



# Practice of compost use in urban farming: Opportunities and constraints in the West Region, Cameroon

Moye Eric Kongnso\*

Department of Geography, Environment and Planning, University of Dschang, Cameroon

\*Corresponding author: [moyeeric@yhoo.com](mailto:moyeeric@yhoo.com)

Received: 10 Feb 2024; Received in revised form: 05 Apr 2024; Accepted: 11 May 2024; Available online: 15 Sep 2024

©2024 The Author(s). Published by Infogain Publication. This is an open-access article under the CC BY license

(<https://creativecommons.org/licenses/by/4.0/>).

**Abstract**— *Urban agriculture is an ancient economic activity that sustains urban livelihoods. Composting as an alternative method of waste treatment and compost use in urban farming has led to sustainable practices. This paper sets to examine the opportunities and barriers of compost use under the lens of the Social Practice theory. Adopting a mixed methods approach, data was collected during a questionnaire survey of 265 households purposively selected from the urban and peri-urban quarters, eleven (11) in-depth interviews with stakeholders and a focus group discussion with compost users. Quantitative data from questionnaires were analyzed statistically using SPSS while qualitative data from interviews and focus group were treated using content and thematic analysis with the help of Atlas.ti. Findings revealed that compost use practices are favored by the availability of compost and technical assistance provided to farmers. Municipal compost production has increased from 60tons to 600tons per year over a period of 10 years and private composting is greatly improved. Nevertheless, small scale famers have constraints which are technical, experience and knowledge, financial, institutional and policies. Farmers in the peripheries (45%) tend to compare compost with mineral fertilizers and are reluctant to change their old practices. State extension services promote mineral fertilizers over compost but farmer-to-farmer experience sharing has informed practices. The existing regulatory landscape has not encouraged compost use and traditional practices persist. Adopting sustainable practices require policies that prioritize compost use.*



**Keywords**— *Compost, practices, social practice theory, opportunities, constraints, Cameroon.*

## I. INTRODUCTION

The world's population is rapidly growing and feeding the growing population while keeping the urban ecological footprint has been a great challenge for agriculture today[1]. Urban agriculturalists are concerned with maximizing profits through intensification and use of more inputs such as chemical fertilizers [2,3]. However, the negative impacts of intensified forms of agriculture on the environment and human health have motivated the adoption of new input types such as organic manure and new farming systems [4,5]. Among the good practices of urban agriculture, the adoption and use of compost has been given considerable attention [6]. Organic matter add nutrients to the soil, maintains and builds up the soil structure that provides an aerated moisture retentive conditions and allow increased microbial activity to take

place[7,8]. The economic, health, environmental and agronomic importance of compost used in farming have been substantially documented [4,7,9, 10]. However, the rate of adoption of such a practice in developing countries is timid. This paper thus seeks to investigate the opportunities and constraints for compost use in urban farming in towns of the South.

The practice of circular agriculture that is well developed in countries of the North is still more common in African countries today but the evidence base for the existing practices, norms and behaviors remains weak [11]. The practice of minimizing food losses by using waste streams and transforming them into valuable agricultural inputs for food production is an important principle of circular economy that has made the waste stream a valuable resource in the urban food production systems [5].

Compost use in farming is important in upgrading waste streams but the extent to which compost is integrated into urban farming depends on the opportunities and constraints that range from technologies, waste separation, local and national regulations, cultural acceptance and the market demand for compost-based products [9, 12,13].

The adoption and use of compost in urban farming is timid but gradually gaining grounds in African towns [14]. Using the example of Cameroon, he demonstrated that the use of compost for lettuce production is ecologically and economically advantageous for farmers than mineral fertilizers but regrets that its popularization has not been encouraged by the government. Compost unavailability, lack of good compost marketing systems and policy limitations in the domain of organic fertilizer use are major constraints for compost use [15]. Using the case of France, [16] demonstrated that although compost users in urban areas share the same views on the benefits of compost, they consider regulations to be overly rigid. Equally, the application of compost is associated with drawbacks such as toxicity, compost dose, and by practices which either replaces other fertilizer types by compost or associate it with chemical fertilizers [6]. Given a multitude of waste management options in developing countries, [5] argues that farmers need to be given the opportunity to experiment the new practices and feel confident about their usefulness and that individual model farmers or farmer groups can facilitate the adoption of new practices and disseminate information about the benefits of the new practices.

In Response to the rising demands for organic products, the Dschang municipality in the West Region of Cameroon pioneered the valorization of food waste by turning it into compost. However, waste streams are still under-utilized and at times overlooked by actors of the food production system, thus limiting possibilities of generating health, economic and environmental benefits. Given that constraints and opportunities for compost use in urban farming are likely to differ between countries of the North and those of the South, this work explores the situation in developing countries, which is less documented, and informs practices developed within the Dschang municipality in Cameroon.

### **Theoretical Framework: Compost use as a Social Practice among urban farmers**

The adoption and use of compost in urban farming has been theorized using the social practice theory (SPT) approach. Social practice theory has dimensions that vary from material, competences, things, knowledge systems and culturally-grounded social structures [17, 18, 19]. Since the year 2000, this theory has been used sufficiently

to theorize unsustainable consumption practices that lead to food waste [20, 21, 22, 23, 24, 25, 26] but Its contribution in understanding composting and compost use as a practice offers a new perspective. The adoption of compost calls for change in farming techniques, practices, culture and redesign of infrastructure. Integrating compost has the potential to make farming practices more sustainable and improve economic and environmental benefits. The change in behavior should be intended and competences built [17]. The practice of compost use in agriculture in developing countries, however, has a long history even though it was not named as such. However, the intriguing question is; how do we change or shift everyday old and culturally-grounded practices to be more economically and environmentally sustainable?. Studies by [4] and [10] have shown that composting practices and compost use techniques have evolved due to changes in knowledge systems and culturally grounded-structures.

Practices are social phenomena whose performance requires the reproduction of cultural meanings, skills and competences and technological products. [27] identified three elements; material, competence and meaning, which must be brought together to perform a practice. In composting and compost use, materials include technologies and physical entities required in the process, competences include compost application skills and handling techniques while meanings represent social norms, ideas and motivations. These elements are useful in explaining the transformations of practices and diffusion of compost among farmers [28]. Chemical fertilizer in farming is a common practice among gardeners in Dschang town [29]. The integration of compost is recent and for such a practice to be sustainable, farmers must be willing and able to keep the practices alive. The SPT is fundamental in this work as it focuses on the practices and the manner in which they are reproduced rather than on individual, institutions or programs [30, 31]. It is based on this theoretical backdrop that opportunities and constraints for compost use in urban farming have been examined with the aim to inform policies and make practices sustainable.

## **II. MATERIALS AND METHODS**

### **Study area**

Located between longitudes 10°01" and 10°06" and latitudes 5°29" and 5°24", Dschang is the head quarter of the Menoua Division in the West region of Cameroon. It covers an area of 123km<sup>2</sup> with an urban center estimated at 7 km<sup>2</sup>. Dschang has an equatorial monsoon climate with two distinct seasons. The rainy season runs from mid-March to mid-November and a dry season from mid-

November to mid-March. Average rainy season rainfall amounts of 2500mm and temperatures of about 21°C have favored the cultivation of both seasonal and perennial crops [32]. Urban and peri-urban agriculture is rapidly developing with the rise of commercial food crops [33]. These are market garden crops like tomatoes, cabbages

and huckleberry. Off-season maize and beans are also grown there. Although sufficiently practiced, urban and peri-urban agriculture comes up against the problem of space; it is practiced in specific areas such as swamps and lowlands [29] and in areas awaiting construction of urban infrastructure (Figure 1).

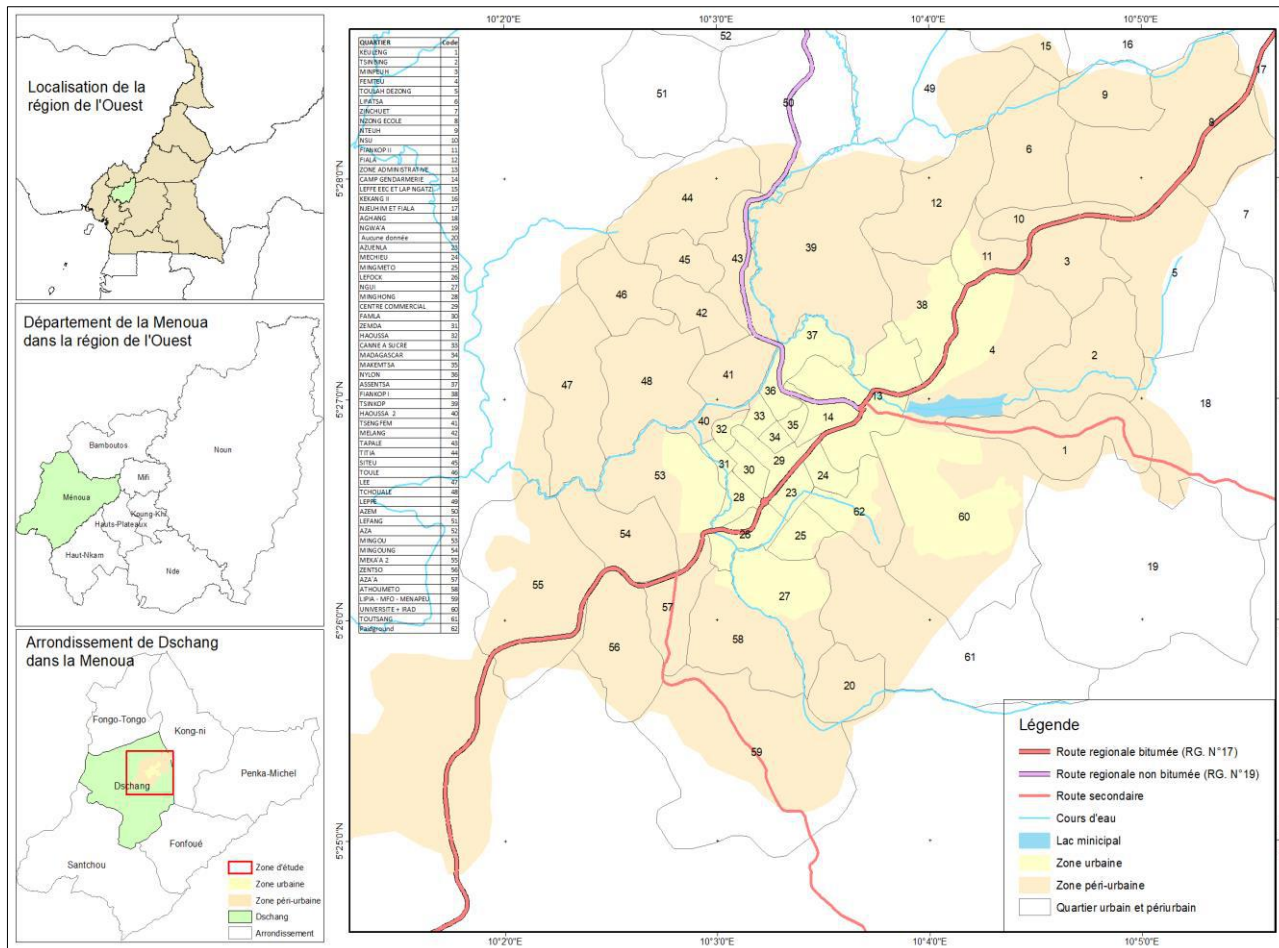


Fig.1: Localization of Dschang town

Source: Administrative boundary data taken from BD Atlas, 2018 edition and equipment data taken from the city's POS and the open Street Map site.

**Data collection and treatment**

Data for this study was collected using qualitative and quantitative techniques. This mixed methods approach improves data validity thanks to both methodological and data triangulation [34]. Fieldwork survey was carried in Dschang from the 24<sup>th</sup> of March 2020 to the 12<sup>th</sup> of September 2020. First was the administration of a household questionnaire followed by key informant Interviews and a focus group discussion with compost users. A semi-structured questionnaire was administered to 265 purposively selected households in five quarters of Dschang town (Table 1)

These quarters were chosen based on their socio-demographic characteristics and their accessibility (Table 1), with a coverage rate of 22.7%. Before the survey proper, pre-test surveys were conducted in 10 households to ensure the validity and reliability of data collection tools. The household questionnaire survey was carried out through a data collection interface previously mounted on smartphones. Interviews were conducted with 11 stakeholders from diverse stakeholder groups (Table 2).

Table 1: Number of questionnaire distribution in households per quarter

Quarters	Characteristic of quarters	Total number of households	Number of Questionnaires
Ntseug	-Middle class settlement -located at the peri-urban area -Plannified quarter -Irregular waste collection by council	183	40
Fiankop 2	Zone of very high waste production - low income and inaccessible quarter - linked to the waste collection system by the council	220	51
Haoussa 2	Muslimquarter(specific socio-cultural composition) - Waste disposal into nature -Spontaneous and peri-central	205	49
Asseitsa	Plannified -Middle income -Peri-central quarter - Regular waste collection	340	75
Vallée (Paidground)	Student residential area -Accessible - Served by council waste collection	220	50
Total		1168	265

Table 2: Stakeholders involved in the promotion and use of compost in Dschang

Stakeholder group	Number interviewed	Name of Participant	Zone of activity
Farmer Groups	02	Jardin Polyvalent Tsenbourg	Peri-urban area
		Yiwiyi Partnership	Urban area
Municipal Authority	03	Head of compost valorisation Unit	Urban/ Peri-urban
		Director of AMGED (Municipal waste management agency)	Urban/ Peri-urban
		Head of compost commercialisation Unit	
NGOs	01	GAAD	Urban/ Peri-urban
Private	01	Mineral fertilizer commercial agent	Urban/ Peri-urban
Government	03	Agricultural extension agents	Urban/ Peri-urban
	01	Divisional Delegate of Agriculture and rural development	Urban/ Peri-urban

To compliment results gotten from household questionnaires and interviews, 12 individual compost users participated in a focus group discussion. The focus group was made of 4 farmers using only municipal compost, 3 farmers using private and family compost, 2 farmers using agro-compost and 3 compost retailers. The group was

made up of 40% male and 60% female and discussions lasted for about an hour. Though discussions were guided, participants were given the opportunity to share their experiences with the use of compost.

Data obtained from these sources was analyzed using quantitative and qualitative techniques. Questionnaires were coded and treated using Excel and SPSS version 20. Interviews were transcribed and analyzed using thematic and content analysis with the aid of Atlas.ti software. The coding consisted of organizing and classifying the text to get explanations that permit us to understand the data content. The thematic analysis consisted of exploring the links existing between statements and meanings in respondent's discourse. Excerpts were extracted to support the established arguments.

### III. RESULTS AND DISCUSSIONS

#### Forms of Compost-based urban farming in the West Region of Cameroon

Urban farming is an important economic activity in urban areas as it provides food for the urban households and sustains them economically. Dschang dwellers know the importance of urban farming and gardening but only about 51% of households practice urban agriculture. Those practicing urban agriculture are involved either in urban farming, urban gardening or both.

Urban farms are generally larger parcels of land (more than a hectare) occupied mostly cereals (Plate 1). The use of chemical fertilizers is still common with urban farms, where farmers either use for specific crops such as maize or associate with organic manure.



Plate 1: Urban farms in Dschang town

The act of dumping waste to decompose naturally is practiced mostly in urban farms. The dominant crop type is maize although polyculture and crop rotation are practiced. Crops with high water requirements are cultivated in the wet season due to water availability from rainfall while the dry season is meant for very short-cycled crops that require less water. Most urban farms are cultivated only in the wet season due to limited irrigation possibilities. Farms are prepared in the dry season and planting done with the arrival of rains. It is practiced mostly on state land reserves and on private lands found mostly at the urban peripheries.

Unlike urban farms, gardens are smaller in sizes, generally less than a hectare and contain mostly market gardening crops (Plate 2). The cultivation of urban gardens is intensive and the use of compost dominates. Farmers who use chemical fertilizers in their farms do not apply them on market gardening crops. They argued that their short-cycled and leafy nature do not permit chemical fertilizers to effectively act on the crops and as such, consuming such crops have negative health consequences. Cultivation is all year round and during the dry season crops are irrigated with water from streams and boreholes. The dominant cropping type is monoculture and crop rotation is equally carried out, especially as crops are short-cycled (Plate 2).



Plate 2 : Urban gardens in Dschang

The use of organic manure in farming is a long aged tradition that has evolved with time. Food waste, animal droppings, wood ash and crop residues are traditionally buried into furrows where they decay to form humus. This indigenous practice which was considered as means of waste disposal has improved on food production practices and yields. In the last two decades, this traditional composting by small farmers has been replaced by chemical fertilizer in pursuit for greater yields.

### **Opportunities for the adoption of compost-based agriculture**

#### **Composting and compost availability**

Compost is either produced by farmers themselves (20%) or at the municipal composting platforms (80%). Composting practices and compost types vary. Household survey revealed that 39.43% of farmers bury their kitchen waste in pits where it decays into humus, 31% put in bags while 22.57% carry their waste to the community composting. The other 8% use on-farm composting in which crop residues and kitchen waste are deposited along furrows where it decomposes into manure. Interviews with Yiwiyi partnership, a farming group in Dschang (20/06/2020) revealed that on-farm composting is a common practice among resource-poor farmers who cannot afford municipal compost and operating mostly at the peri-urban areas. These groups of compost users have

adopted other practices such as collecting debris from waste collection points, using animal dung and wood ash. Family composting has equally been put in place by AMGED, especially in polygamous homes. At the moment, more than 20 family composting bins have been constructed and placed under the control of organized families.

At the level of the municipality, two composting platforms have been put in place; one in Nguì and the other in Siteu. The objective was to produce good quality compost and make it available to small scale farmers. This has encouraged many urban farmers and gardeners to use compost because it is readily available. The head of the municipal composting unit revealed during an interview (5/06/2020) that since 2015, the quantity of compost produced has increased from 60.3 tons to 543.78 tons per year in 2020 while the number of compost users have practically tripled within the same period. The introduction of agro-compost (25% fowl dung and 75% municipal compost) has increased the rate of adoption among small scale farmers as it produces yields within just a single farming season. Focus group discussions revealed that farmers who own land are likely to go in for municipal compost while those renting land have a tendency for agro-compost. This is because compost is a soil amendment that nourishes the soil and improves yields after a long period of time while agro-compost nourishes

the plants directly. Hence agro-compost is used for short-cycled crops.

### Compost sales promotion and technical assistance to compost users

The production of compost at the municipal platform attracts a cost which should be reflected in the price of compost. However, prices have been subsidized and compost sold to farmers at relatively low prices. Promotional campaigns organized by AMGED usually come up at the beginning of the planting season and communicated in the media and public gatherings. As ascertained by the head of compost commercialization unit (05/06/2020), the production cost of a 50kg bag of compost is approximately 4000fcfa but compost is sold to farmers at 2000fcfa. During promotional campaigns, the price goes down to 1500fcfa and farmers are communicated about the offer. To ensure proximity with farmers, AMGED have compost retailers all over the Sub Division. Compost from the municipal platform is given to them at a discount to sell to farmers after convincing them with practical examples on their own farms.

Technical assistance on compost applications is equally provided. AMGED have recruited agricultural engineers that accompany compost users in their farms and carry out demonstrations. Demonstration plots are equally created in different localities and farmer- field -schools are organized frequently. These fora enhance the effective transmission of basic principles and good practices in compost use. Besides, a simple-to-apply technical guide has been elaborated to enable farmers apply appropriate dosages for compost and agro-compost (Table 3).

Table 3: Technical guide on the application of municipal compost and agro-compost

Indicated Volume	Compost	Agro-compost
One 10 liters bucket	6kg for a linear hole of 6-8 meters	5kg for a linear hole of 12m
One 15 liters bucket	9kg for a linear hole of 9-11 meters	7.5kg for a linear hole of 15meters
Recommended Dosage	2.5kg per line/m	2kg per line/m
	4kg/m <sup>2</sup>	3.5kg/m <sup>2</sup>

Source: AMGED,(2020)

The compost valorization agent indicated that mastering the compost application guide have motivated farmers to adopt and use compost from the municipal platform. During an interview, the head of the compost valorization unit (06/06/2020) said « .....mastering the technical guide

and making farmers use appropriate dosage have improved on yields and increase the demand for compost... ». Farmers understanding of compost as a soil amendment with long term benefits and not a just a fertilizers has been successful thanks to efforts of the valorization unit.

### Transition to organic farming

In towns such as Dschang and Baffoussam, organic farming (use of natural manure and compost) is gaining importance and attracting many urban farmers and consumers. The questionnaire survey revealed that 23% of urban households do not consume vegetables cultivated with chemical fertilizers. Whether it is the influence of mood, social class or mere imitation, field findings have revealed that the trend is rising. The Delegate of Agriculture and Rural Development for Menoua (19/08/2020) stated that “*Dschang dwellers gradually understand the negative health consequences related to the consumption of chemical-fertilizer based products. From public opinion and the media, people have known that many emerging diseases have been attributed to the consumption of chemical fertilizer-based products and genetically modified plant and animal products*”. This awareness and desire to consume healthy have reduced the use of chemical fertilizers, increased the rate of adoption of compost and played an important role in the transition. Although more than 70% of urban farmers still use chemical fertilizers, the rate of selective application is on the rise. This practice consists of using different fertilizer types for different crops and at different growth stages. It was observed that market gardening crops such as huckleberry and other short-cycle crops are cultivated with organic manure while perennial crops such as plantains, tree-crops and long cycle-crops such as maize are cultivated with chemical fertilizers. More than 50% of mixed farm owners are from the lower class and consume mostly private compost or collect debris from waste collection points as revealed during the focus group discussions. In an interview (06/06/2020) the compost valorization agent working with AMGED acknowledged that sensitization against the practice of collecting debris from waste collection points into the farms has significantly increased municipal compost use in urban gardens.

The NGO GADD has equally played an important role in the transition. In efforts to promote biological farming and compost use, GADD developed a policy to encourage young people in this sector by providing support through what they call "incentive policy". The coordinator ( 10/08/2020) said “*any youth who sets up a 300m<sup>2</sup>organic farm is given five bags( 250kg) of compost, accompanied*

technically in the farm, trained on compost production techniques and assisted in the certification and commercialization of products". To ensure that the products are actually organic, they have set up a Participatory Guarantee System (PGP) that allows them to ensure the quality of their products and the respect of good practices in the production process. This has increased the rate of compost use significantly.

### Barriers for the adoption of compost-based farming

#### Poor mastery of application guide and inadequate experience with compost

During focus group discussions conducted on the 9<sup>th</sup> of August, 2020, compost users indicated that lack of experience with and knowledge about using compost and the non-mastery of technical guide are barriers for compost application among households. Household survey showed that 65% of compost users do not respect the dosage nor the application procedures outlined in the application guide. The guide prescribed application in three stages; 1. Construction of linear holes of 5 to 10 cm deep on the ridges, 2. Placing compost along the holes and covering with a layer of soil and 3. Watering for 5 to 7 days before sowing the seeds. Interviews with compost valorization agents (06/06/2020) revealed that most farmers simply spread compost on the surface of ridges without respecting either the dosage or the stages due to lack of knowledge. He said « *most small-scale farmers do not get the message. We recommend for example that they use between 10 and 15 tons per hectare but it is not respected* ». He added that differences in agronomic requirements for specific crop types and edaphic conditions in various farms, farmers have considered compost use challenging. For instance, a soil that is rich in nitrates (previously had nitrogen fixing crops) will require more compost than agro-compost. This is an aspect that makes compost use difficult among farmers because majority does not have such background information.

Inadequate experience with and knowledge of compost has made farmers to compare compost with other fertilizer types. Compost is a soil amendment and not just a fertilizer. Despite the proven long term benefits of compost to the soil and plants, many scale farmers are still reluctant to adopt it because they expect yields within a short period of time. Such farmers expressed dissatisfaction after using municipal compost as quoted « *.....I got the adverts on the radio talking about municipal compost and i bought four bags to try. I respected the procedures given us on how to apply it but frankly speaking, i am disappointed with the results. Bananas that i cultivated with the compost did not do well as compared with the one i cultivated with pig dung....* »

(Urban farmer, 19/08/2020). This attitude has discouraged many farmers from using municipal compost but has enabled some farmers to produce their own compost. Reacting to this, another compost user (21/08/2020) said « *.... We have been producing our own compost in the pit behind the house because i tried municipal compost three years ago and it did not do well. I bought only two bags to experiment and since then, i have not bought it again.....* ». The rate of dissatisfaction was reported to be higher among farmers renting land.

#### Stringent urban tenure system

The tenure system refers to the manner in which land is acquired and used in the urban space and the actors involved. The Dschang urban planification document of 2013 makes provision for urban agriculture but in practice; most of these spaces initially kept for agriculture are gradually being occupied by habitats and other infrastructures such as playgrounds, car parks and temporary markets. This practice which is done in complicity with the local authorities has negative impacts on urban agriculture and compost use. In conformity with the Cameroon Code of Urbanism, the construction of habitats and other urban infrastructure must occupy 60% of the total land space while 40% is kept for other activities. Although this provision does not really define the type of activity meant for the remaining 40%, it could be exploited for urban agriculture.

Compost use requires long-term investments and secured tenure systems. Following a household questionnaire survey, 38.5% of farmers bought the land they are farming on, 27% are renting, 11% inherited from their parents, 8.5% are care-takers while 11% were freely given to cultivate (Fig 2).

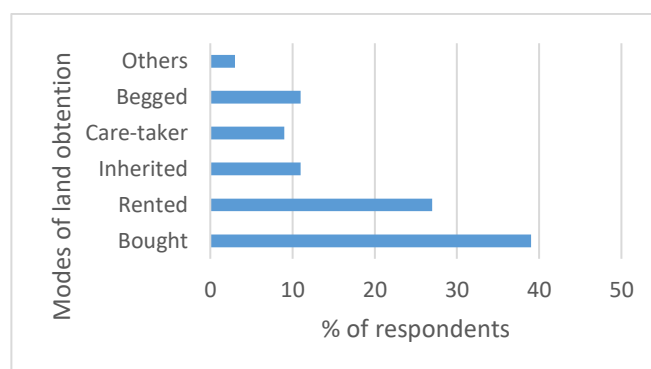


Fig.2: Mode of land acquisition

The buying of land in town is mainly for construction but those with more space always keep aside a portion for gardening. Most urban farms are plots that are awaiting construction and cultivation is just temporal. Owners of such plots either cultivate by themselves or rent them out



to those who express the desire. The renting price varies depending on the size of the plot, its location and on the negotiation between the rentee and the renter. In most cases, the agreements are verbal with no legal binding contracts. This has discouraged long term investments because those renting have no guarantee over land. For instance, the director of Yiwiyi partnership (13/08/2020) said « We rented a 3600m<sup>2</sup> piece of land but the landlord refused giving us a three year contract and accepted just a one year contract. This has prevented us from using only compost because the future of the farm is uncertain and investments in compost are expected to yield maximum profit in about three to four years of cultivation ». The is valid for the 11% who begged land to cultivate and the 4% cultivating on roadsides and other public spaces without any authorization. This tenure system shows that more than 50% of urban farmers are not the real owners of the land they cultivate. Their temporal and insecure occupancy status is a constraining factor for the adoption of compost use. Rentage is done without legally binding contracts and rights of users are usually abused as usage rights can be stopped without any prior notice and without considering previous and not-yet-yielding investments such as the application of compost.

#### **Difficulties in transporting and handling compost**

Compost is bulky and heavy. Field surveys revealed that households at the peri-urban areas wishing to use municipal compost are not certain about its availability when they need and also identified the high cost of transportation as a barrier. Interviews with the head of the compost commercialization unit of AMGED (05/06/2020) revealed that farmers who buy compost from the municipal platforms are transported free of charge to their farms but there is no transportation for small scale farmers who buy a few bags. He said « farmers who buy more than 10 bags (500kg) are assisted with transportation ». This encouraging strategy has not favored small scale farmers wishing to embark on compost use.

During focus group discussions, compost users were unanimous that due to the bulkiness of compost and the large quantities needed for use in farming practices, the high transport cost and bad roads limits the distribution and use of municipal compost. The cost of transportation of about 500fcfa per 50kg bag of compost has made it difficult for those at the peri-urban areas to adopt and use compost. One farmer (24/06/2020) said « the problem of getting compost to per-urban farms has negatively affected compost distribution and use among the resource-poor farmers. It becomes very expensive for them and they prefer mineral fertilizers which they consider profitable ».

The difficulties of small scale farmers in transportation compost, prompted AMGED to put in place compost retail points at the peripheries to ensure proximity with farmers. This was intended to boost compost use at the peripheries but discussions during the focus group revealed that compost is heavy and difficult to handle, it smells badly and bags constantly tear while in the store. They also mentioned that the reduction in volume and moisture content of compost during storage is a disadvantage. Retailers received complaints from compost users in which some are considering compost as unfinished products, unlabeled bags and any waste could be sold in place of compost, product not fine enough and doubts on the fertilization qualities of the product. The observation made after this discussion is that the current intermediaries or retailers do not know compost very well and are therefore not totally convinced about its goodness. This explains why farmers have strong affinity for agro-compost than compost.

#### **Institutional and policy limitations**

The production, distribution and use of organic amendments and mineral fertilizers in Cameroon are a sovereign responsibility of the Ministry of Agriculture and Rural Development (MINADER). Nevertheless, several other ministerial departments are involved in this sector such as the Ministry of the Environment and Nature Protection (MINEP), the Ministry of Commerce (MINCO), the Ministry of Health (MINSANTE) and the Ministry of Scientific Research and Innovation (MINRESI) and the Ministry of Finance (MINFI). The multiplicity of ministerial departments involved especially in the importation and commercialization of mineral fertilizers have led to inefficiencies through the duplication and waste of capital resources and poor enforcement of regulations.

In addition to these ministerial departments, there is a complex regulatory and judicial framework at the interface of environmental, agriculture and health issues and at different policy levels. Outstanding regulations include;

- The framework law N°96/12 of August 05, 1996, relating to the management of the environment;
- Law No. 2003/007 of July 10, 2003 governing the fertilizer sub-sector.

It follows from the framework law Order No. 0069/MINEP of March 08, 2005. This order provides carrying out an impact study in the event of the introduction of new fertilizers or new agricultural practices. The law of July in its chapter 3 reserved for the inspection and quality control of fertilizers provides in article 9 (1) that samples should be taken for laboratory analysis. It also provides that any fertilizing material

placed on the market must be effective, must be harmless to humans, animals and the environment. In addition, the new standard of the French Agency for Standardization [35] on organic amendments recommends a safety assessment of all raw materials used in the manufacture of organic amendments. These laws are not enforced in the field. The 2004 law on decentralization have created more complex and sometimes contradictory legislative landscape with conflicts of authorities. The director of AMGED (11/05/2020) ascertained that the institutional and policy sectors in charge of farm inputs in Cameroon have made compost unattractive despite efforts made by municipalities and NGOs. He added that policies have created disincentives for the adoption and use of compost.

The use of mineral fertilizer in Cameroon is high especially among large scale famers. Mineral fertilizers are imported and promoted at the local scale by agents of multinational companies in complicity with state agents. Interviews with an extension worker( 22/08/2020) revealed that between 1990 to 2001, fertilizer was subsidized at almost 50% but with the removal of subsidies in recent times, the government still considers mineral fertilizer as a zero-rate policy and cut import taxes. The production of compost is not encouraged at the national level. Rather than supporting municipalities using composting as alternative method of waste treatment, the Cameroon government has recently signed an agreement with the Chinese to mount chemical fertilizer plant in Douala. The plant is intended to produce 80,000 tons of ammonia and 130,000 tons of urea per year and could cover the annual consumption of Cameroon which is currently about 200,000 tons. Concluding on this, another fertilizer sales agent (22/08/2020) working with an international company that deals with chemical fertilizer said the Cameroon government have no good intentions in the promotion of organic fertilizers.

In addition to these disincentive measures of the government, the municipal authorities in have accused extension agents of the Ministry of Agriculture and Rural Development for discouraging compost use. The head of the compost commercialization agent (05/06/2020) reacting to this point saying *“despite our efforts in compost production and promotion, extension services are not helping us in the field. They are supposed to disseminate information on the availability of compost and schooled farmers on its use but rather, they cooperate with multinational firms and promote chemical fertilizers for personal financial gains”*. This is due to the non-enforcement of the above mentioned legislation and lack of accompaniment measures at the local level.

#### IV. DISCUSSION

Composting and compost use in urban farming is a long time practice in Africa even though it was not called as such. Given the evolution in composting techniques, knowledge systems and competences, new practices have emerged. The social practice theory have been used to study food consumption practices that produces waste [23, 24, 26] without looking at compost use as a practice that require specific knowledge-base, competences and materials. Attempting to bridge this knowledge gap, this work examined the opportunities and barriers for implementing compost-based urban farming in Dschang in order to inform policies and make practices sustainable. The economic, environmental and health benefits of compost have been sufficiently demonstrated[10,14, 36].

Findings have shown that compost availability at the municipal platforms, affordable prices, technical assistance provided to farmers and the transition to organic farmer have encouraged the adoption and use of compost. Effective Ccmposting and compost application requires appropriate techniques, materials and competences [13, 16]. The Dschang municipality produces about 600 tons of compost annually and has trained families on composting techniques. Compost application techniques and guidelines are disseminated by AMGED and GADD, a local based NGO but surveys revealed that 45% of farming households in Dschang do not respect such techniques but rely on local practices. Practices such as mixing compost with wood ash, mixing compost with animal droppings and on-farm composting along furrows have been identified. These associations have given a positive image to compost, promoted farmer-to-farmer diffusion of good practices thus increasing the rate of adoption in Dschang. Compost is sold to farmers at a subsidized rate of 2000fcfa per 50kg bag and 1500fcfa during promotional campaigns as an incentive to boost adoption. Studies by [36] demonstrated that increasing compost production in Cameroon had the potential to substitute mineral fertilizer use among urban farmers. Using an economic model, he opined that increasing compost production could save about 18.55% of the annual imported mineral fertilizer quantity and prevents close to 8.47% of annual import expenditure. The transition from conventional farming to biological farming in Dschang is powered by GADD. Organic farming defined by the Federation organization of organic agriculture movement [37, 38] as a production system that maintains and improves the health of soils, ecosystems and people have encouraged compost use in Dschang. The Participatory Guarantee System of certification for organic products put in place have been reported to have encouraged compost use in Cameroon[36] but the “natural without certification” that refers to

traditional practices with low use of inputs have promoted diverse composting options.

Despite the opportunities identified, this work evaluated barriers to the application of compost in urban farming. Barriers include; technical and informational, experience and knowledge, financial and transportation, land tenure, policy and institutional [16, 39]. However, local practices persist. For instance, resources-poor households have opted for on-farm composting by burying kitchen along furrows, using animal droppings, wood ash and so on rather than using municipal compost. The overarching challenge come from institutional and policy limitations. Law No. 2003/007 of July 10, 2003 governing the fertilizer sub-sector in Cameroon pay more attention to mineral fertilizer than compost while diverse institutions in the sector have created a confused legislative landscape. For example, using the case of Yaounde town in Cameroon,[36] revealed that the policy of decreasing the transport rate of compost could encourage farmers in the urban peripheries and villages to substitute mineral fertilizers with compost. It is thus evident that policies of popularization of compost can ensure sustainable practices.

## V. CONCLUSION

This article examined opportunities and barriers for compost use in urban farming under the lens of the social practice theory. Using a mixed method approach, findings revealed a number of opportunities and barriers that range from on-farm practices to policies and institutions. Compost in its diverse forms has a long time history in agriculture. Old traditional practices that required farming with very little input still persist in the peri-urban areas. Such indigenous knowledge systems and culturally-grounded social structures are important dimensions of the social practice theory. Since the year 2010, Dschang municipality for instance have embarked on a compost production project that have seen quantities increased from about 60 tons in 2013 to 600tons per annum in 2020. The provision of technical and material assistance to farmers, subsidization of compost prices have been identified as an incentive to compost use practices. Also, the emerging environmental and health crisis frequent among urban populations have motivated the transition from conventional type of farming that lay emphasis on mineral fertilizers to organic farming with use of compost. Organic farmers are accompanied by GADD and sustainable practices have evolved. Nevertheless, technical, experience and competences, knowledge, financial, policy and institutional barriers abound. Small-scale farmers with unstable and short term land occupancy status prefer

mineral fertilizers to compost. They tend to compare compost with mineral fertilizers from the yield perspective, neglecting the fact that compost is a soil amendment with long term benefits. The existing regulatory landscape has not promoted the use of compost and policies are limited. Hence, while encouraging the traditional farming practices with fewer inputs, policies and programs of compost popularization should be prioritized in the fertilizer policy of Cameroon.

## REFERENCES

- [1] World Economic Forum. Circular Economy in Cities: Evolving the model for a sustainable urban future, White Paper, 2018
- [2] Sotamenou J and Parrot L. Sustainable urban agriculture and the adoption of composts in Cameroon, International Journal of Agricultural Sustainability, 11:3, 282-295, <http://dx.doi.org/10.1080/14735903.2013.811858>, 2013
- [3] Cuneen G., Analysis of the Barriers and Opportunities for the Use of Compost in Agriculture, White Paper. Seven Generations Ahead, 1049 Lake St. Suite 200, Oak Park, IL 60303 708.660.9909, [www.sevengenerationsahead.org](http://www.sevengenerationsahead.org), 2018
- [4] Tendero M and Phung C. "The revival of urban agriculture: an opportunity for the composting stream", Field Actions Science Reports [Online], Special Issue 20 | 2019 <http://journals.openedition.org/factsreports/5682>, 2019
- [5] Bianchi F., Beek C., Winter D and Lammers,. Opportunities and barriers of circular agriculture. Insights from a synthesis study of the Food & Business Research Programme, 2020
- [6] Vincent A., Saravanan R and Bhattacharjee S. Urban Farming: Good Practices and Knowledge Management. Discussion Paper 4, MANAGE-Centre for Agricultural Extension Innovations, Reforms, and Agripreneurship (CAEIRA). National Institute of Agricultural Extension Management, Rajendranagar, Hyderabad - 500 030, Telangana State, India, 2018
- [7] Essougong U. Urban and peri-urban agriculture in Cameroon: Status and perspectives for development. International Journal of Agronomy and Agricultural Research, The International Network for Natural Sciences, 11 (3), pp.116-127, 2017
- [8] Wurff V., Fuchs G., Raviv M., Termorshuizen J. Handbook for Composting and
- [9] Compost Use in Organic Horticulture BioGreenhouse COST Action FA 1105, [www.biogreenhouse.org](http://www.biogreenhouse.org). ISBN: 978-94-6257-749-7, DOI: <http://dx.doi.org/10.18174/375218>, 2016
- [10] Ndambi A., Pelster E., Owino O., Buisson F and Vellinga T. Manure Management Practices and Policies in Sub-Saharan Africa: Implications on Manure Quality as a Fertilizer., 2019 Front. Sustain. Food Syst. 3:29. doi: 10.3389/fsufs.00029, 2019
- [11] Sagne Moumbe, J., Yemmafouo, A., Tsalefac, M. & Fapong, L. Municipal Solid Waste (MSW) Management Initiatives and Design of a Green Economy Strategy in the City of Dschang,

- Doi:10.19044/esj.2020.v16n14p12  
 URL:<http://dx.doi.org/10.19044/esj.2020.v16n14p123>, 2020
- [12] Preston P. A Wider Circle? The Circular Economy in Developing Countries. Briefing December 2017, Chatham House: Energy, Environment and Resources Department, 2017
- [13] Bodegem A. Circular Agriculture in Low and Middle Income Countries. Discussion paper. Food & Business Knowledge Platform, October 16, 2019
- [14] Kabasiita J., Malinga J., Odongo J and Opolot E. Factors influencing utilization of municipal solid waste compost among urban farmers in western Uganda. CABI Agriculture and Bioscience <https://doi.org/10.1186/s43170-021-00067-2>, 2021
- [15] Folefack A. The use of compost for the cultivation of foodstuff crops and vegetables in the villages surrounding Yaoundé (Cameroon): descriptive and production function approaches of analysis. Quarterly Journal of International Agriculture 46 (2007), No. 3: 221-239, 2006
- [16] Hofny-Collins A. The Potential for Using Composted Municipal Waste in Agriculture, 2006
- [17] Viaene J., Lancker V., Vandecasteele B., Willekens K., Bijttebier J., Ruyschaert G., De Neve S and Reubens B. Opportunities and barriers to on-farm composting and compost application: A case study from northwestern Europe. Waste Management 48(2016) 181-192, 2015
- [18] Moore, S. 'The Excess of Modernity: Garbage Politics in Oaxaca, Mexico', The Professional Geographer, 61:4, 426 — 437. DOI: 10.1080/00330120903143375, <http://dx.doi.org/10.1080/00330120903143375>, 2009
- [19] Njoh D., Feld, C., Seeger N., Ditttrich H., Karg E., Gawum A., Witte R., and Veenhuizen V. Urban and peri-urban agriculture in Bamenda: A Policy narrative, 2018
- [20] Ntangmo H., Temgoua, E. and Njiné, T. Le maraîchage urbain à Dschang: Exploration des sites de maraîchage et identification des pratiques culturelles, Dschang du 14 au 15 Mai 2009. Actes du colloque scientifique (CAFIOBIOS), 49-53, 2009
- [21] Aruna, G.; Kavitha, B.; Subashini, N.; Indira, S. An observational study on practices of disposal of waste Garbages in Kamakshi Nagar at Nellore. Int. J. Appl. Res. 4, 392–394, 2018,
- [22] Getahun, T.; Mengistie, E.; Haddis, A.; Wasie, F.; Alemayehu, E.; Dadi, D.; Van Gerven, T.; Van der Bruggen, B. Municipal solid waste generation in growing urban areas in Africa: Current practices and relation to socioeconomic factors in Jimma, Ethiopia. Environ. Monit. Assess. 184, 6337–6345, 2012,
- [23] Palczynski RJ. Study on solid waste management options for Africa. Project Report for the African Development Bank – Sustainable Development & Poverty Reduction Unit. Abidjan, Côte d'Ivoire; 2002
- [24] Corsini F, Laurenti R, Meinherz F, Appio F and Mora L. The Advent of Practice Theories in Research on Sustainable Consumption: Past, Current and Future Directions of the Field. Sustainability, 11, 341; doi:10.3390/su11020341, 2019
- [25] Breadsell J, Eon C and Morrison G. Understanding Resource Consumption in the Home, Community and Society through Behaviour and Social Practice Theories. Sustainability, 11, 6513; doi:10.3390/su11226513, 2019
- [26] Bissmont M. The practice of household waste minimisation, Environmental Sociology, DOI:10.1080/23251042.2020.1792264, <https://doi.org/10.1080/23251042.1792264>, 2020
- [27] Keegan, E. and Breadsell, J. Food Waste and Social Practices in Australian Households. Sustainability 2021, 13, 3377. <https://doi.org/10.3390/su13063377>, 2021
- [28] Shove E, Pantzar M and Watson M. The dynamics of social practice: everyday life and how it changes, London: Sage, 2012
- [29] Bodegom A. J. v., Middelaar J. v., Metz N. Circular agriculture in low and middle income countries: Discussion paper exploring the concept and 7 innovative initiatives. Food & Business Knowledge Platform. <https://knowledge4food.net/circular-agriculture-low-middle-income-countries>, 2019
- [30] Temgoua E., Ntangmo T., Njine T and Serve M. Vegetable Production Systems of Swamp Zone in Urban Environment in West Cameroon: Case of Dschang City. Universal Journal of Environmental Research and Technology, eISSN 2249 0256, [www.environmentaljournal.org](http://www.environmentaljournal.org), 2012
- [31] Corsini F., Laurenti R., Meinherz F., Appio F., Mora L. The advent of practice theories in research on sustainable consumption: Past, current and future directions of the field. Sustainability, 11(2), 341. <https://doi.org/10.3390/su11020341>, 2019
- [32] Hampton S. Policy implementation as practice? Using social practice theory to examine multi-level governance efforts to decarbonize transport in the United Kingdom. Energy Res Soc Sci. 2018
- [33] Legwegoh A., Hovorka A. J. Assessing food insecurity in Botswana: The case of Gaborone. Development in Practice, 23(3), 346–358. <https://doi.org/10.1080/09614524.2013.781128>, 2013
- [34] Spurling N., McMeekin A., Shove E., Southerton D., Welch D. Interaction in practices: Re-Framing policy approaches to consumer behavior. University of Manchester, Sustainable Practices Research Group. <https://research.manchester.ac.uk/en/publications/interventions-in-practice-re-framing-policy-approaches-to-consume>, 2013
- [35] Creswell, J. Research design: Qualitative, quantitative, and mixed method approaches. In: second ed. SAGE Publications, 2003
- [36] AFNOR. Qualité des sols, méthodes de prélèvement d'échantillon de terre. Norme Française Homologuée. 80p, 2006
- [37] Folefack A. The substitution of mineral fertilizers by compost from household waste in Cameroon: economic analysis with a partial equilibrium model. Waste Management & Research: 27: 207–223, DOI: 10.1177/0734242X08090403, 2009

- [38] Bayiha G., Temple L., Mathe S., Nesme T. Typologie et perspective d'évolution de l'agriculture biologique au Cameroun. Cah. Agric. 28: 3, 2019
- [39] IFOAM. Definitions: Ifoam. Disponible sur <https://www.ifoam.bio/fr/organic-landmarks/definition-organic-agriculture>, 2009