fertility thus are poor in alkaline elements and organic matter (Jaza, 2005; Ministère du Plan, 1999).

On the other hand, the management of urban household waste in Yaoundé-city became an acute problem since the early 1990s (Ndoumbé et al., 1995). Due to an inefficient collection, disposal and management system, household wastes generated in the city heap up continuously provoking a dirty, unaesthetic environment, water pollution, bad odours

causing air pollution and multiplication of flies that are diseases' carriers (e.g. malaria, typhoid, diarrhoea, cholera, dysentery, etc). However, composting the Yaoundé household waste and distributing the processed compost for crop production in various regions of the Centre province could help to avoid or reduce both waste management and soil degradation problems (Fao, 1978; Jaza, 2005). According to Ngnikam (2000), with a Carbon to Nitrogen (C/N) ratio of 16 and its total organic matter content which is about 17.7% of dry matter, the compost of Yaoundé is suitable for restoring the soil fertility maintaining thereby the microbiological equilibrium of soils. Thus, this compost can be conveniently used as fertilizer for crop production.

Actually, small-scale composting activities already exist and about 32% of farmers in the Centre province currently utilize the resulting compost and animal manure to produce foodstuff crops and vegetables. That means, in spite of soil degradation problems, more than 68% of farmers are still reticent or have the doubt on the efficacy, higher productivity or economic profitability of their crops by using compost from household waste (Duane, 2004; Jaza, 2005). Those farmers rather prefer to use mineral fertilizer and other alternative or substituting fertilizers (Dalzell et al., 1987). However, the main question that arises is to know the reasons of the reticence of all farmers to adopt compost, the reasons

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motivating the compost utilization by compost users and the willingness by non-compost users to utilize compost in the future. Thus, this paper will try to answer those questions.

2. MATERIALS AND METHODS

2.1. The Study Area and Data Collection

The field survey was carried out in the Centre province of Cameroon during the period from August 2003 to February 2004. It was undertaken precisely in Yaoundé-city and 11 surrounding villages belonging to the province. That province is located at the central position of the south Cameroonian plateau, covering 70,000 km² of land area, with a population of 2.3 million inhabitants (the population density is 3,802 inhabitants/km² in the Yaoundé-city and 30.4 inhabitants/km² for the rest of the province), counting a total number of 162,000 cultivated farms among which 32% are users of compost and animal manure (Jaza, 2005; Ministère de l'Agriculture, 2003; Ministère du Plan, 1999).

The Centre province was chosen because it contains Yaoundé (the capital city of Cameroon and the county-town of the province) which produces among the highest quantity of household waste (1023 tonnes/day) thus of compost in the country, the nature of its soils which are very poor in organic matter, the availability of data and the large number of compost users practising in the location.

A total of 108 farmers (comprised of 52 compost users and 56 non-compost users) and 44 compost makers of the province were purposely selected for the survey. The selected compost users were farmers using compost as main fertilizer whereas the non-compost users were those using mineral fertilizer as major fertilizer. Using a prepared questionnaire and interview schedule, cross-sectional primary data of the cropping season 2002/2003 were collected from those two groups. The data collected were estimation made from own assessment of each farmer or compost maker and concerned mainly the age, gender and farm size of the selected farmers, the monthly quantity of compost produced and sold per compost maker, the reasons motivating the compost utilization by compost users and the willingness by non-compost users to utilize compost in the future. Secondary data were collected from available

literature in the domain of waste composting for urban farming in developing countries and Cameroon in particular.

2.2. Data Analysis

After data collection, the data were codified and entered with the help of EXCEL tabulation. For the data analysis, the descriptive or statistical analysis (mean, standard deviation, etc) were done using EXCEL for Windows and SPSS software program (Version 11.5).

3. RESULTS AND DISCUSSIONS

3.1. Socio-demographic Characteristics of the Selected Farmers

3.1.1. Age of the Farmers

Table 1 presents the age characteristics of the compost users and non-compost users selected in the study area. The compost users' mean age is 34.4 years whereas the non-compost users have an age average of 45.0 years. Therefore, farmers using compost are relatively younger compared to the non-compost users. A previous survey by Nkamleu (1996) also shows that young people are more interested in the organic waste composting and use in agricultural exploitations surrounding Yaoundé. This is generally because, young people are more ambitious or courageous and like adventurous situations such as discovering a new input like compost (Dalzell et al., 1987; Jaza, 2005). Since the compost is still a new product being presently advertised, only the younger generation of nowadays are convinced about its importance in agriculture as compared to older generations i.e. non-compost users who still have the doubt of the advantages and efficacy of using compost from household waste.

Table 1: Age distribution of the farmers selected in the study area

<i>Farmer group</i>	<i>Compost users (N=52)</i>	<i>Non-compost users (N=56)</i>	<i>Total farmers (N=108)</i>
Minimum	19	25	19
Maximum	52	70	70
Mean	34.4	45.0	39.7
Standard Deviation	7.4	9.1	9.8

Another motivation for younger generations to be interested in using compost comes from the multiplicity of subsidized Non-Governmental Organizations (NGOs) dealing with waste composting and the use of compost for farming activities in the Centre province. Thanks to the subsidies they are receiving from international funding organizations (UNDP, UNEP, WORLD BANK, SNV, etc), those NGOs are currently creating a lot of new employment opportunities with attractive salaries for young people (Ndoumbé, 1994; Ndoumbé et al., 1995). The increasing migration trend of young people from various regions of the country to the Centre province could be justified by that reason (Ministère du Plan, 1999). As a matter of fact, the newly created composting NGOs utilize part of their subsidized funds to pay higher salaries to those young persons working on compost farms. In most parts of the province, young people working on compost farms are paid at 2,000 to 2,500 FCFA¹ per day whereas in non-compost farms, one manday of labour activity worth only 1,000 to 1,500 FCFA¹. Consequently, young people would prefer to start working on compost farms and in the long run, they become by habit more familiar and develop interest to continue in the agricultural domain and namely in using compost for farming activities (Dalzell et al., 1987; Jaza, 2005).

Unlike compost-users, the non-compost users are a little bit older because they are in majority represented by farmers from old generations and native of the area who inherited land from their parents (Ministère du Plan, 1999). Contrary to compost users, the non-compost users are not sponsored by NGOs and thus receive no subsidy amount to afford youth's jobs in their farms. Therefore, young individuals have no interest to immigrate in their farm locations. There is no motivation for them to work on non-compost farming activities unless they become later the chief of the farm through inheritance. Otherwise (in case they do not inherit), they prefer to work either on compost farms or in the non-farm sector due to its quicker return (Jaza, 2005).

3.1.2. Gender of the Farmers

Table 2 presents the gender characteristics of the compost users and non-compost users sampled in the study area. Overall, it can be seen that male (69.4%) dominate agricultural activities

compared to female (30.6%). The same observation is also true for compost users (75.0% male against 25.0% female) and non-compost users (64.3% male against 35.7% female). According to Nkamleu (1996), this can be explained by the fact that compared to women, men generally have more physical strength thus are more powerful to carry or manage heavy and voluminous/bulky inputs like compost. Since compost is heavier and more voluminous (rates of application sometimes reaches 150 t/ha) than mineral fertilizer (maximum rate is 1150 kg/ha), that explains why less women would use compost as compared to mineral fertilizer (Duane, 2004; Fao, 1978; Jaza, 2005; Ministère de l'Agriculture, 2003).

Table 2: Gender composition of the farmers selected in the study area

Farmer group	Compost users (N=52)		Non-compost users (N=56)		Total farmers (N=108)	
	Number	%	Number	%	Number	%
Male	39	75.0	36	64.3	75	69.4
Female	13	25.0	20	35.7	33	30.6

3.1.3. Farm Size

Table 3 presents the characteristics of cultivated land area of the selected farms in the study area. From the table, the first highlight is that, the cultivated parcels of land are relatively of very small size. That is 0.29 ha on average for total farmers sampled in the study area which is far below the 1.80 ha and 1.61 ha figures representing the average size of an agricultural exploitation in Cameroon and Centre province respectively (Ministère de l'Agriculture, 2003; Ministère du plan, 1999). In fact, most farmers selected during the field survey live and practice agricultural activities in the Yaoundé urban or peri-urban areas where the population density is too high (3,802 inhabitants/km²) and therefore less space is devoted to agricultural activities (Ministère du plan, 1999).

Table 3: Cultivated land area (ha) per farmer group in the study area

Farmer group	Compost users (N=52)	Non-compost users (N=56)	Total farmers (N=108)
Minimum	0.02	0.04	0.02
Maximum	0.70	1.00	1.00
Mean	0.27	0.30	0.29
Standard Deviation	0.20	0.20	0.20

Comparatively, the average land area cultivated by the compost users (0.27 ha) is slightly smaller than the non-compost users' cultivated land area (0.30 ha). Likewise, the minimum cultivated land area for the compost users (0.02 ha) is less than the minimum cultivated land area for the non-compost users (0.04 ha). Similarly, the maximum cultivated land area for the compost users (0.70 ha) is also below the maximum cultivated land area for the non-compost users (1.00 ha). Generally, all these figures indicate that compost farms are smaller than non-compost farms. This could be explained by the fact that compost is still a new product in Cameroon and most farmers prefer to test it firstly in smaller parcels of land. It is after they realise the high compost productivity, efficacy and usefulness in crop production that they extend its use in larger parcels of land (Dalzell et al., 1987; Jaza, 2005).

3.2. Compost Produced and Sold in the Study Area: The Supply and Demand Determinants

The potential demand of compost in the Centre province of Cameroon was evaluated at 3,348 tonnes per year in 1995. But since then, compost consumption has followed an annual growth rate of 4% in 1995-1999 and of 5% since 2000 (Focarfe, 1995). At those rates, the actual demand of compost can reach up to 6,000 tonnes per year in the province (Focarfe, 1995; Jaza, 2005). According to Jaza (2005), that demand could have been higher if the price of compost was fixed or subsidized at a level close to its commercial value (value of substitution). As a matter of fact, the compost made in Yaoundé-city is currently sold at 1,500 FCFA per bag of 50 kg (i.e. 30 FCFA per kg). This price is higher as compared to the commercial value of compost (value of substitution) which is 402.4 FCFA per bag of 50 kg (i.e. 8 FCFA per kg). That means compost is 3.75 times more expensive than its value of substitution and thus the compost demand and supply are affected by such a price level (Jaza, 2005; Ndoumbé, 1994; Ndoumbé et al., 1995).

Moreover, the transport cost remains another limiting factor for compost use because of its bulkiness requiring very large amounts to be utilized. At the current transport rate of 40 FCFA/tonne per km applicable to compost and commodities in the Centre province, farmers (especially those living in villages far away from Yaoundé-city) think that, it is very expensive for them to transport important compost quantities in

their farms (Focarfe, 1995; Jaza, 2005). The problem is even worse with some villages of the province which, because of bad road maintenance or no road connection, can not be easily accessed by vehicles or cars transporting compost (Ministère du Plan, 1999). And such transport problem also seriously affects the compost demand and supply (Jaza, 2005).

In table 4, a comparison of the monthly quantity of compost produced and sold per compost maker in the study area is presented. More explicitly, the table shows that the average quantity of compost sold (7.7 t/month) is very far below the average quantity of produced compost (180 t/month). The maximum quantity of compost produced stands at 230 t/month while the maximum quantity of compost sold is 100 t/month. The same results were obtained from similar researches in the previous decades by Focarfe (1995), Ndoumbé (1994), Ndoumbé et al. (1995) and Ngnikam (2000). This indicates that, no major effort has been made in the meantime in order to popularize the compost and encourage more reticent farmers to demand and use this input.

Table 4: Comparison of monthly quantity of compost produced and sold per compost maker (N=44) in the study area

Compost quantity	Quantity produced (t/month)	Quantity sold (t/month)
Minimum	20	2.5
Maximum	230	100
Mean	180	7.7
Standard Deviation	24.29	3.74

From the results of table 4, it is thus clear that either more advertisement on compost input or a subsidy in its price and transport cost are still necessary to be made in order to increase the demand of compost (quantity sold) in a way that it can reach the quantity supplied (quantity produced). By doing so, the compost makers would be willing to make more compost and thus to use more household waste for composting as they promised during the survey.

3.3. Reasons Motivating the Compost Utilization by Compost Users

In Cameroon and particularly in the Centre province, the compost from household waste is still a new input which is not yet well known by farmers. For most of the surveyed compost users, the compost input was known and used for the

first time in 1995 thanks to advertisements made from the NGO FOCARFE which was among the first organisations to process the Yaoundé household waste into compost (Focarfe, 1995; Jaza, 2005). And since that period, they have continued to use compost in their farms.

During the field survey, questions were asked to compost users about the reasons motivating them to continue using compost. From their various responses (Table 5), 92% of compost users declare to continuously use compost because of its high productivity. According to them, all their crop yields have been improved because of compost use. Another research by Nkamleu (1996) also indicates that, compost users in the agricultural exploitations surrounding Yaoundé prefer compost because of its higher productivity and efficacy as compared to other fertilizers. Nevertheless, 8% of compost users declare to use compost in order to help solve the pollution from household waste currently observed in Yaoundé-city. None compost users declare to use compost because of its affordable price (see Table 5).

Table 5: Reasons motivating the compost utilization by compost users

<i>Reasons for using compost</i>	<i>Number of compost users (N=52)</i>	<i>Percentage of compost users (%)</i>
High productivity	48	92
Reduce pollution in Yaoundé-city	4	8
Affordable price	0	0

3.4. Willingness by Non-Compost Users to Utilize Compost in Future

Among the reasons the non-compost users give to justify the non-utilisation of compost in their farms, one could highlight mainly: the high price of compost, the difficulty to transport compost to the farm and the non-productivity of compost. As shown in table 6, among the 56 non-compost users surveyed in the study area, 86% of them could not use compost because of its high price. Compost is really sold at the price of 1,500 FCFA per bag of 50 kg and its commercial value (value of substitution) is estimated at 402.4 FCFA per bag of 50 kg (Jaza, 2005). So, those farmers, non-compost users think that at such price, they prefer to buy mineral fertilizer which can substitute compost and which does not pose

any transportation difficulty. A proportion of 11% of non-compost users does not use compost because of the difficulty to transport it to their farms (Table 6). They say that compost is voluminous/bulky and less concentrated compared to mineral fertilizer, hence difficult and more expensive to be transported to the farm. Only 3% of non-compost users say that (Table 6), they are not using compost because of its non-productivity compared to other substituting fertilizers (mineral fertilizer, animal manure, etc).

Table 6: Reasons for not using compost by non-compost users

<i>Reasons for not using compost</i>	<i>Number of non-compost users (N=56)</i>	<i>Percentage of non-compost users (%)</i>
High price	48	86
Difficulty to transport	6	11
Non-productivity	2	3

The 3% of non-compost users that do not use compost because of its non-productivity say that, they will never use compost in future even if offered “free of charge” (Table 7). This means a future subsidy on compost price would not affect the decision of that group (Jaza, 2005; Yecke, 1994). They say that, there is even no need to use compost in their farms since they would instead prefer to use animal manure which they obtain directly and “free of charge” from their farms through their own livestock (animal husbandry). Moreover, they say that, the mineral fertilizer they use in their farms has no substitute because of its high productivity in comparison to compost.

Table 7: Conditions for compost use in the future by non-compost users

<i>Conditions for compost use in the future</i>	<i>Number of non-compost users (N=56)</i>	<i>Percentage of non-compost users (%)</i>
Use if offered at “low price or free of charge”	54	97
Never use even if offered “free of charge”	2	3

In contrary to those 3% that reject any offer of using compost in future, the remaining 97% of non-compost users are willing to use compost in future if offered at “low price or free of charge” (Table 7). They represent both categories of those

who could not use compost because of the difficulty to transport it to the farm and its high price. Thus, a subsidy on the compost price and on compost transport cost could probably encourage them to use compost in their farms in the future (Jaza, 2005; Yecke, 1994). Table 7 presents those figures on the conditions for compost use in the future by non-compost users.

Since a great majority (86%) of non-compost users say they do not use compost because of its high price (Table 6), they were then asked about the level of price they would be willing to use compost in the future. Results from their answers are shown in table 8. Those answers on the compost price level vary from farmer to farmer with a minimum price of 100 FCFA, a maximum price of 1,500 FCFA and an average price of 334 FCFA per bag of 50 kg (Table 8). That average suggested price is below the commercial value of compost (value of substitution) which is 402.4 FCFA per bag of 50 kg (8,048 FCFA per tonne). This confirms that non-compost users would be willing to give up mineral fertilizer in order to utilize compost (i.e. substitute mineral fertilizer by compost) only if the compost real price is below its commercial value (Jaza, 2005; Ndoumbé et al., 1995; Ngnikam, 2000; Yecke, 1994).

Table 8: Level of price (in FCFA) encouraging future compost utilization by non-compost users (N=56)

Statistics	Level of compost price (per bag of 50 kg)
Minimum	100
Maximum	1,500
Mean	334
Standard Deviation	220

By considering this average suggested compost price (i.e. 334 FCFA per bag of 50 kg), then if the government or any funding organisation wants the compost to be used by most farmers, then he has to subsidize its price by an amount of at least 1,166 FCFA (i.e. 1,500 FCFA minus 334 FCFA) per bag of 50 kg. That means, the subsidy rate should be at least 77.73%.

4. CONCLUSION

In general, young men averaging 34 years of age are the most motivated people using compost from household waste in the Centre province of Cameroon. Since compost is still a new input not yet well known in the province,

those young farmers prefer to test its productivity, efficacy and usefulness firstly in smaller parcels of land (0.27 ha on average). Among the reasons motivating them to work on compost farms, one can cite mainly the higher productivity of compost and the attractive salaries offered by compost farms/NGOs currently sponsored by international funding organizations. However, in the province, the compost demand is less than its supply because of the price and transport cost of this input which are not at a level affordable by every farmer. Thus, a subsidy on the price or transport cost of compost would encourage most non-compost users to start using this input. Results of field survey suggest that, a subsidy amount of up to 78% on the current compost price would encourage the non-compost users to substitute mineral fertilizer by compost. Hence, the government agricultural policy should be oriented towards that direction in order to encourage most farmers to adopt the compost input solving thereby the waste management and soil degradation problems in the Centre province.

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NOTES

1. FCFA (Franc de la Communauté Financière Africaine) is the currency used in Cameroon. Its conversion rate is: 1 Euro = 655.957 FCFA.

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