



Neglected Resource for Hunger and Poverty Alleviation - City Food Production.

Lovet Enow Ajebe

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Author: Lovet Enow Ajebe

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Abstract

Population growth and urbanization in Sub-Saharan Africa are facing the challenges of rise in food price and food provisioning. This growth is often accompanied by high levels of hunger and food insecurity leading to the engagement of city dwellers in farming activities. Much emphasis has recently been placed on the growing of basic foodstuffs in urban areas.

The empirical evidence presented in this study shows that urban agriculture is providing farmers with important food provisioning opportunities that would not otherwise be available. This was derived from a qualitative data collected from 24 urban farming households in Kumba municipality in Cameroon. Key informant interviews were carried out with the government delegate for agriculture and also questionnaires were sent to the farmers.

The result shows that urban agriculture has become an important source of fresh produce, employment and income to those carrying out this activity. However, this activity and livelihood is being threatened by a number of problems.

Furthermore, the results also show that this activity contributes to households' food supply but the magnitude in terms of utilization, availability, dietary diversity and financial contributions should not be overemphasized. Finally, there are a number of suggestions being made on how to improve this sector of the economy.

Language: English

Key words: Population growth, urbanization, urban agriculture,
Food insecurity, Hunger, Agricultural land use, Agricultural waste,
Sustainable management, Heifer International, Biochar Fund Trials

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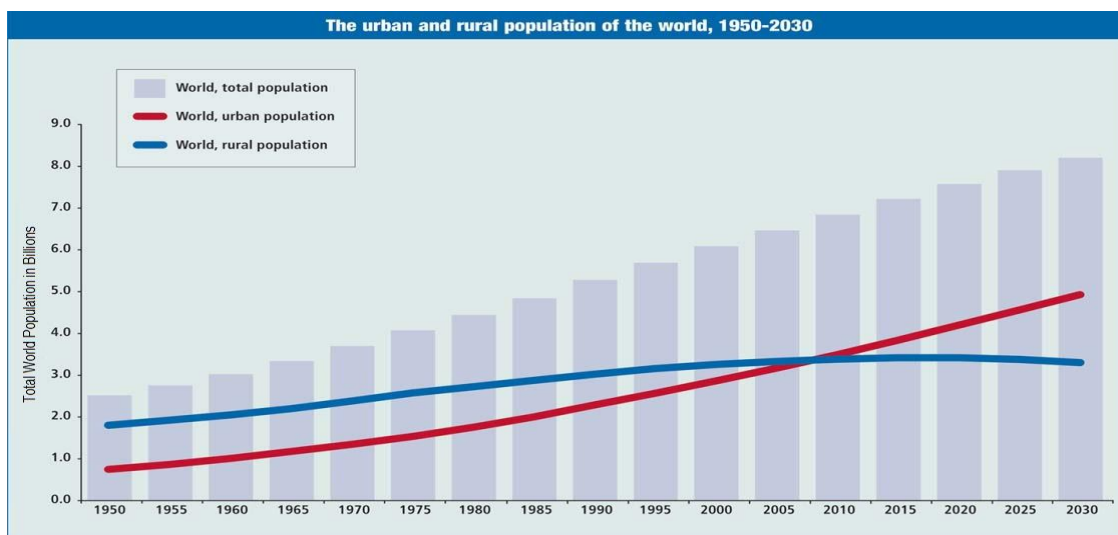
1. Introduction

With the recent and continuous economic growth around the world, Sub-Saharan Africa is still overwhelmingly rural, with 70% of its population living in rural areas engaged primarily in producing food for household consumption. However, this situation has changed rapidly with some cities in Sub-Saharan Africa (SSA) growing more than any other part of the world at an exponential rate of about 5% annually (Crush et al., 2006).

As the urban population will continue to increase due to a number of reasons, there is no doubt that this same population will continue to purchase large quantities of imported food from supermarkets. There is, therefore, an increasing concern about the urban poor; and as urbanization grows steadily, the locus of poverty from rural to urban settlements is slowly moving (Ambrose-Oji. 2009, p. 2). Since the current pace of urbanization is not unique in human history, the sheer magnitude of urban growth, driven by massive demographic shifts in the developing world, is unprecedented, and as such there are vast implications for human well-being and the environment (World Resource Institute, 2008).

It is true that cities generate a disproportionate share of a country's gross national product (GNP) and equally provides on average greater social and economic benefits to their inhabitants than their rural counterparts do. As a result of this, increased urbanization often correlates with a higher national income. As the urban population increases, there is the need to feed this ever growing population. Bangkok, for example, produces 40 % of Thailand's output according to United Nations Centre for Human Settlement (UNCHS, 2001b).

Figure 1: Urban and Rural Population in the world



Source: United Nations, Department of Economic and Social Affairs, Population Division (2006).

The present world population of 7 billion was attained in October 2011, United Nations Population Fund (UNPF, 2011). A world population of 7 billion people means and poses many challenges and countless opportunities to make positive differences. The UN-HABITAT (2006) reports that the percentage of urban residents in Sub-Saharan Africa is expected to rise from 30 to 47 % of the total population during the period of 2005 to 2030. There is, therefore, the concern of feeding the urban poor, many of whom have no permanent employment and limited access to resources.

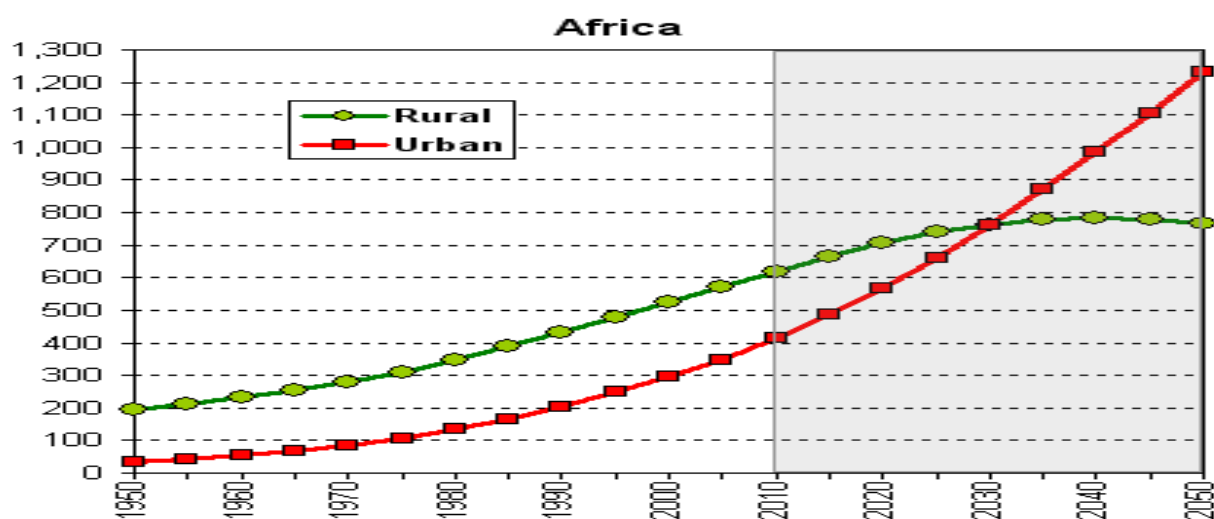
This will bring about new and critical challenges for urban development policy and municipal authorities as well as different ministries' concern especially in terms of ensuring household food security. It is acknowledged that, as the world's urban population grows, so does the population of the urban poor (Beall and Fox, 2007).

The Food and Agricultural Organization's (FAO) food price index of commodity prices surged 57 % between March 2007 and March 2008 after a 9 % increase in 2006. A study carried out by Baker (2008) also reported that the world food situation appeared to be in a crisis. Developing countries were particularly affected as the situation was paralleled by high food prices and low food reserves. He continued by saying Cameroon and many other countries were affected, riots and social unrest were reported in urban areas due to rising prices. In Mexico City, the 'tortilla riots' broke out in January 2007, as well as in early 2008 when 70, 000 people rioted against increased corn prices. In February of 2008

riots broke out in Burkina Faso in Bobo, Ouahigouya and Banfora in response to rising prices of food, clothes, and gasoline. Government buildings were destroyed and many people were injured. Protesters partly blamed the government's recent crack-down enforcing collection of custom taxes from merchants importing food, and partly the rising of global wheat prices. In Cameroon a few days later riots broke out instigated by taxi drivers over fuel prices that escalated into a protest against food prices followed by riots in Senegal and Mauritania.

It is estimated that all countries will somehow be affected, although those, whose economies are less integrated in the global economy, will be somewhat less affected (Baker, 2008). Generally speaking, the principles of designing policies and programs for addressing shocks do not differ from the rural and urban poor. Well designed, targeted safety nets can cushion the impacts on the poor and enable households to maintain a basic standard of living and social unrest. Finally, there is enormous evidence that urban agriculture can also help to mitigate the impacts of crises through the production of additional income and food for households (Dr Stamoulis, 2011).

Figure 2: Trends in Urban and Rural Populations, in less developed regions, 1960-2030 (estimates and projections).



Source: United Nations Population Division. 2007. World Urbanization Prospect: The 2007 Revision Population Database.

1.1 The aim of this study

The aim of this study is to find out how urban agriculture contributes to poverty alleviation and also to meeting food security in Kumba, the Southwest Region of Cameroon.

1.2 Objectives

The objectives of this thesis are:

- to find out if urban agriculture helps in improving the income level of households involved and if it reduces unemployment
- to assess if gardeners engaged in urban agriculture are benefiting from their activities and what their opinions are
- to assess what is being done in mitigating the health and sanitation problems caused by wastes from the animal farms and the use of chemical fertilizers
- to assess the economic factors contributing to food insecurity.

1.3 Significance of the study

The study shows that there is a need for a greater efficiency in managing land for urban agriculture in cities. The study shows that space provisioning for urban agriculture is vital in meeting food security in developing countries. Today, due to the growing scarcity of land for agriculture in cities of the world and due to population increase, it is of great importance for city planners and municipal authorities to consider various factors of land use and land management in cities in their strategic planning and designing phase. An important feature of land used for urban agriculture in cities is that it acts as a recycling machine, since waste from the animal farms is being used in the gardens as manure and these gardens in turn provide food for the animals, it also acts as a microclimate regulator. Thus, there is the continuous flow of nutrients.

2 Growth assessment of cities and some consequences

2.1 Urban growth in some Sub-Saharan African nations projected trends

The United Nations has predicted that by the year 2030, the number of city dwellers will reach 60% of the world's population. This urban population growth will be most significant in low income countries, notably in Africa and Asia. Also, within and among the African nations, East Africa will experience total urban population growth rates significantly higher than the African average (UN-HABITAT, 2008). African cities such as Antananarivo, Addis Ababa, Kampala, Nairobi, and Dar es Salaam are already ranked among the 31 fastest growing cities and urban areas in the world (see table 1).

Table 1: Fastest Growing Cities and Urban Areas (1-31).

Rank	City/Urban area	City Population (2010)	Metro population (2010)	% of total urban population in the country in 2007	Country	Average annual growth (2006-20), in %
1	Beihai	1,420,000 (2006)	-		China	10.58
2	Ghaziabad	970,000	-		India	5.20
9	Dar es Salaam	2,498,000	2,700,000	29%	Tanzania	4.39
13	Kampala	1,420,000	1,600,000	35.9%	Uganda	4.03
18	Nairobi	3,13,000	3,300,000	37.7%	Kenya	3.87
20	Antananarivo	903,000	1,403,000		Madagascar	3.73
25	Maputo	1,244,000	1,640,000		Mozambique	3.54
31	Addis Ababa	3,385,000	4,568,000	22.5%	Ethiopia	3.40

Source: <http://www.citymayors.com/statistics/>

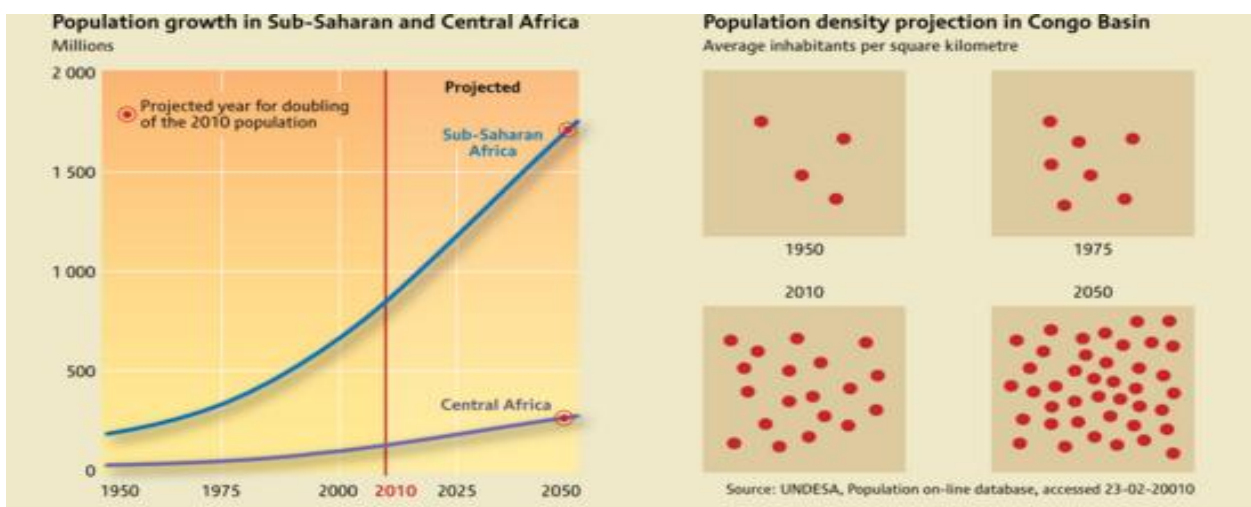
It is true that these capital cities will continue to host a larger part of the urban population but smaller urban areas should also be taken into consideration, since they are also bound to rapidly changing conditions. According to the UN-HABITAT (2008), East African cities with less than 500,000 inhabitants are now absorbing about two-thirds of all urban

population growth. Therefore, the governments of these countries need to prepare well for this coming growth. There is the need to provide services for both the smaller and the larger cities, plan for their expansion when needs arise and, of course, use their resources in a sustainable manner as well as deliver to these cities the essential services required.

2.2 Sub-Saharan African and population growth

As populations are rapidly rising in the Greater Congo Basin, so is the pressure on land and natural resources in general. Soil fertility is also collapsing in many African Nations. The Congo Basin, and the Central African Region general are experiencing an extremely high rate of habitat degradation, fragmentation and destruction, and the urban communities in these regions are facing food shortage and hunger crisis.

Figure 3: Population growth in Sub-Sahara and Central Africa and population density projection in Congo Basin.



Source: UNDESA, Population on-line database, accessed 23-02-2010.

2.3 Urban poverty, food insecurity and urbanization

The urban poor in many parts of the world, Sub-Saharan Africa in particular, are vulnerable to variations in food and fuel prices, and also in income levels, since the food prices (often over 60 %) and the fuel price (often more than 10 %) make up a larger part of the household expenses. According to Baker (2008), it is estimated that the rise in food prices between 2007 and 2008 increased the number of people living in extreme poverty in urban areas in East and South Asia, the Middle East and Sub-Saharan Africa by at least 1.5 %. Even though some countries in Sub-Saharan Africa have had an improvement in the food security situation during the year 2009 to 2010, almost half of the region's population is still food-insecure.

The urban growth in combination with limited employment opportunities in most cities in the world is a leading factor to a more rapid increase in poverty in urban areas than in rural areas. In several Sub-Saharan African Nations, the share of unemployment and poverty in cities even exceeds 50 % and Africa's urban slum population continues to grow.

Approximately 50 % of the households in Kampala and Nairobi, 65 % in Dar es Salaam and 69 % of all households in Addis Ababa are slum households (UN-HABITAT, 2008).

It is true that most of the African countries are highly dependent on imported food. This concerns especially the low income countries with their limited foreign exchange reserves, meaning that any changes (increase) in the prices or decline in their export earning is going to cause a decline in food import, thus causing a further deterioration in food security, and hitting the urban poor first.

According to FAO (2010), the food security benefits of engaging in urban agriculture materialize mostly through better access to additional and more nutritious food. The report further explains that urban households engaged in farming activities tend to consume greater quantities of food, sometimes as much as 30 % more. They also seem to have a more diversified diet, as indicated by an increase in the number of food groups consumed.

A relatively higher consumption of vegetables, fruits and meat products translates into an overall higher intake of energy as well as higher calorie availability.

Most of the African nations today are dependent food aid recipients as well as food importers, due to the fact that some imported food like rice is even cheaper than local food. Some 11 Sub-Saharan African countries had an imported share of the total grain supplies which is equal to 45 % of the consumption between the years 2005-2006. The import share also ranged between 30-50 % in seven countries. In some countries like Ethiopia, Tanzania, Uganda, Madagascar and Kenya the imported food including their basic staples, such as grains and vegetable oils, which are considered as important components of urban food supplies, are projected to rise towards 2020 (USDA, 2010, Marielle and Margaret, 2010).

Table 2: Projected grain imports 2010-2020

Country	Commercial grain imports in 1,000 tons	
	2010	2020
Ethiopia	28	48
Kenya	1,6229	1,771
Madagascar	256	276
Tanzania	949	1,624
Uganda	271	439

Source: USDA (2010), Economic Research Service, using data from FAOSTAT, UN Food and Agriculture Organization and World Food Program, Rome.

3 Urban agriculture

Mougeot (2005, p. 2) defines “Urban agriculture as an industry located within (intra-urban) or on the fringe (peri-urban) of town, an urban centre, a city or metropolis, which grows or raises, processes and distributes a diversity of food and non-food products, (re-) using mainly human and material resources, inputs and services found in and around that urban area, and in turn supplying human and material resources, outputs and services largely to that urban area.”

From the definition, this industry (urban agriculture) does not only deal with gardens and farms in an urban environment but also relates to other activities such as water management, organic waste management and rearing livestock. Urban agriculture is actually an old practice in many parts of the world as a culture and tradition, especially in African cities since ancient civilization, but the situation has changed with modern civilization due to various reasons and needs. Today, it is considered an important source of income, better health and nutritional value, livelihood and an employment opportunity employing hundreds of thousands of individuals (UNDP, 2006).

Urban agriculture is growing food for urban markets in close proximity to where a community of people lives. According to RUAF (Resource Centre on Urban Agriculture and Food Security), urban agriculture is not a relic of the past that will fade away (urban agriculture increases when the city grows) nor brought to the city by rural immigrants that will lose their rural habits over time. It is an integral part of the urban system. It is true that the potentials for urban agriculture are largely untapped and undervalued, but it is currently a large industry of many small, medium-sized and large scale farms. Intensive urban agriculture can yield several times as much produce per area as rural agriculture (RUAF.org). Lots of names are today given to urban agriculture such as: city farming, city gardening, vacant gardening, rooftop gardening, peri-urban agriculture, community gardening, container vegetable gardening, and portable gardening.

Cities in developing nations are growing faster than cities in developed nations. Between now and the year 2030, nearly all population growth will be in cities of developing countries, where some cities are actually growing two or three times faster than the country's overall population. This trend is equivalent to adding a city of one million residents every week (UN-HABITAT, 2004).

Urban agriculture varies between countries and even within countries. According to UNDP (1996), urban agriculture is dominated by small producers achieving food security and earning income for their families. In many countries (like the US and Argentina) farmers

are average income family gardeners using their own backyards to improve the quality of the food they eat. Their motives are cultural or nutritional, not usually economic. In many developing nations, most farmers are low income groups trying to supplement their meager food supply. Many of these farmers do not own the land they cultivate (UNDP, 1996).

According to UNDP (1996), 800 million people are involved in urban agriculture worldwide and contribute to feeding urban residents. In the US, 25 % of the urban families work in food gardens or horticulture and in Kenya 67 % of urban families farms (80 % of which are low incomes) on urban or peri-urban sites (UNDP, 1989, p.55). In Kathmandu, Nepal, 37 % of the households raise horticultural crops and 11% raise animals, which is similar in Moscow, Russia, where 65 % of the families were engaged in agriculture in 1991 as compared to only 20 % in 1970 (UNDP, 1996).

In peri-urban areas, production is often intensive and commercially oriented, and farming within cities generally occurs on a small scale. The activity is commonly practised on public and private fallow spaces, wetlands and underdeveloped areas. It is also found on lands designated particularly for agriculture. Urban agriculture is informal in many countries and sometimes even illegal, there is frequent competition for land and it usually results in a conflict. Other problems include the environmental impact of urban agriculture and food safety concerns particularly relating to livestock production.

3.1 Previous research and theoretical frame work on urban agriculture

According to the UNDP “Urban agriculture is an easy-in, easy-out entrepreneurial activity for people at different levels of income. For the poorest of the poor, it provides good access to food. For the stable poor, it provides a source of income and good-quality food at low cost. For the middle-income families, it offers the possibility of saving and a return on their investment in urban property. For small and large entrepreneurs, it is a profitable business.”(UNDP 1996, p.4).

The history of urban agriculture began in the urban process of all ancient world civilizations. According to Jr (1996) “intensive food production is what allowed societies to create cities and civilization.” He continued by saying intensive farming abutting the city was essential to the forming and maintenance of the city and evidence of urban agriculture has been today found in countries like Ghana, India, Mexico and Peru.

Africa is actually a region, where a great deal of documentation about urban and peri-urban agriculture is available. One of the first books on urban agriculture published by Williams Rees’ “Cities Feeding People: A growth Industry” (1994) provides more current information about urban agriculture. For him, urbanization has distanced people spatially and psychologically from the land that supports them. After this publication, several authors like Smit (1996), in his book “What the World Would Be Like in the 21st Century if Cities Were Nutritionally Self-Reliant” he points out that in both rich and poor countries, cities are *de-densifying* (decline density in cities due to communication and transport technology). He says the industrial gridirons and core corridor structure of urban patterns are being replaced by a “nodes and links” network. In this book Smit simplified the positive relationship between urban agriculture and resources in three ways:

1. That some urban by-products, waste water and organic solid waste can be recycled and used as usable resources.
2. Idle lands and bodies of water in cities can be converted into intensive agriculture production.
3. Some conservation of national resources in energy for transportation and refrigeration can occur due to the proximity of urban agriculture to the consumers (Smit, 1996).

Other authors like Mougeot and the Agropolis Network have done a lot of work and research on urban agriculture both in Africa and the world. According to Luc J. A. Mougeot (1999), the first publication of (intra- and peri-) urban agriculture on Central Africa was published in the 1960s by the French and he continued by saying since then scattered and isolated urban agricultural surveys by individual social scientists (e.g. Egziabher et al, 1994) have gradually been giving way to institutional projects led by multidisciplinary teams.

Today, more and better information on urban agriculture is now available on several regions (FAO/UNEP, 2010), countries and cities around the world. Several international and national organizations with a handful of pilot projects by donors' institutions like the World Bank, World Food Program (WFP), the Food and Agricultural Organization of the United Nations (FAO), United Nations Population Fund (UNFPA), International Food Policy Research Institute (IFPRI), United Nations Development Program (UNDP), the International Development Research Center (IDRC), United Nations Agency For Human Settlements (UN-HABITAT) are providing data on digital agriculture maps, through research, reports, technical support and project funding, other publications with the help of geographical information systems (GIS), (UNDP, 1996, Murphy, 1999).

Even though these international agencies and governments with several non-governmental organization (NGOs) both at national and international levels have been in support of urban agriculture, and their efforts on these activities in less-developed nations as far back as the 1970s and with diverse inventories and publications (Smit 1996; on Canada: Lifecycles 1998 and Wade 1987). The NGOs have been more active in participation in Latin America and the Caribbean than Africa and Asia (Prudencio, 1997), where more NGOs that were originally traditionally focusing on rural development are now extending into urban areas.

In countries like Zimbabwe, and in the city of Harare, NGOs such as ENDA-ZW have been seeking the collaboration of government actors to upscale the local urban agriculture interventions. This is also the same with the CEARAH-Periferia in the metro Fortaleza in Brazil, CARE Haiti in Port-au-Prince, Haiti, FUNAT in Havana, Cuba, REDE In Lima, Peru and Heifer International, Kumba, Cameroon with few evaluations available on NGO initiatives in urban agriculture and more needed to be done in future in collaboration with other sectors and actors. (Chauca, 1999, Regis, 1999 and Mougeot, 1999b).

Stix (1996) in his research paper issue of Scientific America; "Urbaculture: Cities of the Developing World Learn to Feed Themselves". He points out that urban agriculture is the

opposites of and countering to the fragility of single crop agriculture. He listed potatoes grown in stacked tires in Mexico City, cactus, which are both food and cash crop, raised in yards, patios and on rooftops, rooftop compost beds, and fish co-ops using treated sewer water, as incubating and maintaining diversity (Stix, 1996). Most of the publications in urban agriculture after 1996 are due to the interest and the report from the Habitat 11 UNDP Report of 1996.

3.2 Benefits and problems of urban and peri-urban agriculture

As with other natural and scarce resources, urban land for agriculture in the world, and in Sub-Saharan Africa in particular, a scarce resource is in demand for various uses. Urban agriculture is in competition today with other forms and types of urban development that are all beneficial and benefiting the society. Looking at the present competition for land in the world today, there is the need to evaluate which projects are most favored and which are not by using cost-benefit analysis (CBA) framework.

For this reason, land that is ideal is best located for the use that yields the highest difference between benefits and cost. This is what is called a cost-efficient choice (Pearce, 1993). Unlike before, the concept of cost-efficiency with regard to land use within cities was only limited to a number of parameters reflecting just the economic impacts, like job creation and production cost or income, but today other impacts such as environmental impacts, population displacement and social impacts are considered (Hanley and Spash, 1993). There it is questioned which the benefits are of “preserving a wilderness area rather than using the trees for lumber”, and that it is thus assumed that the benefits of wilderness are not only economic, but social and environmental as well.

3.2.1 Social benefits

Urban agriculture does much more than just feeding cities. It increases the recognition of it as a possible solution to many of the problems associated with urbanization and current agricultural practices in urban areas, it entrenches food production into the community and also tackles a number of societal needs, such as healthy food, healthy land and healthy

social relationship (Kakaliouras, 1995, in Sumner et al., 2010, p.58). Socially, urban agriculture builds up a sense of belonging to the community, it also serves an educational purpose, helps in improving the health situation of individuals and increases food security (Sumner et al., 2010). As the population in cities increases, the cities also become bigger in size making the food and transport chain become more and more complex and costly due to outsourcing products from far and wide (Pearson, 2010). Therefore we need a food system more than ever before that will help in protecting land-based assets and the whole life support system that depends on it.

Urban agriculture is seen today as a re-emergence all over the world with community initiatives, initiating the social values-based phenomenon. This is true due to the recognition of social, economic and environmental benefits. The fact that people increasingly want direct contact with the food they eat (Christensen, 2007) as well as the present growing demand for regional and local food (Mason and Knowd, 2010). Through urban agriculture projects such as a Peace Corps project in the Dominican Republic, youths have not only learned to achieve a stable income but also to become accountable for the environmental well-being and food security of their communities (Smit et al., 2001).

According to Condon et al., (2010, p.117) urbanization has the potential to promote `interactivity, education, social advances and global human awareness and equity if applied appropriately. Urbanization educates people who have been increasingly removed from food production to participate in it and respect its generation. Social learning and participatory approaches between farmers and different projects have also been a key to success in sustainable urban agricultural projects (Pretty and Hines, 2001, p.16). The participatory methods have been very useful in countries such as Uganda (the Kampala case) which is presented in the book “Healthy City harvest: Generating evidence to guide policy on urban agriculture”. Cole et al. (2008, p.38) says the participatory approach is being suggested to be more efficient and effective than any other methods, such as the top-down implementation method, and thus creating social capital and empowerment.

Gender-neutral policy measures are good but not enough because gender-neutral policies are often simply ‘gender-blind’ (i.e. lacking awareness of distinctions of gender or refusing

to acknowledge gender). Education by means of training programs on new farming techniques, such as application of farm chemicals focusing on female gardeners, is a possible gender-sensitive policy measure (Ngome and Foeken, 2010).

This activity also makes people stronger by bringing families and communities together by putting their food security into their own hands, making them more independent and empowered. However, without serious innovation (especially in less developed nations) urban agriculture has tended to do the opposite, providing significant environmental and social challenges (Condon et al., 2010).

3.2.2 Government tools

There are three sets of measures that must be taken by the government in collaboration with other stakeholders in order to help deal with the present situation. Some possible solutions might include:

- 1) Creating and enabling productivity, production in agriculture as well as investing in the appropriate infrastructure research and other public goods, which farmers need to produce more and more productively.
- 2) Governments should avoid taking unilateral trade measures like export bans or export restrictions which aggravate the situation on international markets. Then the price becomes more volatile and higher.
- 3) Governments should be more transparent and coordinated (Dr Stamoulis, 2011).

3.2.3 Environmental and health benefits

It is true that low-income countries in Sub-Saharan Africa are experiencing rapid urban population growth and unmanaged expansion that are degrading the environment of not only the towns and cities but also their surrounding regions. The results are polluted air, water and soil erosion, diminishing biodiversity and increased vulnerability to disasters such as floods (Jac et al., 2001).

A study carried out by Mougeot (2005) indicates that 26 researches carried out in Sub-Saharan African countries show that families, who are practising urban agriculture are

having more meals and food security, their children are healthier with better nutritional status and having a more balanced diet all around the year compared to families who are not participating in urban food production. Farming in and around urban areas can not only reduce the negative environmental impact faced by these urban growth areas but can also improve the urban environment in a number of ways, such as improved water quality, microclimatic modification, reduced temperature, improved air quality, reduced vulnerability to diseases, landscape enhancement, sense of well-being, sites for physical exercises and habitat for wildlife (Ishii, 2004).

Several researches on urban agriculture have been carried out in countries like Cuba. Research on urban agriculture in Havana, Cuba shows that gardeners have had a sense of control of their life and also an improvement in gardening which account for relaxation and food security for the future. It is also an important source for residents who have migrated from rural areas to continue with their farming lifestyle and skills in cultivating different crops (Moskow, 1999).

Gardening and food production either for commercial or for subsistence purposes are good exercise. Several health professionals use plants and gardening materials to help patients of different age and with a mental illness improve social skills, self-esteem and use of leisure time. Horticulture therapy promotes plant-human relationship to induce relaxation and to reduce stress, fear and anger, blood pressure and muscle tension (Anne et al., 2005).

Some recommendations by health professionals are to:

- usually advice patients to cultivate a healing garden on idle land at their department or facility
- encourage patients and clients to shop at farmers markets wherever available
- introduce the subject of public health and urban agriculture in our school/professional associations
- work with local planners and policy makers to establish urban agriculture opportunities.

Other environmental benefits of urban agriculture include the reduction of topsoil removal during heavy storms and the help in cleaning the air and rain water. Urban agriculture has a direct impact on the urban ecology, and it also facilitates the reuse of water for food production. Biodiversity also reduces storm water runoff (at hard surfaces) and flooding. It also closes the nutrition cycle which means less waste and less transport (Bodlovich, 2001).

According to the UN/WWAP (2003) and WHO (2004a) report, the health impact of poor water supply, sanitation, food services and water related diseases on developing countries is devastating. In order to cope with the high food prices some families end up selling their assets for food or cutting down medical and educational expenditures. Children, who may be deprived of basic nutrients in a very sensitive period of their life, may have long-term physical or mental problems, that is, a short-term price rise may have a lot of negative impacts on many families. Close to half of the populations in the developing world are suffering from one or more diseases associated with poor water quality and sanitation services such as diarrhea, ascaris, (guinea worm), schistosomiasis (bilharzias, or snail fever), dracunculiasis and trachoma. Also, more than half of hospital beds in the world are filled with people suffering from water-related diseases (UN/WHO, 2004a).

Developing countries account for 98 % of the world's undernourished people. Two-thirds live in only seven countries (Bangladesh, China, the Democratic Republic of Congo, Ethiopia, India, Indonesia and Pakistan) and over 40 % live in China and India alone. Estimates for 2010 indicate that the number of undernourished people will decline in all developing regions, although with a different pace. The region with most undernourished people continues to be Asia and the Pacific, but with a 12 % decline from 658 million in 2009 to 578 million, this region also accounts for most of the global improvement expected in 2010. The proportion of undernourished people remains highest in sub-Saharan Africa, at 30 percent in 2010. Adequate hygienic behaviors, safe disposal of faeces and food handling are fundamental to health because the main culprit in the transmission of both food and water related disease is the "fecal-oral" cycle (Roberto et al., 2005). Food, water and sanitation practitioners have a mnemonic device to describe the factors that fuel this destructive cycle. They refer to it as the "Five Fs" (UNDP, 2004):

- Food: eating contaminated food presents the same health risks as drinking contaminated water, and careful food handling is the key of combating gastrointestinal illnesses.
- Flies: they are responsible for the spreading of diseases from faeces to food and water or directly to people.
- Faeces: the contamination of water, food and soil with human fecal matter much. Sanitation facilities will interrupt the transmission of much fecal-oral diseases by preventing human fecal contamination of water and soil.
- Fluid: drinking contaminated water transmits waterborne fecal-oral diseases such as cholera, typhoid, diarrhea and viral hepatitis A.
- Fingers: proper washing of the hands and fingers are fundamental in preventing easy transmission of pathogens to the body.

3.2.4 Economic benefits

The economic benefits due to urban agriculture are usually classified under two categories, the direct and the indirect benefits. Mitchell and Carson 1989, p.62 (Henn, 2000) defined the direct benefits as those that may arise from the productive use of the land, making possible the cultivation of fruits, vegetables and animal breeding. The indirect benefits were defined as those arising from the non-productive use of the land, such as when users consider their urban agricultural activity as a hobby, or use their garden for relaxation or for the maintenance of good health. Another indirect benefit that occurs within the urban agriculture is the sense of food security and independence of growing one's own food for one's household. Although this is related to direct benefit, this benefit refers to a state of mind, rather than the physical quantity of food one can produce on their land. We also have the non-use benefits that (Lazo et al., 1997) divided into three parts, i.e. the existence value, bequest value and altruistic value.

The existence value here is simply the value an individual, user or non-user places on the fact that urban agriculture exists independent of who and how many persons actually derive utility from the good. The bequest value is the value that is placed on knowing that urban agriculture will be available and will provide utility for the future generation. Finally, we have the altruistic value, which is the value placed on knowing that other individuals have access to and use land for urban agriculture.

Table 3: Summary of Use and Non-use value of Urban Agriculture:

Total Economic Value of Urban Agriculture

Benefit Class	Value Category	In Urban Agriculture
Use	Direct Use Value Indirect Use Value Option Use Value	Crops Recreation and Health Benefits Future Use of Land
Non-Use	Existence value Altruistic value Bequest value	Knowing Urban Agriculture is part of city Landscape Knowing others gain utility from Urban Agriculture Knowing that future generations will have access to Urban Agriculture

(Source: Mitchell and Carson, 1989)

It is true that urban and peri-urban agriculture expands the economic base of cities through production, processing, packaging and marketing of consumable products. Urban agriculture contributes to household income and includes income through the sale of urban agricultural produce, and saving by not purchasing food their produce (Kutiwa et al., 2010). The economic benefits from urban agriculture include the total income earned from urban agricultural production and how the households used their income. Urban agriculture often exploits unused resources in the city such as wastewater, solid waste, vacant lots, bodies of water and rooftops. It puts idle land to productive use either by paying competitive rent or through usufruct uses, and maintains the land in good condition for the owner (Smit et al., 2001).

Unfortunately, within most Sub-Saharan nations, there is a lack of political will in policy and planning strategies that will help promote urban agriculture, and for these reasons, urban agriculture largely remains a community implemented and initiated strategy (Merson et al., 2010). Several nations in the Sub-Saharan African region have stated that these problems might be as result of land use conflict, economic driven urban development, the urban-rural division, policy barriers, privatization, globalization, social misconceptions, mismanagement, corruption, neoliberal reforms and profit driven food industries (Merson et al., 2010). Concern is expressed about society, whether people care enough about these issues to resist the conveniences of the supermarket or just make them political issues (Merson et al., 2010).

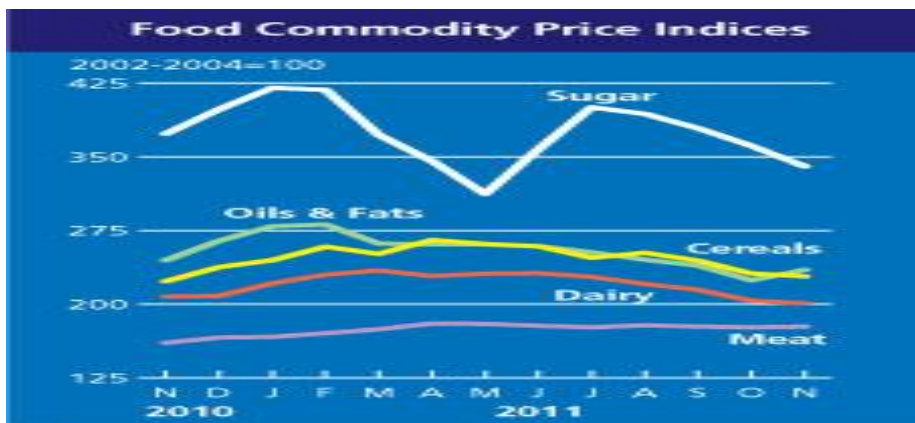
Other economic benefits due to urban agriculture are the creation of jobs and income to individuals who were unemployed, and the transformation from an unproductive to a productive space or land. Urban agriculture also creates a better local economy that does not rely on food from far away areas and can be beneficial to people of all walks of life and income class .It thus also makes use of available resources such as compost that would otherwise go to waste in the city.

3.2.5 The effect of food price trend in Sub-Saharan Africa

The FAO Food Price Index is a measure of monthly changes in international prices of food commodities. According to Dr Stamoulis (FAO's Economic and Social Director), after more than 40 years of relatively stable and declining food prices in most cases, the world has experienced two violent rises in food price, one in 2006-08 and another in 2010-11 with a drastic decline in-between. Prices in February 2011 as expressed by the FAO food price index have reached their historical heights, these prices are not only relatively high, they are extremely volatile, which means there are characterized by highly predictable changes (Dr Stamoulis, 2011).

Figure 4: FAO Food Price Index





World Food Situation: FAO Food Price Index. Food and Agricultural Organization of the United Nations 08/12/ /2011.

3.2.6 Contribution to Millennium Development Goal (MDG) 1: Hunger target

The latest available statistics indicate that some progress has been made towards achieving MDG 1, with hunger declining from 20 % undernourished in 1990–92 to 16 % in 2010. However, with the world’s population still increasing, a declining proportion of people who are hungry can mask an increase in the number. In fact, developing countries as a group have seen an overall setback in terms of the number of hungry people (from 827 million in 1990–92 to 906 million in 2010).

As of 2005–07 (the most recent period for which complete data are available), the Congo, Ghana, Mali and Nigeria had already achieved MDG 1 in sub-Saharan Africa, and Ethiopia and other countries were close to doing so. In Asia, Armenia, Myanmar and Viet Nam had achieved the target reduction and others were coming close, including China. In Latin America and the Caribbean, Guyana, Jamaica and Nicaragua had succeeded in reducing the prevalence of hunger by half and Brazil, among others, was approaching this objective.

The fact that nearly a billion people remain hungry even after the recent food and financial crises have largely passed indicates a deeper structural problem that gravely threatens the ability to achieve internationally agreed goals on hunger reduction. In order to tackle the root causes of hunger, governments should encourage increased investment in agriculture, expand safety nets and social assistance programmes, and enhance income-generating

activities for the rural and urban poor. High prices are good for agricultural producers, it is an opportunity for them as they will have the incentives to produce more. The problem there is in order to produce more, farmers or producers have to have access to market, inputs and infrastructure in order to be able to improve, increase and respond to these high prices (Dr Stamoulis, 2011).

The most vulnerable people in urban areas can be guaranteed with protections. Safety nets, targeted measures can be introduced to help protect the very poor and also other measures to combat risks because the measure factor which impacts the ability of farmers to produce more is risks, volatile prices create risks and farmers will not want to invest on such a situation (Dr Stamoulis, 2011).

4 Study area Cameroon

4.1 General information about Cameroon

4.1.1 Geography

Cameroon is geographically situated on the Western coast of Africa, bordering the Bight of Biafra, between Equatorial Guinea and Nigeria. Cameroon is bordered to the west by the Gulf of Guinea, to the northwest by Nigeria, to the northeast by Chad (with Lake Chad at its northern tip), to the east by the Central African Republic and to the south by Congo-Brazzaville (Republic of the Congo), Gabon and Equatorial Guinea. The size of Cameroon is approximately 475,440 square kilometers of which 469,440 square kilometers is made up of land, 6,000 square kilometers is water bodies and a coastline of 402 kilometers (CIA-The World Fact book 2011 and Ministry of Economy, Planning and Regional Development (MINEPAT, 2010)). The country's capital is Yaoundé.



Picture 1: Map of Cameroon

Source: Central Intelligence Agency, the World Fact Book.

The far north of Cameroon is a semi-desert broadening into the vast Maroua Plain, with game reserves and mineral deposits. This is bordered to the west by the lush Mandara Mountains, the Benue River rises here and flows westwards into the Niger.

Cameroon is divided into distinct geographic regions, with the northwest particularly striking with volcanic peaks covered by bamboo forest rise to over 2,000 m (6,500 ft), with waterfalls and villages scattered over the lower slopes. The south and west are savannah uplands, while dense forest covers the east and south. The highest peak, at 4,095 m (13,434 ft) is Mount Cameroon, an active volcano (Central Intelligence Agency, 2011), which lies close to the coast and the highest peak in Sub-Saharan West Africa. The humid coastal strip is tropical, with a mixture of rainforest and farmland. The River Wouri, which flows southwest into the Gulf of Guinea, inspired the country's name after the 15th-century Portuguese sailor Fernando Po spoke of the Rio dos Cameroes (river of shrimps).

Cameroon is being referred to as 'Africa in miniature. This statement certainly rings true with everything you would expect from the African continent seeming to be consolidated in this diverse slice of land. The south boasts tropical rainforests and deserted golden beaches; the northern parts are awash with great expanses of desert, lakes and savannah; volcanic mountains dominate the southwest and northwest, and game-viewing areas scattered throughout the country offer ample opportunity to observe impressive wildlife, including elephants and lions.

4.1.2 Politics

Cameroon is the only bilingual country in Africa with French and English as official languages. The country is a multi-party presidential regime with President Paul Biya as President and Chairman of the ruling party the Cameroon People Democratic Movement (CPDM), with a mixed legal system of English common law, French civil law, and customary law.

According to history, French Cameroon became independent in 1960 as the Republic of Cameroon. The following year the southern part of the neighboring British Cameroon voted to merge with the new country to form the Federal Republic of Cameroon. After existing as a one-party state for over 25 years, Cameroon embraced a multi-party political practice in 1992 and pledged to promote democratic values in its Constitution of the 18th January (The Right to Food 2010). Cameroon has organized four local presidential elections (1992, 1997, 2002 and 2007), three legislative elections (1992, 1997 and 2002) and four presidential elections (1992, 1997, 2004 and 2011) Ministry of Territorial Administration (MINAT, 2011).

The country of Cameroon has generally enjoyed stability in this region ever since its independence, which has actually permitted the development of agriculture, roads, railways as well as the petroleum industry. Despite the slow and continuous movement towards the process of democracy and democratic reform, the political power of Cameroon

remains firmly in the hands of President Paul Biya since 1982 as the second president of the country since independence (Central Intelligence Agency, 2011).

4.1.3 Population

The population of Cameroon is approximately 19,711, 291 people with a growth rate of about 2.1% (2010). Urbanization with an urban population of 58 % of the total population in 2010 with a 3.3 % annual rate of change (Ministry of the Economy, Planning and Regional Development (MINEPAT, 2010-15 est.). Some major cities in the country include Douala with a population of 2.05 million, Yaoundé (capital) with 1.74 million (2009). A life expectancy at birth of 54.39 years with male and Female 55.2 years, and country comparison to the world ranking of 201. The birth rate stands at 33.04 births/1,000 of the population (2011) with a country comparison of 30 (Central Intelligence Agency 2011/ MINEPAT, 2011).

4.1.4 Economy

The Cameroon climate is very favorable for agriculture and also its modest oil resources have made it one of the best endowed primary commodity economies in Sub-Saharan Africa. Still like many other developing nations, Cameroon faces many of the serious problems confronting the developing world and Sub-Saharan Africa in particular, such as endemic corruption, mismanagement of public funds, bribery, the lack of transparency and efficiency in the state budget, a top-heavy civil service and a generally unfavorable climate for business enterprises. Since 1990, the government of Cameroon has launched a series of measures with assistance from the World Bank and IMF to increase efficiency in agriculture, budget transparency and to recapitalize the nation's banks.

According to Central Intelligence Fact Book 2011, The IMF is pressing the government for more reforms including privatization and poverty reduction programs, and they are under pressure to reduce its budget deficit which by the Ministry of Economic Finance forecast will hit 2.8 % of the GDP, but conducting the recent presidential elections in November 2011 may make the fiscal austerity difficult. Despite boasting a higher GDP per capita than both Senegal and Ghana (Vision Horizon, 2035), Cameroon still lags behind these two countries in important socio-economic indicators, including education and job creation.

Looking at the Human Development Index (HDI) of Cameroon, which is a combination of the three basic aspects of Development which including health, knowledge (level of education) and standard of living (income). This represents a push for a broader definition of well-being. Cameroon's Human Development Index is 0.48, which gives it a rank of 150 out of 187, placing Cameroon above the regional average, United Nations Development Program (UNDP 2011/ MINEPAT, 2011).

Cameroon is economically strongly linked to Nigeria and is a leading member of the Central African Economic and Monetary Community (CEMAC) with other member countries like Congo, Central African Republic, Chad, Equatorial Guinea and Gabon. Cameroon is also the leading member of the (BEAC) Banque des Etats d'Afrique Centrale (Bank of Central African States), which is a regional bank for countries in Central Africa with headquarters in Yaoundé, Cameroon with all the six member countries using the same currency, the CFA Franc (Cooperation Financiere en Afrique Centrale).

The cutting down of civil service salaries by 50% in 1993 and also the devaluation of the CFA franc by 50% in 1994 resulted in an overall drop in the purchasing power of nearly 65%. The Government of Cameroon then engaged with the IMF and the World Bank to find a better way out creating a three-year Poverty Reduction and Growth Facility (PRGF) program, which was approved by the IMF in 2005. This ended in 2008 thanks to the cancellation of debt initiative through the World Bank and the International Monetary Fund's Heavily Indebted Poor Country Initiative (HIPC), with statistical figures of 2009 showing that Cameroon had a GDP of \$4.255 billion and a GDP per capita of \$2.141 (Economist Intelligence Unit estimate U.S. Department of Commerce, Washington, 2010).

4.1.5 Agricultural land use

As the population in towns and cities continues to grow due to several reasons, the number of unplanned and informal urban areas in and within bigger cities, like Douala and Yaoundé, increase, with more than 40 % of the country's population in these cities living on land without legal titles and informal buildings. Due to this unplanned urbanization, the

percentage of urban population having access to safe water and sewage treatment is very low. Houses have in many cases been built in inundated areas, on steep lands, causing pollution and environmental degradation, especially in natural water sources (World Bank , 2002).

4.1.6 Devaluation of the CFA Franc and Economic Crisis

The CFA Franc, which is “Communaute Financiere d’ Afrique (African Financial Community) is the currency of French colonies in Africa. Two separate CFA Franc are in circulation, the first is that of some Central African states, the Central African Economic and Monetary Community (CEMAC) with six central African states i.e. Gabon, Cameroon, Chad, Central African Republic, Republic of Congo, and the Equatorial Guinea. The second is that of the West African Economic and Monetary Union (WAEMU), which comprises countries such as Senegal, Mali, Benin, Burkina Faso, Niger, Togo, Ivory Coast and Guinea Bissau. This division was a result of the pre-colonial French Equatorial Africa (AEF) and French West Africa (AOF) with the exception of Equatorial Guinea, formerly a Spanish colony and Guinea-Bissau a former Portuguese colony (Busch, 2011).

The CFA Franc was first devalued in 1994 and at that time it was versus the French franc to allow the heavily indebted countries to export more (Musa, 2011). During this period, a number of indicators were observed in all the CFA zone member countries with our foreign currency reserve ratio going towards negative. The CFA Franc is freely transferable, allowing capital to exit the CFA zone and enter France without any oversight (Owono, 2011). The devaluation that took place in 1994 caused a lot of negative effects on the Cameroon economy most especially on the agricultural sector.

Since the independence in 1961 Cameroon has faced two major financial crises, the devaluation of the CFA in 1994 and the economic crisis in 2004. There are rumors that the CFA is going to be devalued again in 2012 and according to Chia (2012) devaluation can be helpful in the following ways:

- 1) It allows the government to fight domestic unemployment despite the lack of effective monetary policy.

- 2) It results in improvement of the current account, something that the government may find desirable.
- 3) Lastly, it affects the reserve of the central banks, if they are running low.

Usually currencies are devalued in a situation where inflation rises quite rapidly, because a Central bank is in cahoots with a government for printing money to cover government expenses rather than borrowing. This is not the case with the 14 African States' concern but rather a political problem (Owono, 2012). According to a Senegalese economist Sanou Mbaye and a former African Development Bank professional, "the CFA Franc does not profit the African economies; to devalue the CFA Franc would allow France to resist the euro zone crisis". The consequences of devaluation for the urban dwellers are enormous since it will reduce the price of raw materials produced in the CFA zone countries by approximately 35 %, France and other foreign countries will buy three items for the price of two. Conversely, member countries will have to export more in order to obtain the same amount as before, although at a lower price. Prices of food crops and cash crops are going to double with fewer inputs and lower purchasing power.

4.2 Case Kumba

Kumba is a city located in the South West Region of Cameroon. It is the 13th most populated city in Cameroon and the largest city in the southwest region. It is a regional transport centre connected by railway and road to Douala, the financial capital of Cameroon, and other important towns and cities of Cameroon. Several major roads also link Kumba with some provincial interior towns like Mamfe, Ekondo Titi, Mundemba and Bangem making it one of the most commercial cities in Anglophone Cameroon.

4.2.1 Population and other services

Kumba has a population of 144,413, but it is not the provincial capital; that is located in Buea, which is the former German colonial capital of Kamerun. The history of Kumba as an urban setting is a very old one and can be traced as far as 1938 before independence. The indigenes of Kumba are the Bafaws, an ethnic group that speaks the Bafaw language. The Bafaw community occupies a small percentage of the present population of Kumba, today due to the cosmopolitan nature of the city; the Bafaws have lost their culture. Today

Kumba is a full city with 3 municipal councils (with three mayors and an appointed Government Delegate), the Kumba central market (with mostly foreigners from Nigeria), a Paramount Chief, 5 government bilingual high schools, 4 missionary high schools, a district hospital, 4 police districts, 2 gendarmerie brigades, 2 custom offices and other private services. Kumba, as a touristic town for geographical attraction, has a large crater lake, the Barombi Mbo Lake which is situated at Barombi, a small neighborhood 2 km from the Kumba city centre.

Picture 2 : A view of Kumba.



Source: KAWA INC (Washington DC)

4. 2. 2 Some specific problems

Compared to other African nations, Cameroon in general and Kumba in particular enjoy relatively high political and social stability. This has enabled the development of agriculture in the region. Despite this, a reasonable number of the Kumba populations live in poverty as subsistence farmers. Kumba faces most, or if not all, of the same problems as the other English speaking towns and cities in Cameroon. Farming and trading are the main activities in Kumba.

Land ownership for both crop and animal breeding either for subsistence or for commercial purposes has been a problem in Kumba for a long time. The ownership of land and land title in Kumba has been between the Paramount Chief, Nfon Mukete, and the Government Delegate to the Kumba city council, as to who has the right to issue land titles. There has been something of a power struggle between the traditional rulers and the city council, and

also between the ruling party and other opposition parties concerning the post the City Mayor.

The city of Kumba also lacks a proper and adequate waste management system. Due to the growing population of Kumba, the city council faces inadequate and unsubstantial means of handling and recycling their wastes. There is the problem of selecting suitable sites for land filling and recycling of materials. Even though some efforts have been made in Kumba on waste recycling by some developmental non-governmental organization, it is still not sufficient as they do not cover all areas of the city. Soil fertility is also a problem in this region as the quality decreases often due to pollutants of all sorts, seasonal fluctuation and erosion that occurs on many farms; leaving the farmers with little or nothing at the end.

5 Introduction to the research

5.1 The reasons for this research

This study focuses on the importance of urban agriculture to food security and poverty alleviation in the municipality of Kumba. More closely the aim is to assess the effect of the devastating economic crisis that began in 1986 on urban agriculture, and also how urban farmers survive after the evaporation of subsidies from the government and the collapse of agricultural development programs in the Kumba Municipality. Furthermore, Heifer International Cameroon and Biochar Fund Trial Projects are being carried out within the Kumba city area. It should be noted that the object behind these developmental projects is to improve the well-being of the participants, the environment, the nutritional situation and soil quality in a sustainable manner within the Kumba municipality.

Heifer International Cameroon is a non-profit making organization based in Belgium. This organization have been assisting individual farmers and some Common Initiative Groups

within the Kumba city area on basic techniques of breeding goats, pigs, snails, cane rats and birds (poultry farms). Their main objective includes:

- developing a social capacity within groups through a process of autonomy of the group vis-a-vis Heifer International Cameroon and other organizations
- developing a clear vision within groups for self-promotion
- making formal collaboration with the groups and technical collaborators to establish responsibilities of all stakeholders involved
- professionalizing the existing groups in the value chain including marketing of animals available
- concentrating on the most relevant and important aspects of intervention for a greater impact and credibility of the group.

Since December 2008, more than 1500 subsistence farmers in Kumba have been participating in the large-scale field trial testing the effects of Biochar on crop (Maize) productivity. The first results of this ongoing project are now available and are extremely encouraging. Biochar has consistently helped to boost crop productivity in tropical soils and sometimes in a spectacular manner. Biochar may thus offer a solution to hunger and food insecurity amongst the world's poorest and to soil depletion and tropical deforestation as well.

Both Heifer International Cameroon and Biochar Fund have been very helpful to farmers in the Kumba municipality. Ever since the collapse of the farmers' bank (Credit Agricole Bank) and the South West Farmers' Cooperative Union (SWEFCU) that was giving out loans and subsidies to farmers to help improve their productivity both in quality and quantity, Heifer International and Biochar Fund have been very instrumental in the Kumba city area but only to those farmers in a group (Common Initiative Groups), not to individual farmers.

According to Ndamu 2011, Biochar has been presented as a "win-win solution" based on unfounded claims that it is capable of sequestering carbon "for a hundred or even thousands of years" while simultaneously improving soil fertility.

5.2 What is Biochar

Biochar is basically fine-grained charcoal (biochips) high in organic carbon and largely resistant to decomposition. It is produced from pyrolysis of plant and waste feedstock. Biochar works as a soil amendment, creating a recalcitrant soil carbon pool that is carbon-negative, thereby serving as a net withdrawal of atmospheric carbon dioxide stored in carbon stocks (Small, 2011). It can be a byproduct of a type of bioenergy production called pyrolysis, which produces syngas and bio-oil, both of which can be used for energy as well as char. However, most so-called projects and trials so far including the Biochar Fund Projects described in this research rely on adding crushed charcoal to soil. The addition of Biochar to the soil reduces soil acidity by raising its *Ph*, reduces fertilizer requirement, suppressed methane emission and stores carbon in a long-term stable sink (Ndamu, 2011).

5.3 Heifer International and Biochar Fund's sustainable livelihood approaches

The concept of sustainable livelihood with food security as a priority has been taken into consideration by Heifer International and Biochar Fund's Trial Project, also when analyzing the results of the questionnaire and interviews of this research. It was thoughtful that instead of looking specifically on how the farmers in the Kumba city area are getting nutritious food only, other closely related aspects, such as economic, social and environmental were also taken into consideration since sustainability involves all these aspects.

The United Nations Millennium Goals Target 1.C also emphasizes the proportion of people who are under hunger crisis should be halved by 2015. In the Human Rights Declaration, article 25, food security is being seen as the basic right of every human being:

“Everyone has the right to a standard of living adequate for the health and wellbeing of himself and of his family, including food...” (The General Assembly of the United Nations, 1948).

Heifer International and Biochar Fund are not only working on food security in the Kumba city area but also on the socio-economic and environmental aspect for future development. There is a clear motive from both Heifer International Cameroon and Biochar Fund projects being carried out in Kumba concerning sustainable livelihood approach and “food first” approach. Many individual farmers only think about how to get sufficient food without looking at the environmental or social aspect.

According to Davies 1996 (Maxwell 2001, p.19) the “food first” approach priority is food at the top of the list of wants or needs but this is not the same as the “sustainable livelihood” approach priority that says food is part of livelihood needs. The difference between these approaches is that in the “food first” approach, the environment is being degraded to meet up with the immediate and excess food needs whereas “sustainable livelihood” approaches takes the environment into consideration as a tool and thus secures the future (Maxwell, 2001). Heifer International Cameroon and Biochar Fund are those practising food security in the Kumba municipal area in accordance with the societal law and practices.

6 Research method

This research was carried out using the qualitative research method in the form of questionnaires and a semi-structured interview on the study area. Semi-structured interview refers to a situation where the questions are the same for all interviewees and the order of these questions can vary but the answers are not bound to be pat answers. The qualitative research method was chosen since the response from the farmers in the study area relies on and is based on the subject matter.

The data was gathered in late 2011 and early 2012 in Kumba with the help of the Government Divisional Delegate for Agriculture and Livestock for Meme Division, Kumba Southwest Province. A total of 24 farmers were interviewed from the three council

areas in the Kumba municipality (Kumba 1, 2 and 3 council areas), see appendix 1 for questionnaire. Within each council area 8 interviews were conducted, 4 from those rearing animals and 4 from those growing crop.

With just 24 farmers being interviewed from the three council areas, a qualitative research was necessary as it helps to focus on the quality of the farmers' responses. It again gives room for further studies to be carried out in the municipality on the subject matter. The research sites were all documented by taking pictures at the farms. During the compilation and writing process, a lot of information has been gained about urban agriculture and the role, importance and functions of Heifer International Cameroon and International Biochar Initiative to farmers in the Kumba municipality. At the end, I decided to divide my list into three sections with those growing crops, fruits and animals respectively. The layers and the snail farms were classified under the animal section.

7 Result

7.1 Farming techniques

Farmers are always looking for inexpensive and innovative techniques for cultivation. In places where land is a scarce resource, new production techniques are already available.

7.1.1 Crops and animal varieties

The amount of animals and crops that are grown in the Kumba urban area varied from 3 to 9 with an average of 4 different crops or animals from the interviewee. The table below is a list of animals and crops that are farmed in the interviewed areas with some annual vegetables such as green, water and bitter leaf. The animals are also farmed all year round but the amount of layers (chickens), goats and pigs tend to increase during festivity periods.

Table 4: List of Animal and Crops farmed in the Kumba area

Types of Plants/Crops	Types of Animals	out of 24 interviewees
Maize	Pigs	22 and 10 respectively
Cassava	Goats	18 and 8 respectively
Cocoyam	Layers	16 and 14 respectively
Yams	Snails	12 and 10 respectively
Plantain	Cane Rats	16 and 4 respectively
Beans		12
Water leaf		14
Bitter leaf		24
Green leaf		24
Pepper		24
Oranges		6
Pineapple		2
Groundnuts		6

All the interviewees mentioned that the harvest from their farms has been beneficial and for six of those who have been practising urban agriculture for more than ten years and belong to a group (Common Initiative group). Most of the farmers could not actually determine what quantity they get from the harvest either annually or quarterly, since the activity is mainly for subsistence. Only four of the farmers are practicing urban agriculture for both subsistence and commercial purposes, and said they get about 30 bunches of plantains, five bags of cocoyams, four bags of maize, two bags of oranges and one bag of pineapple quarterly. They also sell about 30 goats, 50 pigs and about 700 layers annually.

The varieties and selection of crops/plants and animals by the urban farmers in Kumba were very important. The animals reared and the crops planted have some significant impact on the culture of the individual farmers and also on the nutritional value. In most African nations, animals like pigs are reared only by certain groups of people who have some cultural respect for it; this is also the same with some leafy vegetables.

As seen in the above table, all the farmers in the urban city area grow the common leafy vegetables like green leaves, water leaves, bitter leaves and pepper. A study carried out by

(Ambrose-Oji, 2009) states that African indigenous vegetables are more tolerant to marginal soils, needs no pesticides and fertilizers, mature faster and are richer in nutrient than exotic vegetables.

Picture 3: Water leaf farm



Photographer: Abraham Yenkong

In Cameroon in general and particularly in Kumba, calorie intake is based on vegetables and crops like cocoyams, cassava, yams and maize and can be found everywhere in the cities. Farmers benefit from growing vegetables and they prepare local meals daily, thus enriching their daily meals. Indigenous vegetables like legumes, okong-obong, cassava leaf and pumpkin leaves have been traditionally used in Cameroon. Crops and animals like maize, beans, cocoyams, yams, layers, pigs, snails and goats, even fruits of different kinds, can already be seen in the list of crops and animals above.

It was surprising that up to ten farmers are growing snails; this was not the case some years back when I last visited the area. This may be due to funds from the Heifer International Cameroon since most of the farms were managed by common initiative groups. Crops like yams, cocoyams and cassava which are very common root crops in many parts of Africa, are doing well in the urban farms in Kumba. Two farmers said some of the reasons might be the fact that these crops are very resistant to seasonal changes and can survive even on

marginal soils, they can be left in the farm without being harvested for up to five years and also the population believes that yams, cocoyams and cassava produce much more food energy per unit of cultivated land.

7.1.2 Application of chemicals and fertilizers

Among the 24 interviewees who were contacted during the field work, 18 of them said they are using some fertilizers in their farms. They mentioned that the type of fertilizer used is fowl dropping (poultry manure) and wastes from their pigs and goat farms, except for two big farmers who said they are using some fertilizers and chemicals from shops. This was due to the fact that they also grow some cash crops like cocoa on an area of approximately 14 hectares of land.

Picture 4: Chicken Farm



Photographer: Abraham Yenkong

Almost every household in the Kumba district area rears chickens either occasionally or all year round. It is quite normal and evident that most of the farmers use poultry manure as fertilizers. Among the 24 interviewees, 22 are not using any chemicals in their farm, only two were using chemicals and the chemicals mentioned were pesticides and herbicides for Nematodes and black pods.

7.1.3 Composting

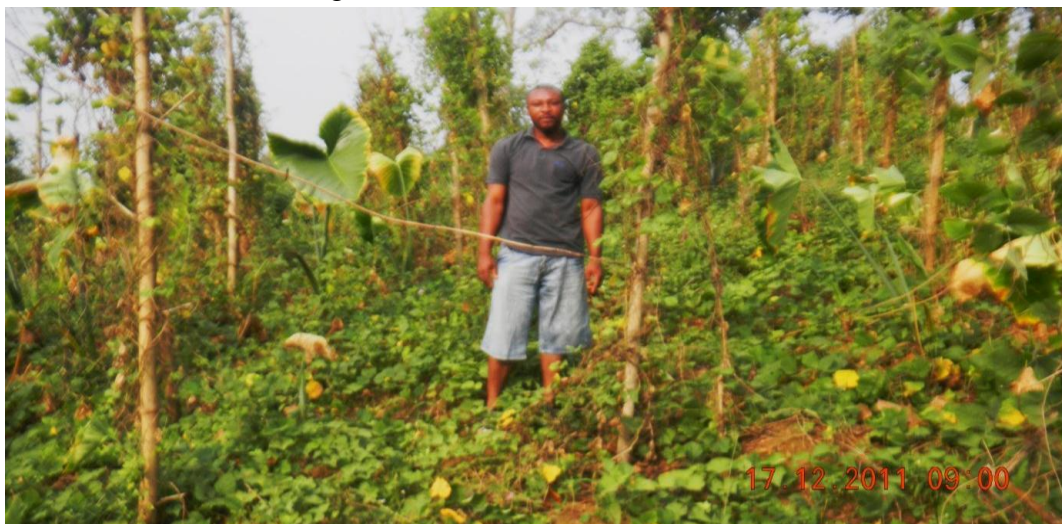
Composting is a very common practice in the Kumba municipality. Most of the interviewees said they are actually doing some compost. The results from the interviewees show that the farmers have a good knowledge of organic farming and 16 of them are familiar with it.

As mentioned by one of the farmers, Jiatsa Ernest: *“Organically grown crops and animals are very welcome by the society, and cause little or no health or environmental problem”*. He said he has received training from the International Institute of Tropical Agriculture, Heifer International, Ministry of Agriculture and Livestock and now teaching members of his common initiative group about organic food and livestock production. Another farmer, Su Eric also said *“composting is a good way to enrich the soil and has been practised for years”*, since he grows yams, cassava, pigs and layers (poultry); the waste are allowed to decay, which further enriches the soil all year round. He said *when practised successfully and carefully, there is no need for chemical or pesticide application* that could be harmful to the environment and also acceptable by the population even though more expensive.

7.1.4 Crop rotation

Crop rotation is the act of cultivating a variety of crops on the same field changing them after a year. Most of the farmers interviewed do not practice crop rotation (10/24). Two farmers said they are interested in particular crops and there is no need changing the crops planted every year. Some interviewed farmers said they do not practice crop rotation because of the size of land they farm. They cannot plant some exotic fruits or vegetables in need of maize or cocoyam or cassava that give them high calories and starch. They mentioned it is practised since crop rotation is used to improve the fertility of the soil, reduce the risk of weather damage, increase productivity as well as reduce soil erosion.

Picture 5: Mixed farming



Photographer: Abraham Yenkong

Another common technique used by farmers in the Kumba municipality is intercropping. Intercropping, is actually using the same piece of land in cultivating varieties of crops together. As said by one of the interviewees; “*intercropping helps in using resources more efficiently*” and acts as a strategy, moistening and protecting the soil in case of failure of another crop.

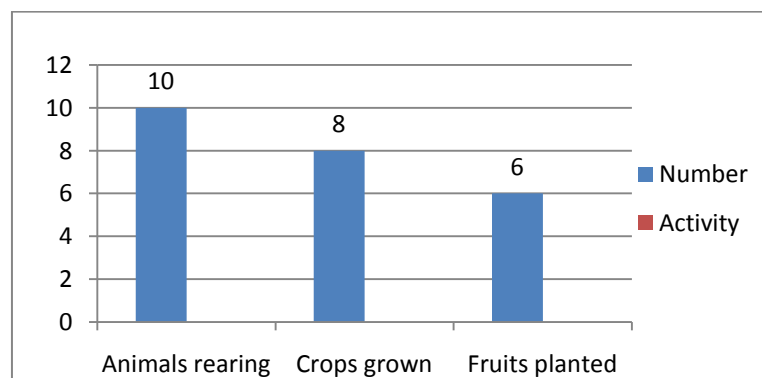
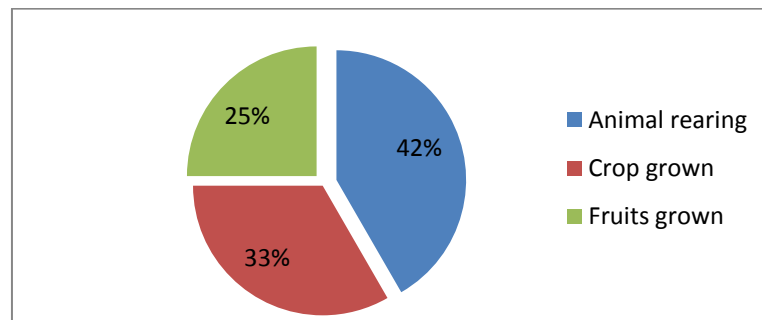
7.2 Resources used

The size of farm among the 24 interviewees ranged from 0.5 hectare to 14 hectares meaning the farm sizes were on average relatively small. The age of the farm equally varied from one year to 22 years and also the same with the farm output that ranged from one bag of maize to 15 bags of maize. This difference is due to the fact that some of the farmers cultivate only for subsistence while others do it both subsistence and commercially.

Out of the 24 interviewees, only four of them practising urban agriculture are mainly doing it for commercial purposes. All the four farmers do some sort of mixed farming, rearing animals like pigs, goats and poultry and also growing crops like yams, cassava, plantain, cocoa and maize. The farmers mentioned that crops like cassava, yams and cocoa are

managed through the Integrated Crop Pest Management (ICPM). All the farms are managed by the family but sometimes extra labor is needed during harvesting and clearing periods. The owners of the farms estimated the time spent on their farms to be from one to four hours per week for those carrying out subsistence farming and usually in weekends, while those practising commercial farming put in more than four hours a day. Seedlings for various vegetables and maize are used by the farmers, one farmer with a water leaf farm has his farm closed to a river source (stream) and 4 of them are practicing crop transplanting. All the interviewed farmers use common materials for cultivating the farms such as cutlass, diggers, hoes, digger's fork, spades, watering cans and harvesting knives.

The pie and bar charts below shows the percentage and number of farmers rearing animals, those growing crops and those growing fruits respectively.



7.3 Farmers' benefits due to urban agriculture

The farmers that were interviewed during this field work gave some positive reasons for practising urban agriculture. More so, each of the interviewees gave his or her own personal experience from urban agriculture.

Five (5) out of the twenty-four (24) farmers contacted said they are rearing animals and cultivating crops on their own piece of land to provide extra food. In addition to this, approximately half of them, 13 of them said the main reasons for cultivating crop and animal breeding are somehow related to economic benefits. Explaining the economic benefits that derived from the farms, they said it is less expensive and economical to grow certain basic crops, thereby reducing the family expenses of buying food from the market with their marginal wages. Out of the 24 interviewees, four of them said they prefer growing vegetables by themselves, saying they believe they get better quality and know what value of food they eat.

Three of the big farmers that were contacted who are actually practicing mixed farming (rearing of animals and growing crops) on a large scale said *“it is beneficial for everybody to grow some quantity of vegetable in the area, since the means of growing is not difficult and this will help fight against hunger and starvation”* Jiatsa Ernest.

It should be noted that, most of the farmers gave reasons related to economic benefits and also to cultural, health and social ones. They said the crops planted give them high calorie intake and vitamins and the desire to grow crops and rear animals is a cultural belief that links them closer to their ancestors while at the farm (spiritual belief). Others said it is a way of keeping oneself busy after retirement and also helping others in food and agriculture-related issues.

Among the farmers interviewed, only three of them do not have any specific future plans with their farms. These three farmers said they are frustrated with the economic situations

in the country and any attempt of planning might lead them to more problems. This is actually true in Kumba, Cameroon and most African nations today, the citizens are frustrated with the economic problems saying it is due to neglects from the government.

Although some do not have any future plans, others do. Most of them are planning to increase their crop and animal varieties so that they may cultivate for commercial purposes. Others said they have plans to join any available common initiative group so that they can get financial loans and material from either the corporative credit unions or from Heifer International sponsored projects. The most common plan among the farmers was the idea of extending the space of land for cultivation, growing other exotic fruits and vegetables, improve their technical knowledge in farming and also practise organic farming. It should be noted that most of the contacted farmers are welcoming organic production and are willing to produce both crops and animals that are organically grown, and also crops using fertilizers, if there is enough space for both practices.

7.4 Problems faced by the farmers

7.4.1 Gender and landownership/space

One of the problems mentioned by the interviewees, especially the women, was that of landownership and space. The lack of sufficient space for urban and peri-urban agriculture is actually a common problem in many cities of the world. The interviewees said they are being limited by space and the land tenure system of the country.

In Cameroon as well as in most African nations, women have the legal right to own land but this often means little in areas where customary law prevails. In Kumba in particular and Cameroon in general, women are responsible for household nutrition and most of them work solely in agriculture. The women cultivate the crops and sell some excess to feed their families. As said by one interviewee, “*we grow the crops on lands we are not sure of tomorrow*”, this is because the women do not have security of the land tenure. This makes it worse, because when they have the opportunity to exploit such areas of land, sustainability is farfetched. What is important to them is how they can maximize this

opportunity. This is simply because they do not know for how long they are going to use the land. They also think of what crops they are going to cultivate and give them the biggest return regardless of the environmental impacts.

“The customary structure is bad”, says a female interviewee; making men and traditional rulers (chiefs) custodians of the land and denying women the right to own property. The situation is actually changing with improved education (gender-neutral policy) and new proactive initiatives by the state aimed at helping the women by giving them a formal, legal title as landowners.

The interviewed farmers in Kumba and most parts of Africa depend on natural resources and land, but they are often faced with non-existing land tenure and registration rights to resources. The farmers complained about the absence of these rights to land, resources, information and institutional support which particularly affect poor women making them powerless due to customary laws of patriarchal land ownership and inheritance which often deny the women lands when being widows or divorced.

Some migrant farmers interviewed also said that their lands are often taken from them by the natives (Bafaws). So it is clear that people living in urban areas have the enthusiasm to cultivate crops and breed animals within the city, but they are being limited by land issues. The solution to this problem is more administrative and social than practical, and one farmer said the Kumba municipal council is helping them presently with this.

Two farmers said they have been reading reports from the Institute for Agricultural Research and Development, IRAD Cameroon. They said some of the reports state that “Cameroon is utilizing approximately 12 % of the arable land for food crop production”. This means that land availability is not the problem but the complex nature of the land tenure system of the country, which still deals with smallholder farmers who plant less than one hectare.

To help solve the problem of space and landownership, the women in Kumba are forming common initiative groups. A good example is the Social Centre for Humanitarian Services, Agriculture and Environmental Protection (SCHAEP) development program. Their objectives as a development program are to:

- train members of common initiative groups in the need for good governance and accountability
- educate the common initiative groups on individual management of resources.
- teach the farmers nutrition and hygiene
- establish a school outreach program on environmental protection
- assist the Kumba community by building their capacity on how to live and work in common initiative groups, in order to strengthen their bargaining position over their produce and purchase of farm inputs.

Picture 6: Maize farm



Photographer: Abraham Yenkong

Since social capital can also be an answer to the problem of space, a solution to this problem might be cooperation between the city council and the common initiative groups in the form of exchange of ideas and utilization of different resources available within the municipality, which can compensate cultivation space.

7.4.2 Financial and technical support

The farmers interviewed mentioned the problem of lack of financial and technical support from the government to help them improve both the quality and quantity of their produce. Out of the 24 farmers interviewed, 22 of them said they get little or no assistance from the government and other organizations. But this was not the case in Cameroon in the 1970s and 80s. In the 70s and 80s, Cameroon was producing enough food to feed itself and to export but the situation changed in 1986 with the commencement of the economic crisis. The government stopped granting subsidies to farmers, and other agricultural development programs also collapsed. The number of agriculture extension workers also decreased as some agricultural schools were closed down. The emphasis on agriculture actually dropped as the demand for oil increased.

Eight of the farmers mentioned that *“this is a vital sector and it needs a lot of financing, since it creates job opportunities and provides food for the population.”* They further explained that *“the poor farmers do not trust banks in Cameroon, some of which have recently collapsed on short notice.”* A good example is the Credit Agricole Bank, which was a farmer’s bank responsible for giving out loans and subsidies to farmers to buy pesticides, seedlings and fertilizers. The interviewed farmers all said that, if they can be subsidized for the purchase of costly fertilizers and pesticides, this will significantly encourage their production. Eighteen of the farmers mentioned the lack or insufficient agric extension workers. They said the government is doing little or nothing to educate them on new agricultural practices and are hardly visited by agricultural workers.

Abraham Yenkong is the government’s regional delegate for agriculture and rural development in Kumba. During the interview, he said *“if we consider agriculture as a priority sector in our economy, it means that other sectors must find money to pump into agriculture and guarantee food for the rapidly growing population of the country.”*

The problem of insufficient finance and technical support to the agricultural sector of the economy is corruption and mismanagement. A solution to this might be accountability of state resources and funds allocated to different sectors of the economy. Cameroon and

most developing nations south of the Sahara are highly corrupt and mismanagement of state funding is a common phenomenon.

7.4.3 Soil fertility

Four gardeners mentioned problems connected with soil fertility in the interviews. Cameroon in general and Kumba in particular has very fertile soil for agriculture in general. This problem might be due to the fact that some farmers plant crops without any knowledge of best soil type to be grown on and suitable environmental conditions. The soil varies from one region to another and ranges from clay soil, to sandy soil, to silt soil and moraines. Soils in the Kumba area are ferralitic and some are sandy with a high level of acidity. The problem related with soil fertility has been experimented by Biochar experts by the Biochar Fund Trials in Kumba, Cameroon. Biochar (biochips) works on the soil and improves soil fertility. Some benefited farmers during this trial process said:

“Organic matter buffers pH, helps in restoring nutrient balance, lightens clay soils in holding nutrient and moisture” and this was noticed during their trial phase. Biochar application on maize planted in the Kumba area has been very instrumental in solving the soil quality related problem. Furthermore, composting is a traditional and old practiced used by farmers and gardeners in the area. More so, it also reduces the generation of wastes by recycling biodegradable wastes into the soil. It is cheap, affordable and a beneficial technique for the local and poor farmers.

7.4.4 Other problems

The farmers interviewed came out with a series of minor problems due to theft (stealing), administration, pests and diseases, shortage of, and expensive, seedlings, bad harvest (seasonal fluctuation) and also lack of agricultural data.

Stealing of goats, chickens and pigs is very common within the Kumba municipality. It is actually a very visible and major problem especially during festivity periods like Christmas and Easter periods. Two of the interviewed farmers said, that due to the lack of money to construct a proper building for the animals, the animals usually decrease due to stealing by young jobless boys in the area. All the farmers growing maize also complain of their maize

being stolen during the harvesting periods, they continued by saying it is almost impossible to grow maize in the municipality without almost a third of it being stolen.

Furthermore, the problem of pest and diseases, which is a common problem with tropical crops and animals, was also raised by the farmers. Seven farmers that were interviewed mentioned pest as a big problem, especially those rearing chicken and growing food crops. One farmer said the birds (chickens) are usually infected with Newcastle disease, egg drop syndrome and infection bursal diseases. Other farmers with crop production did mention their maize is usually infected with maize stalk and comb borer diseases, a nematode for those growing plantains and bananas, black pod and capsid attacks were also mentioned by two farmers growing some cocoa closed to their houses.

The problem of seedlings was also raised by eight farmers that were contacted. They all complained that the prices were extremely high for them to afford during the planting seasons. Two of the farmers mentioned that in a fight to solve the high priced seedling problems, some families and common initiative group members are now practicing exchange of their extra seedlings before and after planting periods among themselves to save money. In addition to the high price for seedlings, some of the farmers also mentioned that the quality and quantity of their crops are usually affected by seasonal fluctuation with either the rainy seasons extending for more months than normal or due to the dry season. This is causing a limitation in their output ability.

One big farmer (Jiatsa Ernest) who has been practicing urban agriculture for the past 24 years, also mentioned that there is poor integration and dissemination of agricultural data. He further explained that the government is doing little or nothing to collect data on agricultural production, in the Anglophone region (Kumba) in particular, for further research. Furthermore, most of the farmers mentioned that they are being neglected by the government because of their minority and cannot get loans or grants very easily, even when fulfilling the necessary requirements. Marginalization is actually the topic of the day in this part of the country, the urban people of southern Cameroon are not very happy with the current system of the country as they are considered marginalized.

A simple and common problem that the farmers did not actually bring up but could be seen visibly was that of wastes. The management and handling of wastes by many developing nations still need to be improved. Within the city of Kumba, small-scale business like smelting and garages are spread all over the town and also very close to agricultural fields. The farmers do not actually look at these garages and smelting houses close to their farms as a problem, some of the gardens are even set up on waste sites. The reasons for this might be that they are used to seeing waste everywhere in the environment. Wastes from garages like the engine oil, and also the fine iron dust from the smelting houses, are very toxic, hazardous metals and chemicals, even when in contact with soil and water. These garages are polluting the soil and we can find small farms at waste sites due to ignorance. Soils in certain parts of the city contain lead and other poisonous residues from surrounding factories and manufacturing industries.

8 Discussion

This study shows the importance of urban agriculture in Kumba municipal council area and clearly points out that the farmers are benefiting from their various activities. The benefits derived from gardening within the city are economic, social and environmental. The farmers interviewed said they experience a sense of community belonging from their activities in the city as they obtain healthy food, healthy land and healthy social relationship and use their farms for educational purposes. This is also true with the findings of Sumner et al., (2010, p.58), who states that urban agriculture builds into the community a sense of belonging, improves the health situation as well as the food security of individual farmers.

In addition to the above, some wastewater within the city is being channeled to gardens and used for watering the plants/crops and thereby reducing environmental pollution. The usage of wastes from the animal farms as mentioned by a farmer (Su Eric) is used as manure for crop cultivation and, therefore, also helps to reduce the application of artificial

chemicals and fertilizers that may have some environmental effects, putting also idle land and unused resources to productive use. This study is in relations to the findings of Jac et al., (2001) which says that youths in the Dominican Republic have learned to achieve stable incomes and also become accountable for the environmental wellbeing and food security.

Furthermore, the economic benefits from gardening within the Kumba city area by households practicing animal rearing and crop cultivation from the interview were clear. A big farmer, Kamgwa Richard and a few other interviewed all said their families are having more meals, food secured and revenue from the sales of excesses from the crops grown and animals reared. This is also true from a study carried out by Mougeot (2005), which says 26 researches carried out in Sub-Saharan African countries shows that families practicing gardening are having more meals; their children are healthier, and have a better nutritional status, etc.

However, looking at the present situation with regard to the past, much has been done to help solve certain issues at hand. The delegate for agriculture in Kumba responded by saying *“Things have improved tremendously. Farmers have been trained in different areas of raising endangered species of animals such as can rats, grass cutters, etc. for free and provided with breeding stock for multiplication”*. He also says there are organizing seminars every two weeks and workshops once a month to educate farmers about the laid down policies for obtaining grants and loans from NGOs and other local financial institutions. He concluded by saying a lot is being done for the future through corporation and collaboration with more NGOs and the government for the handling of waste and price adjustment.

Above all, the households interviewed mentioned they all face the problem of insufficient capital to invest in their farms. They said due to insufficient capital, they cannot construct proper buildings for their animals and buy farming equipment. Finally, based on the idea of land use and land management, it is of vital importance to integrate the principle of sustainability. Land used for agriculture has been designated in several parts of the city to

help achieve an optimal level of minimization of environmental risks and negative impacts of human health as much as possible, because these problems may arise through carbon dioxide emission and use of polluted waters in the city center.

9 Conclusions, limitations and recommendation

9.1 Reliability, ethics and future research

It is true that reliability and validity of any research are very important parts that should not be excluded. This research work was carried out with the help of a qualitative method. It is therefore necessary to acknowledge the validity since it lies within the context of qualitative research.

The farmers were all contacted and interviewed by the government divisional delegate for livestock and agriculture with the help of other local project workers within the Kumba municipal council area. These people helped in translating the questionnaire to the local farmers. It was obvious that some answers or questions were not well translated or misunderstood either by the farmers or the local authorities. There is also the normal tendency of farmers in the area not to be willing and ready to answer questions from the authorities for various reasons. Some of the reasons might be that some agricultural activities and practices are not allowed in the area, perhaps for cultural reasons or the need to be licensed. This means that the farmers are not ready to give out information about their activities without being familiar with the person's concern.

Through research reviewed, this study has found that urban food production has emerged as one of the greatest challenges facing the world. This might be due to a high population increase in most cities in developing nations (Cameroon as example) coupled with the hunger and food insecurity crisis caused by high food prices and a constant price fluctuation. To some extent, the results of the research from the interviews may have been better, more exact and more accurate if the author himself was present, since some of the

interviews with key farmers and the divisional delegate were carried out through Skype and other media by the author. Explaining the purpose of the research at the beginning to the authorities and their willingness to cooperate were not an easy task. The local authorities said time and again that they are not conscious enough of why foreign students always contact them for research assistance, it is assumed that the local government is behind most of this research work.

Finally, it was a very successful and profitable research at the end, since the farmers were familiar with the delegate for livestock, agriculture and local project workers, who did the questioning. I do believe that if there was enough time allowed for me to carry out the studies, the number of farmers contacted could have been larger, and the analyses of the results more accurate. The setting up of areas of land within cities (urban settlements) for agriculture requires critical evaluation. Due to lack of data availability the study area, therefore, needs adequate spatial planning and this can only be achieved through an integrated management system approach with the stakeholders involved for a better sustainable environment.

The use of Geographic Information Systems (GIS) as a tool for the decision making will be helpful. This is due to the ability of GIS to manage spatial attributes from a variety of features and sources, and produce give concrete results. The usage of GIS in the study area will help municipal authorities and other stakeholders to be more transparent in designating land for agriculture, and also in protecting the state of the environment on the basis of accepted state laws and criteria. GIS can also be beneficial in the study area when solving the problem of increased population, causing some of the poor to build farms in slums and waste areas, by designing the environmental and social gains within the city for a sustainable generation. This will further help in the minimization of social, health and environmental conflicts.

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Appendix 1:

Questionnaire to Famers and the Government Divisional Delegate for Agriculture.

Basics/Generalities:

What is the name of the farm? (or area located in the city)

How long have you being managing the farm?

What is the farm size?

What type of farming is carried out (organic or inorganic)

What crops or animals are grown on the farm?

Is the farm divided into plots for any reasons?

What tools (e.g. hoes) do you use in farming?

How is the farm managed (by you, other employees or the family)

How much crop do you produce (months or year)

Technical section:

Do you practise crop rotation?

Do you apply any form of fertilizers, manure or special feed to the animals

Do you have some basic knowledge of chemical application to crops, pest, etc?

During which seasons do you normally apply the fertilizers, chemicals on the farm (dry or rainy)

Do you have some knowledge and ideas of organic farming (advantages and disadvantage)?

How do you handle the wastes from your farm (animals and crop farm)

Any laboratory or storage house for the animals and crops?

Social, Political and Economic:

How often do public officials visit the farm?

Any subsidies from the government/ NGO in terms of finance and training?

What are the criteria for getting loans/ subsidies from agric banks (credit Agricore) and the government?

Any Problems ?

Erosion

Irrigation

Landslides

Animals and crop diseases

Interview with the divisional delegate for agriculture

How long have you occupied this position?

Are you working with some NGOs to improve agriculture in this region?

How often do you organize workshops/seminars?

Any subsidies to the farmer? What are the criteria for obtaining such?

What strategic plans do you have to help improve this sector in the future?

How do you see this activity today with some past years' results?

Sustainability:

Do you educate them on the following:

- Possible Human Impact due to Agriculture in and around the city
- Environmental Impacts (Land and water) due to poor practices

- The type of materials used
- The best available techniques

How do you educate the farmers on waste minimization, resource used etc.

How do you intend to solve problems, such as:

- Space for urban land for agriculture
- Economic/political problems concerning grants, loans and subsidies allocation
- Usage or conversion of waste generated from the farms
- Gender differences of farmers?

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