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Urban and Peri-Urban Agriculture in Bamenda: A Policy Narrative



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The parties who formed part of the core group of experts and contributed to the initial formulation of policy recommendations were:

- NGOs Strategic Humanitarian Services (SHUMAS) and Mbororo Social and Cultural Development Association (MBOSCUDA)
- Bamenda City council (BCC)
- Bamenda I, II, III councils
- Ministry of Agriculture and Rural Development (MINADER)
- Ministry of Livestock, Fisheries and Animal Industries (MINEPIA)
- Ministry of Environment, Protection of Nature and sustainable Development (MINEPDED)
- North West Development Authority (MIDENO)
- Ministry of Economy, Planning and Regional Development (MINEPAT)
- North west Famers organization (NOWEFOR)
- Farming cooperative societies e.g. Bamenda Vegetable Cooperative, Alamakon Cooperative
- Research bodies e.g. Institute of Agricultural Research for Development (IRAD)
- College of technology (COLTECH)
- Catholic University of Cameroon (CATUC)
- Ministry of Water and Energy (MINEE)
- Media (Cameroon Radio and Television Cooperation-CRTV, the Famers' Voice)

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List of Abbreviations

BCC	Bamenda City Council
MINADER	Ministry of Agriculture and Rural Development
MINEPIA	Ministry of Livestock, Fisheries and Animal Industries
MINEPDED	Ministry of Environment, Protection of Nature and Sustainable Development
MINEE	Ministry of water and Energy
MIDENO	North West Development Authority
MINEPAT	Ministry of Economy, Planning and Regional Development
MBOSCUDA	Mbororo Social and Cultural Development Association
SHUMAS	Strategic Humanitarian Services
NOWEFOR	North West Famers Organisation
IRAD	Institute of Agricultural Research and Development
CATUC	Catholic University of Cameroon
COLTECH	College of Technology
UPA	Urban and Peri-urban Agriculture
FCFA	Franc de la Coopération Financière en Afrique Centrale
FONADER	National Fund for Rural Development
PPP	Public-Private Partnerships

Executive Summary

Increasingly people live in cities. Currently more than half of the population lives in urban areas, and it is predicted that by 2050, this will be over 75%. This urbanisation is a major driver of unsustainable transformation of urban rural relations and food systems. Urban and peri-urban agriculture (UPA) links and interlinks a wide variety of urban issues and development objectives. Different stakeholders (local assemblies, NGOs, the (formal and informal) private sector and urban farmers, traders, consumers) are involved, while a range of policies and regulations address urban farming directly or indirectly.

This policy narrative provides information on the situation and role of UPA in Bamenda, in the North West region of Cameroon. It has been developed through the collaborative effort of researchers of the UrbanFood^{Plus} project and the project partner organisations SHUMAS and RUAF, together with the key stakeholders from Bamenda including Bamenda Central City Authority (BCCA), several ministries, universities, farmer cooperatives, civil society organisations and local media.

The policy presents a typology of urban and peri-urban farms and gives an overview of the general characteristics, challenges and opportunities. The aim of this policy paper is to contribute to the city's sustainable development by offering both research insights and policy recommendations, and facilitate policy dialogue on UPA among the key stakeholders and UrbanFood^{Plus}. An important next step in the dialogue is to recognise the role of UPA in the urban food systems of Bamenda and agree on a City Strategic Agenda on UPA to guide further action.

Bamenda has seen rapid urbanization in the past decades with the concomitant negative consequences of unemployment, poverty and food insecurity. The practice of agriculture in the city provides an alternative to cope with these problems. Agriculture within Bamenda's boundaries is nothing new, but the area under cultivation has reduced in the past two decades due to the expansion of built-up areas, which merely pushes farmers to other locations – from the town centre to the fringes or the peri-urban area. Bamenda thus continues to profit from the benefits of urban agriculture such as food and income.

UPA in Bamenda is not an activity of the urban poor only. Backyard farms contribute to household consumption and savings, and even middle-class households and larger farms generate income. The general tendency is for farms in the urban area to be smaller and geared towards subsistence while the larger farms of the peri-urban area are more market-oriented. Agricultural activity in Bamenda includes the rearing of both conventional and unconventional livestock in both urban and peri-urban area.

Several challenges remain. First of all, the agricultural activity is carried out in an unregulated manner leading to problems of waste and water management. Furthermore, there are increasing conflict incidents between crop and livestock farmers. Other problems faced by farmers include the insecurity of land access, animal encroachment, access to finance, markets and improved farm inputs.

To improve UPA and assist Bamenda stakeholders to further tap its potential, a list of recommendations have been agreed and written down in this policy narrative, which focus on land access, access to inputs, management of water, waste and environmental impacts, livestock management, institutional development, the whole agricultural value chain and education.

It is suggested that:

- Access to land within the city needs to be facilitated through better information on land use and ownership, the implementation of the existing Bamenda city development plan, integration of state services and land regulations and the creation of the (temporary) use of land for agriculture against a fee.
- Enhance the availability and access to improved inputs, such as seeds or fertilizers, attuned to farmers' needs.
- Improve water management with regard to responsible use, the treatment of waste water, and the creation of new water sources by drilling of wells.
- Improve (solid organic) waste management by promoting its use in (organic) agriculture, the closing of illegal dump sites, and the sorting and recycling of wastes through the waste management company.
- Encourage livestock rearing by trainings and enforcement of existing regulations on roaming.
- Promote UPA by local and national institutions such as MINADER and stimulate self-mobilisation of farmers.
- Improve market infrastructure and stimulate corresponding association development.
- Undertake research by local key institutions to determine market demands and adequate post-harvest technology.
- Create awareness and organise sensitization campaigns on the multiple role of UPA and links to urban resilience in Bamenda.

Introduction

This policy narrative is concerned with the role of urban and peri-urban agriculture (UPA) in Bamenda, Cameroon, its opportunities and unexplored potentials. It provides information on the situation of UPA in Bamenda municipality and its environs and aims at contributing to the city's development. The document was drafted through the collaborative effort of researchers of the UrbanFood^{Plus} project and the project partner organisation SHUMAS and RUAF as well as stakeholders from Bamenda including Bamenda Central City Authority (BCCA), several ministries, universities, farmer cooperatives, civil society organisations and local media.

Urban agriculture can be defined as the cultivation of food within metropolitan areas (Golden 2013, Lovell, 2000). Unlike rural agriculture, urban food production is embedded in the urban ecosystem (Mougeot 2005). Urban agriculture includes a range of activities such as growing vegetables, fruits and herbs as well as raising conventional (chickens, goats, pigs) and unconventional livestock (rabbits, guinea pigs, bees) and fish (aquaculture). Urban farmers typically engage in the processing, marketing and distribution of their products through for example farmers' markets.

In Cameroon, 70 percent of the population depends on agriculture and pastoralism for their livelihood according to a World Bank study (World Bank 2011). In the Cameroon Vision 2035 (Ministry of Economy, Planning and Regional Development, Growth and Employment strategic plan, it is foreseen that economic growth should help elevate the country to middle-income status and that this should be done, amongst others, through the modernisation of the production system by intensifying agriculture. The public and private institutions that serve Cameroon's food sector include research institutions, extension services, cooperatives, financial bodies, public administration, and non-governmental organizations. Their role is to provide policy, labour, technologies and market infrastructure (Abbot et al., 2001).

The developing countries of Africa, Latin America and Asia will accommodate 75% of urban and peri-urban dwellers of the world by 2020. Projections show that by 2020, 85% of the poor in Latin America and 45% in Africa will be concentrated in urban areas. Cameroon is not an exception to this fast urban growth, being one of the most urbanised countries in Africa with 52% of its population living in towns and cities (UN 2012). According to the National Institute of Statistics (2015), 12.3% of the poor in Cameroon are concentrated in urban settings. Bamenda is a city with estimated 322,889 inhabitants (Republic of Cameroon 2017) out of which, the urban population constitutes 269,530 while the suburban population is estimated at 53,359 inhabitants. The North West region is the third most

populated in Cameroon and 55 percent of its population is urban with two fifths of it living in Bamenda (République de Cameroun 2010).

A classification of Landsat satellite images at a resolution of 15 m revealed that urban built-up area has increased threefold from 40 to 125 km² within the past 30 years (Fig. 1). Along with the increase in urban land comes the transformation of other land uses, such as the conversion of previously agricultural land to built-up area (Karg, unpubl. data).

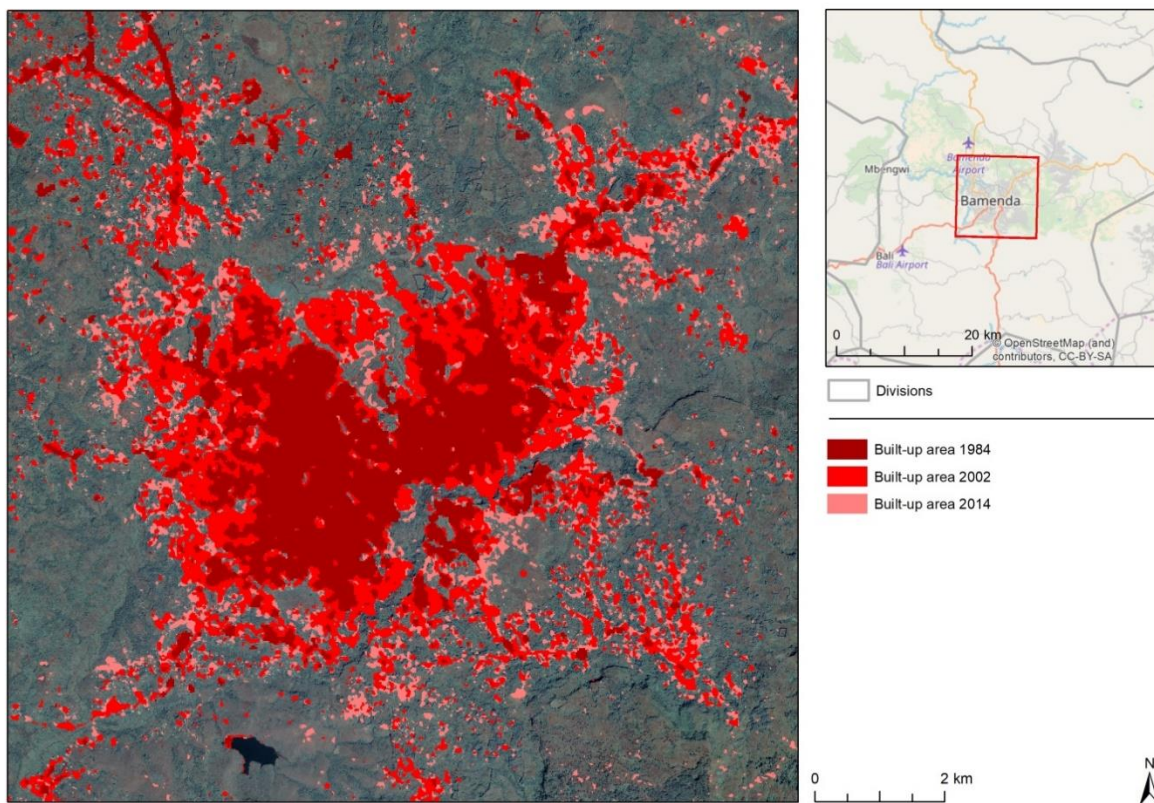


Fig. 1: Change in built-up area between 1984 and 2014 (Map by H. Karg, source: Spies 2015)

Situated at 366km from the capital Yaoundé, in Cameroon’s North West region, Bamenda is set at an altitude between 1,230 m to 1,510 m and in a hilly landscape surrounded by mountains reaching up to 2,621 m. The North West region has a tropical mountain climate with considerable variability of rainfalls and temperatures at the micro-level (Schlesinger 2013). Economic activities in Bamenda town are dominated by small and medium-sized enterprises and by agricultural produce from the neighbouring divisions. There are a variety of banks and microfinance institutions in town. One major product of the region is coffee. Agriculture within the city boundaries is a widespread phenomenon in Bamenda where a majority of the population is involved in some kind of urban agriculture (crop or livestock). A spatial analysis of agricultural land by Hanna Karg within the inner urban area and the

urban fringe showed the location and extent of former and current agricultural land (Fig. 1). The change analysis revealed that within the densely built-up inner urban area the area under cultivation has considerably decreased between the past 7-15 years (Fig. 2). On the other hand, the area under cultivation has increased towards the urban fringe with providing more space for farming activities as compared with the inner urban area. Figure 2 suggests an association between the increase in built-up area and the decrease in agricultural land.

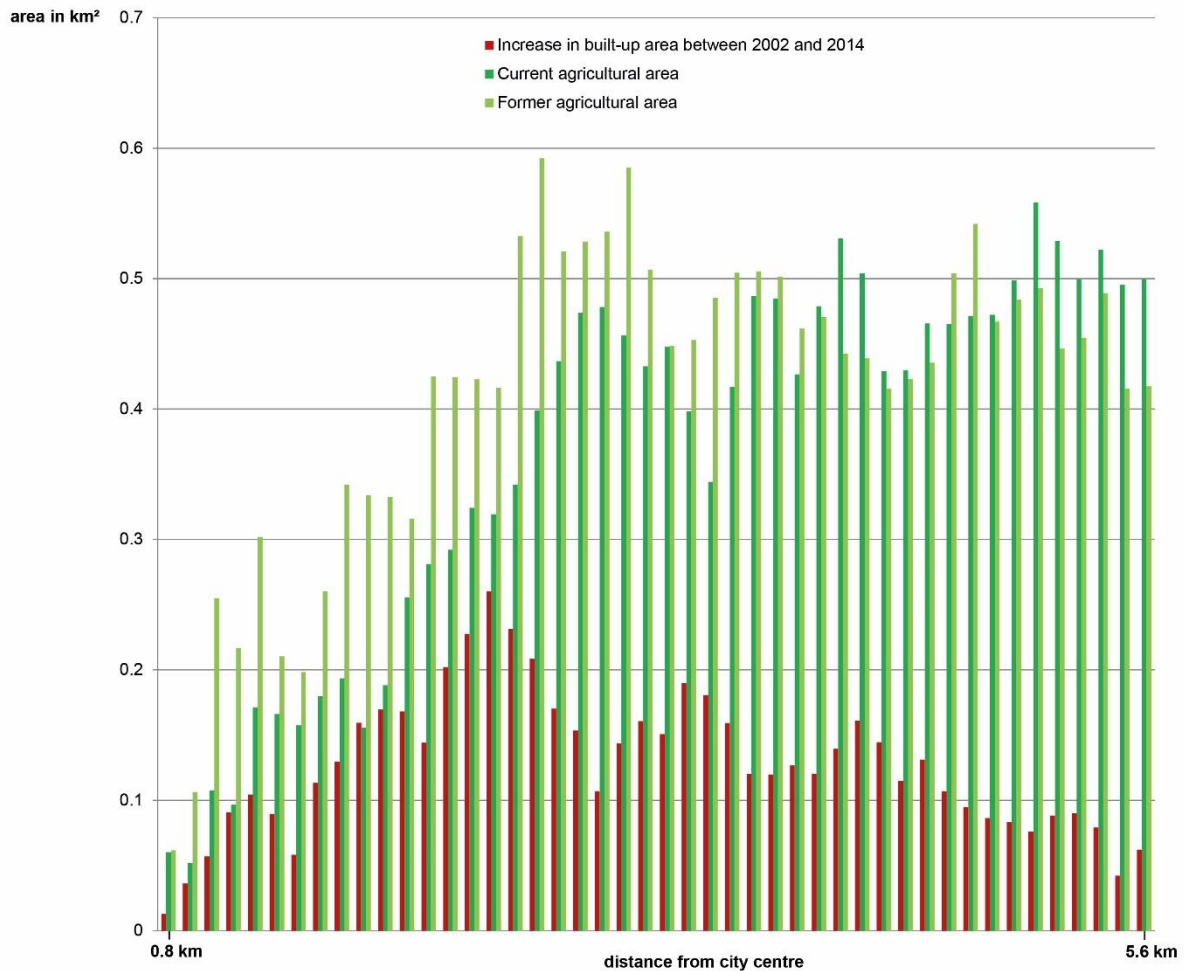


Fig. 2: Area of former and current agricultural land as well as increase in built-up area in km² along a distance gradient. Note: The respective area was calculated based on multiple buffer rings of 2 km² each around the city centre (Karg, unpubl. data).

Not only is the total area of agricultural land changing within the rapidly growing urban area, but farming sites have shifted to other locations (Fig. 3). Only half of the current sites were cultivated 7-15 years ago, implying that while urban farms are pushed back by urban construction activities farmers move to other locations (Karg, unpubl. data).

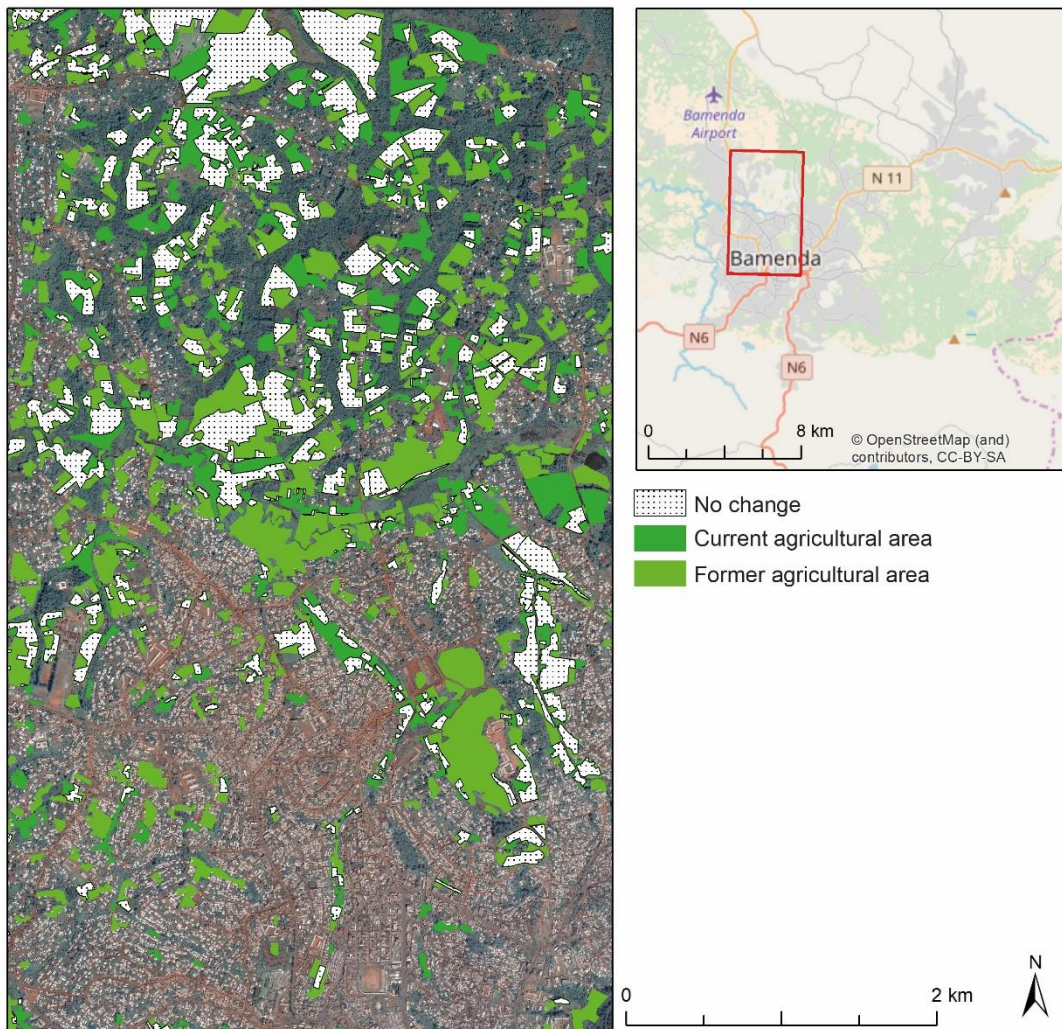


Fig. 3: Agricultural land use dynamics in Bamenda (Map by H. Karg)

The practice of agriculture in and around the city of Bamenda is an important aspect of the creation of a resilient food system, and provides an important solution and complementary strategy to cope with the problems of rapid population growth. In fact, Bamenda is facing rapid urban growth since the 1970s but has great difficulties in coping with this rapid urbanization as it faces major challenges in creating sufficient employment opportunities for the poor and the rapidly growing population. Urban agriculture reduces urban unemployment, poverty and food insecurity. Urban agriculture also plays an essential role in enhancing urban food security because the costs of supplying and distributing rurally produced food to metropolitan areas does not satisfy the demand, especially of the urban poor. Contributing to food security and healthy nutrition is undoubtedly the most important asset of urban agriculture. Food production in Bamenda is characterized by insufficient, unreliable and irregular access to food, health and income especially by the urban poor, a low

purchasing power in the city and a fear of (chemically) contaminated vegetables sold on the market. In urban settings, lack of income translates more directly into lack of food than in a rural setting. Badmus and Olufolaji (2012) estimate that approximately 50% of the poor live in urban areas (25% in 1988). In urban settings, lack of income translates more directly into lack of food than in a rural setting. Urban agriculture improves access to a cheap source of protein and the quality of the food in the households is improved as poor families involved in farming eat more fresh vegetables produced by themselves in gardens.

In the following sections, the status of UPA in Bamenda is presented including a typology of types of urban farms, the role of livestock and general characteristics. Information given on urban agriculture in Bamenda in this document is based on available literature, the UrbanFood^{Plus} research project and the input from participants of the multi-stakeholder dialogue platform. The document is rounded up by a discussion of the benefits of UPA, the identification of major issues and policy recommendations that were defined by the core group of experts listed and validated by the larger group of interested parties convened in the ongoing multi-stakeholder forum.

Urban and Peri-Urban Agriculture in Bamenda

Rapid population growth in Bamenda has led to a dense concentration of habitat. The quarters that surround the densely populated central business district (Ntarinkon, Musang, Ntamulung, Nitop and Azire) are less populated but have the highest concentration of gardens. Vegetables, plantains and bananas are planted on cleared spaces in the compounds. With an increasing population, the demand for agricultural products has increased and consequently these products have known considerable hikes in prices. Against this back drop, urban dwellers have been showing interest in cultivating crops and rearing animals around compounds in order to reduce the cost of living.

In Bamenda, urban agriculture is an important income generating activity and is a means of ensuring food security. According to a study by Johannes Schlesinger (2013) a 77% of households in Bamenda are involved in crop production. Schlesinger relates this to favourable climatic conditions, strong rural-urban linkages despite the fast urban growth, and the availability of arable land in the region (ibid.). In the urban centre the rate was at 65% of the households but many of these households produced on fields outside of the city (ibid.). The majority of the farmers were also involved in marketing. In the urban areas more crops were produced for self-consumption while in the peri-urban area large-scale market oriented cultivation dominated (ibid.). Ojong (2011) calls agriculture in Bamenda a major informal economic activity that substitutes household consumption and generates

income. According to him women farmers dominate but are assisted by household members. Crops are cultivated on fields in the outskirts and in backyards, around office buildings, riverbeds, marshy areas or any small opening throughout the city.

Urban agriculture in Bamenda plays a role in job provision. According to Ngoran & Ngoran (2015), urban agriculture in Bamenda employs 11% of the towns' working population. Three forms of employment are offered by urban agriculture. This includes self-employment, wage employment and task work. Self-employment includes farmers working on their personal farms. Urban farmers in Bamenda view urban agriculture as rewarding activity that gives them some economic freedom. The farmer is self-employed and a greater proportion of the capital belongs to the farmer. The income also permits urban farmers to be able to consume urban services. Such services include intra-urban transports, health services, leisure etc. UPA offers many food-related opportunities in and around urban areas such as input supply, manufacturing, agro-processing and marketing. Apart from offering jobs, urban agriculture has contributed to ensuring food security and healthy nutrition in Bamenda. Urban agriculture in Bamenda has thus ameliorated the living conditions of city dwellers by improving their diet and offering income opportunities.

Different institutional organisations are involved in urban and peri-urban agriculture in Bamenda. These institutions include government departments, research institutions such as IRAD, international organizations, the civil society or private businesses. Active stakeholders from civil society are for example Strategic Humanitarian Services (SHUMAS) or Mbororo Social and Cultural Development Association (MBOSCUA) or the various, many times rather small, farming cooperatives and bigger institutions such as the North West Farmers Organization (NOWEFOR) or PLANOPAC (Plateforme Nationale des Organisations Professionnelles Agro Sylvopastorales et Halieutiques Cameroun), the national umbrella organisation for cooperatives. Stakeholders also include all relevant municipal authorities, which in Bamenda are split between a the Bamenda City Council (BCC), which is instituted by the central state, and locally elected Bamenda I, II, III councils and the traditional rulers such as the Fon of Nkwen. Furthermore, state institutions such as the Ministry of Agriculture and Rural Development (MINADER), Ministry of Livestock, Fisheries and Animal Industries (MINEPIA), Ministry of Environment, Protection of Nature and sustainable Development (MINEPDED), Ministry of Water and Energy (MINEE) or the North West Development Authority (MIDENO) are relevant in setting the regulatory frames and offering assistance in the form of projects to farmers. An important source of information on technologies and innovation are the research bodies of the country such as the Institute of Agricultural Research for Development (IRAD) or the agricultural departments of Bamenda University, the Catholic University of Cameroon (CATUC) and the College of technology

(COLTECH). Businesses include dealers in seeds, fertilizers, pesticides, manure, animal feeds and farm equipment.

The involvements of these stakeholders are at different levels and aspects of agriculture. While the government institutions like MINADER, MINEPIA or MINMESSA come in to put order, legislation, finances, technical knowhow and supervision, most international and national civil society organisations like NGOs come in to support government action in their different areas of intervention. Even though there are several extension services active in Bamenda most of the sampled farmers (82%) did not have contact with one in the last years (Dittrich, unpubl. data). Those that had contact with an extension service had questions regarding livestock keeping, improves seeds or general cultivation problems. Out of the 18% that used the support of an extension service 12% were satisfied with the service (Dittrich, unpubl. data). The next section offers a typology of urban and peri-urban farms in Bamenda.

Typology

Urban and peri-urban agriculture is not a uniform phenomenon but rather refers to a variety of different types of urban farms. Crop production in Bamenda is done in four geographic spaces namely wetlands, densely settled zones, slopy areas and suburban locations. The techniques of cultivation utilized in each of these areas are site-specific. There are factors that determine the techniques of each of these geographic spaces, which are both human and physical. Human factors include the high concentration of buildings, council laws regulating urban agricultural activities as well as culture and tradition of the people. Physical factors include the nature of the terrain, humidity of the soil and land availability. Table 1 gives an overview of the different types of farms in Bamenda distinguished by spatial characteristics, water availability and usufruct rights. There are six different farm types that can be distinguished for Bamenda: micro-farming, community gardening, institutional urban farming, small-scale (semi-)commercial horticulture and livestock and aquatic farming and peri-urban farming. The next sub-sections, describe the types in more detail.

Table 1. Typology of Bamenda's urban and peri-urban farms

Farm type	Spatial characteristics	Water availability
Micro-farming	In and around the house/homestead; urban poor families, female headed households, as well as medium/high income class families	Close-by irrigation sources such as a gutter, a commercial pipe or a reservoir.
Community gardening	Within walking distance of the homes, especially in vacant open areas in or adjacent to popular neighbourhoods	May or may not have access to irrigation.
Institutional Urban farming	Within the compounds of, schools and research institutes; mainly in periphery	Formally provided irrigation canal system, sourcing water from a reservoir
Small-scale (semi-) commercial horticulture	Mainly in the peri-urban areas as well as vacant open spaces within the city and in wetlands	Close-by irrigation sources such as a gutter, a commercial pipe or a reservoir.
Small-scale (semi-) commercial livestock and aquatic farming	Larger house plots, vacant open spaces within the city, lakes or rivers, suburbs, peri-urban	May or may not have access to water
Peri-urban farming	Farming on contiguous fields in villages around the metropolis, linked to urban input and output markets. Some villagers also cultivate on isolated fields close to the house, analogous to backyards.	Non-irrigated

Micro-farming



Fig. 4: Small garden in the backyard of a house in Mile 4 neighbourhood (Picture by SHUMAS)

These farms are mostly found in and around houses. Micro-farming is carried out by households of all socio-economic classes. It is the most common type of farming in Bamenda present in marginal urban settlements, urban centres, and urban suburbs. It is carried out in micro-scale (up to 200 m² but often smaller). Used for subsistence, mainly women carry out this activity. Production on micro-farms is mainly for home consumption. Water is available through location of these farms in proximity to gutters, commercial pipes or reservoirs.

Community Gardening



Fig. 5: Ridge with cocoyam, sweet potatoe and egg plant (Picture by SHUMAS)

Found within walking distance of the homes, especially in vacant open areas in or adjacent to popular neighbourhoods, it is carried out mainly by urban poor families, female headed households, elderly people, or recent migrants. Production is mainly subsistence. Irrigation is not always available. The land is usually not legally owned by the cultivator but traditional usufruct rights apply.

Institutional Urban Farming

These farms are within the compounds of institutions in the built-up city or in the periphery. These farms are mostly of about 500m scale with some of the land held by the state and others by traditional authorities. This is mostly carried out in areas like Bamenda II and III by institutions like IRAD and University demonstration farms held by COLTECH.

Small-scale (Semi-) Commercial Horticulture

The cultivation of crops around compounds can be seen near houses in Government Residential Areas (G.R.A. Up-station) and Nkwen. Market gardening in Bamenda is practiced in wetlands. In Bamenda, these areas include corridors of rivers such as those of River Nki Nelia and streams such as Nki Nshewu, Machu, Nkyi Ashega. Marshy lands below Foncha Street and those behind the G.R.A. in Up-station are equally wetlands. It should be noted that most inland valleys in Bamenda are wet valleys

which in most cases are wetlands. These wetlands have gone a long way to foster market gardening and increase the income of gardeners. The wetlands in Bamenda are peculiar in that they are humid



Fig. 6: Farm at Mile 6 Nkwen
(Picture by A. Witte)

throughout the year. The precipitation received within the town is about 2500mm in the high lava plateau (Bamenda I) and 2300mm in the intermediate plateau which incorporates Bamenda II and III (Asongwe et al., 2016). This high precipitation rate ensures the continuous humidity of these areas throughout the year. The cultivation is not just for consumption but also market-oriented. The cultivator usually does not own the land.

Small-scale (Semi-) Commercial Livestock and Aquatic Farming

Livestock production entails the rearing of conventional and unconventional farm animals such as cattle, sheep, poultry, goats, pigs, rabbits, and ducks, guinea pigs, fish, cane rats and others and bee farming by an individual or a group of people for consumption or profit making (Forchid, 2016; Provost, unpubl. data). In the production process the animals are usually confined in a particular area



Fig. 7: Cattle in Bamenda (Picture by SHUMAS)

(animal farm) and bred through the application of skilled and sometimes unskilled management techniques. Water availability is an important factor that favours the location of poultry farms, piggery and animal tethering. Water spaces are used by livestock breeders as areas for the discharge of animal waste and cleaning of animals. Livestock production is done by traditional small-scale urban and peri-urban farmers, urban middle class households with larger house (as a secondary source of income) and urban poor households

on vacant open land or in lakes or rivers.

Peri-urban Farming

Farming in peri-urban areas is done on fields in villages around the city and on fields close to administrative areas such as Mile 6 Nkwen, Bambui or Mile 8 Mankon. The advantage of peri-urban areas is the greater availability of bigger stretches of land that are nonetheless well connected to urban markets for buying farm inputs or selling the produce. Owners of these farms do not necessarily



Fig. 8: Farm in Mforya (Picture by A. Witte)

live close to their peri-urban fields but reside in other parts of town. If farming is not their only economic activity, they may have farm workers living around the farm and visit the farm themselves only on free days such as Saturdays. However, there are also some villagers who cultivate on isolated fields close to the house, analogous to backyards. The farming is done for the market and the cultivator is usually either renting or has traditional usufruct rights.

Characteristics of UPA in Bamenda

Agriculture in Bamenda city involves crop based farming, pastoralism and integrated livestock and crop cultivation. It should be noted that over 95% of the population of the urban and peri-urban area is involved in agriculture in various ways. The major farming areas in Bamenda city are usually around homesteads and wetland areas but towards the peripheries more extensive farm lands exist. According to a survey made by Dittrich (unpubl. data) with 160 urban farmers the average plot size in Bamenda is 292 m². Furthermore, the sampled 160 households show that most farmers only grow crops inside the city (63%) and only use one plot for cultivation. The practice of urban agriculture in Bamenda is fostered by economic, social and political factors that are addressed in the next sub-sections.

Crops and Vegetables

Crops and vegetables cultivated in Bamenda include; banana, cassava, maize, yam, sugarcane, sweet potato, cocoyam, Irish potato and huckleberry, cabbage, okra, tomatoes, pepper and green spices like celery (*Apium graveolens*). The crops grown vary according to seasons (wet and dry seasons). In the urban setting, the cultivation is mostly mixed cropping irrespective of the season but dominated by water leaf, green spices, pepper and *Solanum scabrum* (huckleberry or *njama njama*). The average

yield for the cultivation of leafy vegetable varies between 50 to 300t/ha, with an average revenue of 340.000- 4.000000 FRS per hectare in Cameroon (Bidogezza et al., 2016). These vegetables, remain one of the mainstay of diets in the area as they often accompany their carbohydrate staples such as the local food called *achu* (produced from pounded *Colocasia spp.*), corn *fufu* obtained from corn (*Zea mays*) flour, plantains (*Musa spp.*), etc. Only 5% of the sampled population indicated that they do not consume vegetables either because of health matters or because of fear of contamination. Those who fear contamination eat vegetables when they are sure of their sources. Additionally, according to Asongwe and Yerima, (2016). Officials from MINADER suggested that the general perception is that 95% of the inhabitants of the municipality prefer vegetables from the outskirts to those of the urban municipality. The three most common vegetables are *Solanum scarbrum*, *Vernonia amygdalina*, and *Amaranthus spp.* These results are partly in agreement with those of Fontem *et al.* (2012) but with *Vernonia amygdalina* replacing *Amaranthus spp* from second to third most preferred vegetable. The production of *Amaranthus spp.* is still widespread in the Mankon area. African nightshade (*Solanum*) is exported to the rest of the regions in Cameroon and some neighbouring countries. Thus, leafy vegetables are of nutritional importance in Bamenda and their cultivation is both satisfying a market demand and creating employment opportunities.

In the rainy season, greens, huckleberry, cocoyam and cabbage dominate the urban setting. Mix-cropping is the strategy used by farmers who cultivate crops around their compounds. Faced with land scarcity in the densely populated quarters, mix-cropping is economical, efficient in soil nutrients exploitation. Land use is also maximized as a ridge carries a high plant population. There is effective use of available plant nutrients as the different crops obtain nutrients at different soil depths. It also reduces crop failure, which may result from pest and diseases attacks leading to food insecurity.

Typically, in the dry season farmers only grow one crop on their plot, while in the rainy season intercropping, especially maize with beans and cocoyam, is common (Dittrich, unpubl. data). Intercropping is, in fact, a common characteristic of urban agriculture in Bamenda (Schlesinger, 2013). The situation is different for peri-urban areas. In the dry season, these areas are characterised by the cultivation of tomatoes, cabbage, carrots and green spices (leeks, paprika, celery etc.) along river banks and wetland. In the rainy season, over 50% of the population cultivate staples such as maize, beans and Irish potatoes (Table 2; Ministry of Agriculture and Rural Development, 2017a). Huckleberry and maize are the most cultivated crops within the urban and peri-urban areas. This is evident in sample market in these areas. A reason for this is the fact that these are staple crops in the region, consumed by all. The techniques of cultivation techniques depend on the nature of the

terrain, the soil quality and land availability. Herbs are mostly grown during the dry season, while crops such as maize, beans, cocoyam during the rainy season.

Water Availability and Quality

Urban agriculture in the city of Bamenda is rain-fed in the rainy season and entirely depends on irrigation in the dry season with a majority of the farms located along river banks or in wetlands due to serious water shortage during the dry season. Bamenda has a long rainy season of 8 to 9 months which greatly favours agriculture in Bamenda City. However, the dry season especially during the months of January to March are often very challenging.

Fig. 10: Watering at a demonstration farm (Picture by SHUMAS)



Fig.9: Water used for irrigation (Picture by SHUMAS)

Practically all large-scale farmers in urban and peri-urban Bamenda involved in dry season irrigation farming depend entirely on the many streams, rivers and wetlands for their water needs. These farmers work in wet inland valleys, swampy areas and low-lying areas such as part of Foncha Street, corridors of River Mezam and its tributaries. In most of the farm plots at wetlands, farmers dig small wells of less than 4m where they collect water and use it to water their crops either through the use of buckets, watering cans or cannons or water motor pumps and sprinklers. Some farmers directly connect their pipes and water motor pumps in the rivers. Others, practice furrow irrigation whereby they divert water from streams into their gardens during the months of December, January, and February. For people with small farm plots behind their homes, they can use water from wells at

home to water their crops. It is rare for farmers to use water from the Cameroon Water Cooperation (CAM WATER) supply company for their crops as this is very expensive.

Water used in agriculture in Bamenda is of varying quality. Tap and well water is common in agriculture in backyards. Most farmers who cultivate along river banks and streams benefit from these sources though they are of varying quality. Some of these streams and rivers are polluted as a result of discharge of household and slaughterhouse waste and washing of automobiles. As such, these are used downstream for vegetable cultivation. The legal instruments put in place to protect water resources and ensure constant availability are not followed. According to Tata et al. (2013), these include

- Law No 94/01 of 20 January 1994 relating to the conservation of forestry, wildlife, fisheries and biodiversity and law No 96/12 of 5 August 1996 relating to environmental management which according to section II article 25 is based on the protection of continental waters and flood plains which; states that “continental waters constitute public property whose use, management and protection shall be subject to the provisions of this law and those of the laws and regulations in force. Article 29 pending the provisions of article 30 insist on the fact that any act likely to provoke surface or underground water degradation through the modification of their physical, chemical, biological or bacteriological characteristics shall be prohibited” (Bessong and Ngwasiri, 1995)
- Law No 90/016 of 10 August 1990 on spring and mineral waters, which states that the exploitation of mineral waters is subject to authorization by the Ministry of Energy and Water Resources (MINEE). Such authorization determines the zone of protection of the catchment
- Law No 98/005 of 14 April 1998 which focused on the respect of the norms of environmental protection and the protection of public health. It states that “water is a national resource and that the state assures its protection, administration and facilitates its access to all either by itself or any other person by delegation of authority”. Concerning protection, the following are forbidden
 - Any act likely to pollute water, change its quality negatively, retard or put into question the development of this resource and threatens public health both faunal and floral
 - Provision of water to the general public on a large scale without authorization.
 - Washing, repairing vehicles and any other engines or any material in or near water resources (Article 6(3))
 - Human activity, like farming, infringing on a perimeter of protection of 50-100m that has been created around the catchment zone; treatment works and storage installations (Article 7(1,2)).

Access to Land

The state of urban and peri-urban agriculture cannot be assessed properly without paying attention to the question of who gains access to land and through what formal and informal processes. Access or exclusion from land directly affects livelihoods and survival both in urban and rural areas, making land tenure a high stakes issue. In Cameroon, all land is owned by the state, which can be exploited as need arises. Obtaining a land certificate requires the endorsement of the community head, the legal department, the council, the delegation of urban development, the taxation department and the delegation of lands and state property. The rentals of land for livestock is also crucial as it is carried out on private or public land. While the marshy areas are reserved for agricultural purposes and are supposed to be carved out by the councils for developmental purpose including agriculture and infrastructural development, the activity is carried out haphazardly.

However, land use particularly for the purpose of farming usually poses little or no problem. According to Ojong (2011), the urban poor cultivate crops on public land while those who can afford lease land for cultivation. The result of cultivation on public land is that since it depends on the discretion of the relevant authorities, people only plant seasonal crops such as maize, beans and Irish potatoes (Ojong 2011). People who cultivate on private land usually have bigger farms and can cultivate a greater variety of crops than those on public land. According to the survey by Dittrich (unpubl. data), 54% of the sampled households have a land title while 11% say the land they use is family common land. Another 14% borrow land for cultivation privately and 5% rent land. This implies that paying rent for cultivation is uncommon in urban farms in Bamenda. When paying rent, the rents amount to 2,000 CFA – 60,000 FCFA per year. The sample furthermore shows that most farmers only own the sampled plot (63%). 44% of households cultivate on more than one plot (up to six). Mostly those plots are in peri-urban areas. Furthermore, 52% of respondents asserted that farmland has been increasing in the last 10 years while 28% stated that it stayed the same or decreased (20%) (Dittrich unpubl. data). The farmers' perception contrasts with earlier mentioned data gathered by UrbanFood^{Plus}, which portray a trend of urban construction decreasing available cultivation land in the city centre. However, a possible explanation for the mismatch could be that farmers do not abandon agriculture altogether but simply move to other locations.

Farm Inputs

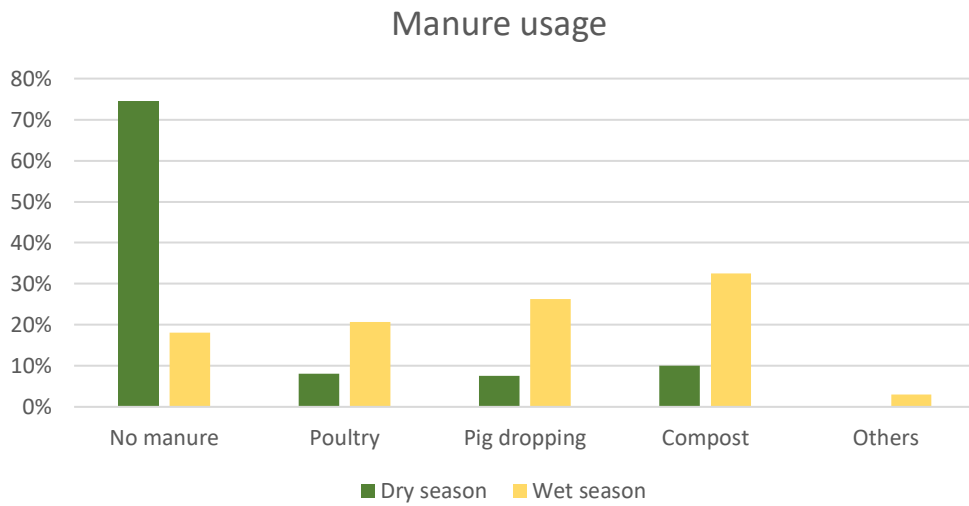
One of the limitation of vegetable production in Bamenda is low soil fertility, caused by very low soil Ph and leaching of soil mineral element due to high rainfall, (2000mm to 3000mm). Urban and peri-

urban agriculture therefore relies on inputs to tackle problems of soil fertility by using fertilizer, manure and sometimes compost as well as improved seeds for increasing yields. In urban zones, farmers use more manure and compost. This is because farms are not that big and waste food from homes are dumped in backyards or composted. In peri-urban areas, use of inorganic fertilizers such as urea or nitrogen-phosphorus-potassium, in short: NPK, is very common especially in the rainy season during maize cultivation.

An UrbanFood^{Plus} survey that sampled 160 urban farmers in 2017, shows that the usage of chemical fertilizer is not that common in urban agriculture in Bamenda (Dittrich, unpubl. data). Farmers displayed an interest in good quality food when producing for their own consumption and fertilizers were viewed rather critically or at least ambivalently as early research findings by Witte (2018) show. Fertilisers were considered to make crops and vegetables waterier or even pose a health risk (ibid.). Furthermore, price differences between fertiliser and manure are not high. Out of the sampled households only 15% use NPK and 7% urea in the wet season. In the dry season, the use of chemical fertilizer is not typical, see table below. For organic fertilizer the picture looks different. In the wet season, 72% of the farmers use manure to increase soil fertility. Especially compost as well as pig and poultry droppings are common. Tables 2 and 3 show the manure and chemical fertilizer pattern for the sampled urban farmers in Bamenda. Weed and pest control is not practiced in urban backyard farming.

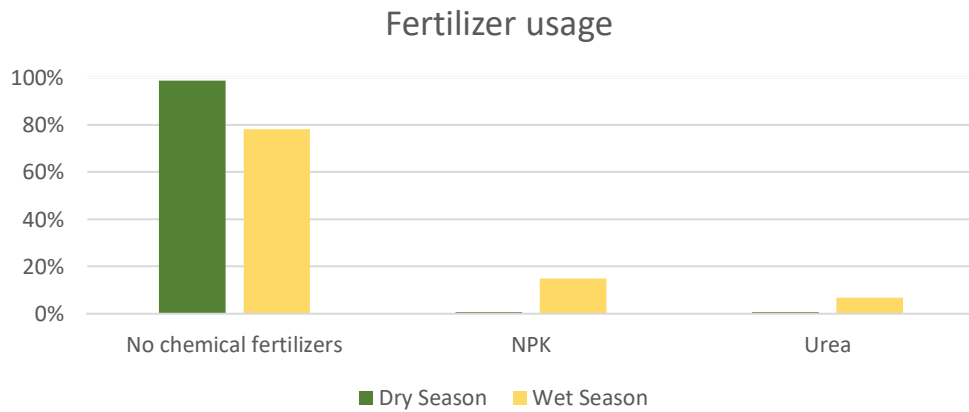
This conforms with findings of Crawford et al. (2006) that the use of fertilizer, organic or chemical, is very low for overall Cameroon (<25kg/ha). However, regional differences in usage of agrochemicals have to be considered as some areas like Santa are cultivating with more chemical fertilizers and pesticides as other areas. Additionally, it has to be highlighted here that backyard farming is mainly for home consumption and not market-oriented, hence a tendency to spend less on farm inputs.

Table 3: Manure pattern of urban farmers



Source: Dittrich (unpubl. data)

Table 4: Fertilizer usage among urban farmers



Source: Dittrich (unpubl. data)

Generally, in urban agriculture a high use of chemical fertilizer is common mainly when high value crops are produced (Adelaj et al., 2010). In Bamenda, farmers producing for the market, especially on peri-urban farms, have stressed in interviews their dependence on chemical pest control and synthetic fertilizers (Witte, unpubl. data).

From observation during farm visits, wetland vegetable farmers in the Bamenda municipality use a variety of fertilizers including urea, NPK or sulphate. Sustained use of these fertilizers could constitute an important source of heavy metals in soils of this ecosystem. In Malaysia, Zarcinas et al.

(2004) noted that, heavily fertilized agricultural soils with P fertilizers, showed significant positive correlations of soluble As, Cu, Cd, and Zn in soil with aqua regia soluble P. Heavy metals input to arable soils through fertilizer use is of increasing concern due to their potential risk to environmental health (Yang et al., 2004; Zarcinas et al., 2004; Yerima and Van Ranst, 2005b). Phosphate fertilizers, for example are generally the major source of trace metals as impurities in inorganic fertilizers, and as such much attention has been paid to the concentration of Cd and Pb in phosphate fertilizers (Yang et al., 2004).

Considering soil fertility problems and the inefficiency and (at times) reluctance to use synthetic fertilizer, UrbanFood^{Plus} research tested the impact of biochar on soil fertility in field experiments in Mendakwe and Bambui, two areas with depleted soils, one highland and the other lowland (Gawum unpubl. data, Fig. 12, 13). The soils in Bambui are not as poor though as the ones in Mendakwe. The aim of this experiment was to investigate the effect of biochar on the growth yield, nutritious properties and soil properties of improved and local variety of amaranth and African nightshade. The experiment ran for two wet seasons and two dry seasons and corn cobs were used for the production of biochar (Fig. 14).

Fig. 11-12: Central field experiment Bambui and Mendakwe respectively (Pictures by A. Bürkert).



Due to the fact that soils in Mendakwe are very depleted, farmers use a common traditional farming practice called “ankara” with the aim to improve soil fertility. Here, dry plant waste is put in the middle

of beds, then partly covered with soil and burnt (Fig. 15). While *ankara* shares with biochar the burning of biomass with limited oxygen, the difference lies in the fact that biochar does not destroy micro-organisms in the soil that actually help increase soil fertility. Too much smoke is being emitted, which indicate loss of carbon to the atmosphere thus reducing soil fertility.



Fig. 13-14: Elsa barrel by UrbanFood^{Plus} for biochar production, Ankara practice by farmers in Mendakwe (Pictures by E. Gawum).

The results of the experiment show that biochar leads to higher yields, especially when combined with manure. The combined treatment increased soil fertility for four cropping cycles even though it was only in the first. In comparison to manure only, the manure plus biochar treatment increased output of African nightshade increasingly with the cropping cycles; 32% in the first cropping cycle, 46% in the second cropping cycle, 68% in the third cropping cycle and 116% in the fourth cropping cycle respectively for Bambui site (Fig. 16). Likewise in Mendakwe the percent increase on application of biochar plus manure was, 49% for the first cropping cycle, 62% for the second cropping cycle, 79% third cycle and 240% in the fourth cropping cycle as compare to manure only (Fig. 17). Furthermore, results show that farmers who apply biochar and manure also in the second cycle can cultivate in the subsequent cropping cycle without any farm input of manure or biochar and will still have high yield. (table 5, 6).

Table 5: Total fresh biomass yield (t/ha) of Local African nightshade in four season at Bambui site

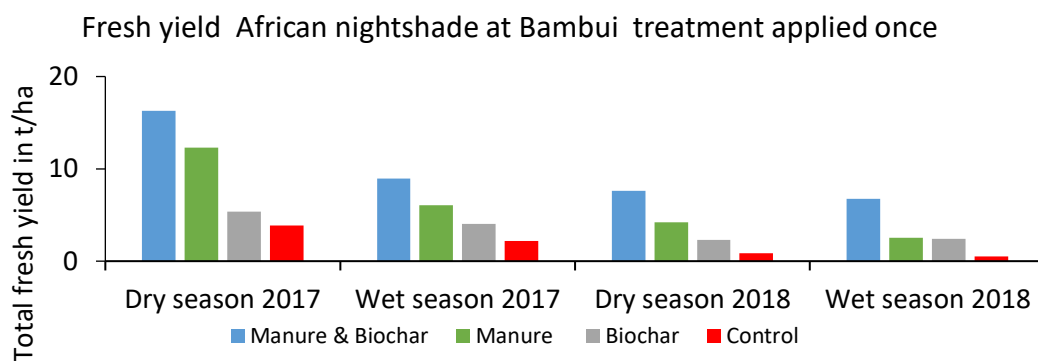
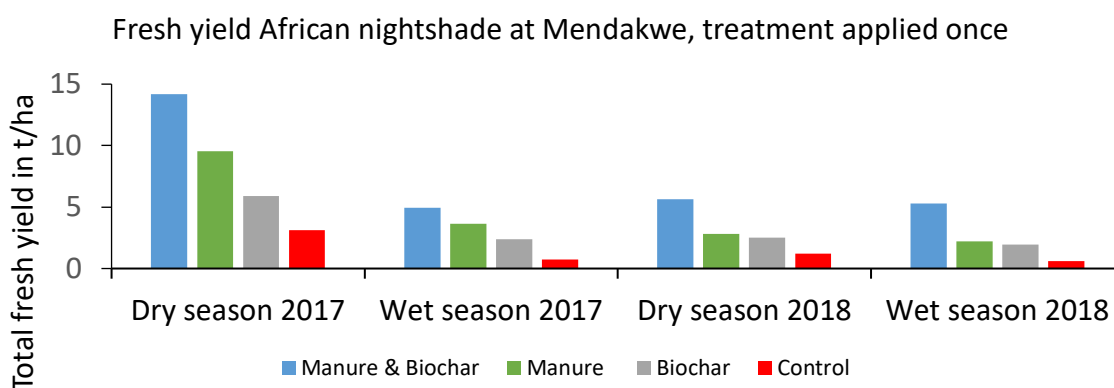


Table 6: Total fresh biomass yield (t/ha) of Local African nightshade in four season at Mendakwe site with application of treatment only in the dry season 2017.



Another crucial input in the agricultural sector is the quality of seeds. Improved vegetable seeds are distributed and used in the urban and peri-urban areas. It should be noted that all vegetable seeds are of improved quality while maize and beans seeds may not be improved. Treated and certified seeds are available in shops and at subsidized rates from MINADER. Also, projects under MIDENO aim at distributing high-yielding seeds to famers.

Market and Subsistence Activity

Income levels of farmers vary per season and per crop cultivated. Farmers who cultivate vegetables in the dry season, make higher earnings than those cultivating in the rainy season. The reason being a higher demand than quantity supplied. According to information gathered by SHUMAS among market sellers, an average farmer occupying an area of 150 m² generates the sum of 750,000 FCFA,



Fig. 15: Market scene in Bamenda
(Picture by A. Witte)

besides sales of other associated farm produce and with cost of inputs included, at the end of the dry season. The Bamenda based farmer survey made by Dittrich (unpubl. data) shows that the majority of farmers do currently not produce for local markets but only for self-consumption. For the majority it is a strategy to ensure the availability of certain crops, typical for the local cuisine, such as maize and beans, and to spend less on food. However, when having extra, people complain that they would like to sell but struggle with missing linkage between producers and markets.

Processing and Packaging

Vegetable and crop cultivation in Bamenda does not include processing and proper storage and hence most vegetables are not preserved adequately resulting in post-harvest crop loss. The only way in which most farmers enhance their produce is by sprinkling water on the vegetables in order to maintain some freshness. However, some sellers have been found to treat grains or fish with chemical products for preservation purposes (Ministry of Agriculture and Rural Development 2017b).

Another method of produce preservation is by sun drying especially in pepper, bitter leaves, okra and egusi. Bamenda has a few shops with processing and packaging facilities for food exported to the United States and Europe. However, most processed food like canned tomatoes are brought from Douala and sold in the local markets in both urban and peri-urban areas. Parboiling of vegetables to be sold in shops is also a common method of preservation. The cultivation and processing of mushrooms is common in Bamenda. The ministries of agriculture and livestock are currently undertaking projects to improve on this sector. This is highly influenced by MINADER and MINEPIA through various projects in the urban and peri-urban areas. Some of these projects include:

- Program for Improvement of the Competitiveness of Family Agro-pastoral Farms (ACEFA)
The aim of the project is to support farmers in improvement in livelihood through the sponsoring of infrastructural projects both in rural and urban areas. The project only assists

farming groups in various aspects of agriculture but in the same vicinity, e.g. construction of piggeries to modern standards, provision of tractors for the ploughing of fields, construction of poultry. However, it should be noted that this project only assists farming groups.

- Program for the Development of Roots and Tubers (PNDRT). This project is aimed at supporting farmers in cultivation of root crops in both urban and peri-urban areas. Farmers here are supported with improved species of these crops to boost production and livelihood.
- Young farmer Settlement and Support Project (PAIJA) put in place innovative mechanisms for the improvement of productivity, marketing transformation of agricultural products and created rural enterprises
- Youth Agro-pastoral Entrepreneurship (PEA-Jeunes) aimed at providing young women and men the means to increase their revenue and improve their food security through profitable enterprises and integrate them in agro pastoral activities. With this project various ministries are involved
- PPD MVCC (Projet de production et division des matieres vegetales des cacao et cafee). This project trains selected farmers on how to nurse cocoa and coffee seeds in each division. They receive trainings and seeds to produce seedlings. After this, the government pays for the produced seedlings (100frs per seedling) and distribute to needy farmers. Aim here is to produce and increase cocoa and coffee production.
- PALAF₂C (Support project for the fight against fungal disease in cocoa and coffee). Each year the ministry of agriculture sends support (chemicals) to cooperatives of cocoa and coffee to spray their crops. The cooperative must be functional. The cooperative intend distributes to its members for free.
- PAUEF₂C (Support project for fertilizers for cocoa and coffee). This project supports cooperatives with fertilizers to distribute to cocoa and coffee farmers in order to boost production. It should be noted that these chemicals distributed have been homologated.
- Solanum potatoes sub sector program. This project supports in providing improved potatoes seeds to farmers in potatoes producing areas. Each year, farmers apply for these seeds after which a screening is made and then distributed in them.

The Role of Livestock

In developing countries, a large increase in demand for livestock and especially beef products has been related to population and income growth and urbanization. This demand is met by changes in the livestock systems based on technological innovations and increases in animal numbers (FAO, 2013; Thornton, 2010). Livestock production is one of the main livelihood strategies used by families living in rural areas in developing countries, and in particular in Sub-Saharan Africa, enabling them to accumulate assets and capital that can be crucial in ensuring the survival of their households in times of crisis. Livestock also provides a major pathway through which poor rural families can improve their incomes and social status (Abdulkadir et al., 2012; Roessler et al. 2016). Livestock equally plays a vital

role in small-scale farming systems. Moreover, the demand by high-income groups in rural areas and cities for animal products provides a viable means for many poor households to earn cash income through the sale of eggs, meat and milk. The share of income from animal production including the value of home consumption of animal products usually ranges from 10 to 20% of rural households (Zeller, 2000).

In Cameroon, the livestock sub-sector serves about 30% of Cameroon's urban population and plays a significant role as a source of revenue. Livestock contributes about 9% of the country's total agricultural or about 2.1% of its Gross Domestic Product (MINEPIA, 2002). Animal production thereby has developed gradually in the past decades. In 1995, the livestock population of Cameroon comprised about 4.6 million cattle, 3.6 million goats, 3.4 million sheep and 2.6 million pigs (FAO 2006), but increased to 5.9 million cattle, 6.3 million goats, 3.0 million sheep, 3.1 million pigs as well as 4.0 million laying birds and 50 million broiler chickens by the year 2013 (FAO, 2018). Horses and asses, by contrast, are grazing species of relatively low economic importance but the former traditionally play an important cultural role for the country's Fulani ethnic groups (Boutrais, 1995; Pelican, 2006).

The importance of livestock, in ameliorating the nutritional status of the Cameroonian population in general cannot be over-emphasized. Livestock products, especially dairy, make unique contribution to human nutrition by providing micronutrients in bio-available form such as vitamin A and calcium. Other cattle products like milk, hides and skin are also highly consumed in some parts of the country, especially in the North West Region (Aliou, 2004). Furthermore, it generates employment opportunities to millions of Cameroonians, like breeders, middlemen in cattle trade, transformers, transporters and butchers. Livestock products, especially beef constitute a significant part of the main diet of more than 60% of the population (Aliou, 2004).



Fig. 16-17: Small scale poultry and pig farms within Bamenda (Pictures by SHUMAS)

Although the pattern of agricultural production is predominantly crop-oriented in Bamenda, small ruminants (goats and sheep as well as poultry farming) form an important component within complex

mixed animal-crops operations (Forchid, 2016; Ngoran and Ngoran, 2015). They are reared widely in mainly small farm systems, which form the pivot of traditional agriculture. In these circumstances, they produce meat, milk, fibre and skins and perform a variety of other miscellaneous functions such as dung production. Integrated crop-small ruminant production, where the animals make intensive use of stubbles and crop residues while returning dung and urine as natural fertiliser to the land, is an established system throughout the city's urban and peri-urban zone whereas in the rural surroundings, crop-livestock integration also involves cattle (Pezo et al., 2012).

According to a baseline survey amongst 226 urban and peri-urban livestock-keeping households carried out in 2016, 79% of them keep pigs while 77% hold poultry, making the two the most common livestock groups (Forchid, 2016; Provost, unpubl. data). However, poultry appears more important for local farmers' livelihoods due to multiple purposes such as the use of eggs and feathers in rituals. Additionally, a growing interest in less conventional animals such as guinea pigs, rabbits, quails and snails has been noted during the stakeholder sessions. The reasons for livestock rearing include amongst others the production of consumables such as meat, milk, eggs and cultural aspects.

Bamenda's livestock sector suffers from various constraints and challenges including regular disease outbreaks due to insufficient hygienic measures, high feeding costs and market price fluctuations (Forchid, 2016; Provost, unpubl. data). Another problem lies in the improper use of veterinary drugs and even agrochemicals to treat livestock diseases and parasites (Feldt, personal observation). This negatively affects the animals' health, the environment (especially due to improper sewage discharge) and, ultimately, the human final consumers. In central urban areas, livestock causes other nuisance such as odour from pigpens and some poultries and improper sewage discharge.

Cattle breeding, both for the purpose of beef and for the purpose of dairy products, has a long tradition in the North West Region of Cameroon, in particular amongst its resident Mbororo people, a subgroup of the Fulani ethnicity (Boutrais, 1995; Pelican, 2006). Vast grasslands in the city's rural surroundings thereby support a still largely extensive livestock system, making the area one of Cameroon's most important regions for cattle rearing and placing Bamenda amongst the country's main hubs for beef production (Mbih et al., 2018; MINEPIA, 2013). However, the region's cattle production system can be considered improvable from an economic and productive point of view. It therefore became the focus of numerous studies as well as national and international development projects (Bayemi and Webb, 2009; Nchinda et al., 2016). Until today, beef cattle husbandry predominantly remains in the hands of Mbororo pastoralists, but local, non-Fulani cattle farmers are progressively entering this business.

In contrast to beef, dairy production was traditionally limited to self-consumption and small-scale local marketing, both again mostly carried out by Mbororo (Ndambi et al., 2008; Pelican, 2012). Nevertheless, due to the region's high potential for the rearing of dairy cows, exotic breeds have been increasingly introduced by governmental and non-governmental organisations to establish a dairy sector in and around Bamenda under both grazing and non-grazing conditions (Bayemi et al., 2005; Bayemi and Webb, 2005). However, the great breakthrough has not yet arrived due to various reasons (Provost, unpubl. data). Currently, there are no dairy facilities in Bamenda since the last company closed in 2015. Many people gave up large-scale dairy business or keep most milk for consumption according to a livestock baseline survey conducted by UrbanFood^{Plus} in 2017 (Provost, unpubl. data). The processing of dairy products in Bamenda is a challenge due to limited or no processing facilities. Government efforts in revamping this sector has all but failed with sponsored small scale dairy development programs. Private milk processing plants such as SOTRAMILK could not make it due to poor financial management. At the moment, the Tadu Dairy Cooperative benefited from the government-funded "Small Scale Dairy Development Project" to construct its own dairy processing plant. This milk processing plant is located in Tadu, 120km from Bamenda.

Benefits of UPA

Urban and peri-urban agriculture can improve the urban environment by contributing to food security, income generation and social inclusion. While it can also contribute to city greening and climate change adaptation, we focus here on these social-economic and health factors. Urban agriculture improves access to a cheap source of protein and the quality of the food in the households is improved as poor families get to eat more fresh vegetables produced by them. It is reckoned that the practice of urban agriculture provides an alternative solution and complementary strategy to cope with the problems of rapid population growth, reduces urban unemployment, poverty and food insecurity. Furthermore, urban and peri-urban agriculture can contribute to mitigating the effects of climate change as the production of foodstuffs close to the site of their consumption reduces fossil fuels needed for transportation from rural to urban areas.

Food and Nutritional Security

The provision of cheap, fresh and safe food can become a challenge in rapidly growing cities. Cultivation in both backyards and open spaces can alleviate the situation. It is a source of livelihood for urban dwellers, who can either subsist on or sell the produce on the market. Goods produced in

the city do not need to be transported at high cost and are therefore generally cheaper than those imported for both the farmers and other non-farming urban customers. Subsistence agriculture extends the opportunity of having a more varied and nutritious diet to poor urban residents. Most common and cultivated vegetables include; water leaf, green spices, tomatoes and huckleberry. However, these vegetables are of high nutritional value, reason why they are mostly cultivated especially among the backyards e.g. huckleberry (rich in vitamin c), waterleaf (rich in vitamin A and C, repairs body tissues, good in weight loss and increases eye vision) and tomatoes (rich in vitamins).

Income Generation

The ability to sell their products on markets in the urban zones means an additional source of income for farmers. Not only do they save on buying foodstuffs but also does the additional income enhance general quality of life. The income generated by agricultural activity can be used for other livelihood essentials such as healthcare. Furthermore, the money can be reinvested into the agricultural business through the purchase of seeds and agrochemicals. This boosts markets for these agricultural accessories, which in turn employ people, circulate goods and cash and thereby contribute to overall economic growth.

Social Inclusiveness

UPA is a low-threshold economic activity as is visible in the way any small land is used for it in Bamenda. UPA thereby offers economic inclusion of the most vulnerable groups. As a community-based activity, UPA is associated with the formation of professional groups and organisations that can also play a role in developing overall governance capacity.

Major Issues

Several major issues can be identified for agriculture in Bamenda including access to land and water, the management of waste, livestock encroachment, infrastructure, storage and marketing, access to finance, food safety, farm inputs and information and training.

Access to Land

Within the urban context, land can be considered as the most contested resource. Its (non-) availability challenges the viability of agricultural activities especially in densely settled cities that rapidly extend into the periphery and where competition for land is great (Rakodi et al., 2002). The

cost of arable land in and around cities is therefore high. In Bamenda, population pressure has led to the occupation of marginal lands such as the steep slopes of the Sisia quarter in Nkwen, swampy areas along the banks of River Mezam and its affluence, inland valleys of Mankon for agricultural purposes leading to land use conflicts and stress on land which now accounts for some major environmental problems like floods in the city of Bamenda. UPA is thus also accompanied by negative consequences on the landscape (Ngoran and Ngoran, 2015). Furthermore, there can be conflicts with Bamenda City Council over the usage of public land for agriculture since the council believes it to be untidy and dirty.

In the livestock baseline survey, 10.2% of both pastoralists and farmers have also complained about a lack of space or pasture on the farm (Forchid, 2016; Provost, unpubl. data). Increasing population and expansion of crop land substantially reduced quality and quantity of land for grazing especially with the extension of crop land into dry season transhumance zones. The uncertainty of land use rights further complicates the situation for livestock farmers. The social system and land use patterns of the pastoral communities are undergoing transformation processes connected to an increasing shortage of grazing land. Concurrently, there has been an increase in farmer-grazer conflicts especially during the dry season (Bessert, 2018; Feldt et al., 2018). The conflict involves acts of poisoning cattle by pollution of water sources or the destruction of crops (Feldt, unpubl. data; Nchinda et al., 2016). This land shortage and farmer-grazer conflicts – one of the major challenges for the region's traditional cattle farmers (Feldt et al., 2018; Mbih et al., 2018; Pelican, 2012). These conflicts will require an adaption of management strategies in the near future. According to a baseline survey on farmer-grazer conflicts in the North West Region of Cameroon (Nchinda et al., 2016), the land tenure is a complicated issue and payments for land lease to the traditional authorities are often required. 85% of land is inherited, while 7% of the land is bought. In order to access and use land there could be land lease costs or payment to the traditional administrative authorities an average of FCFA 15,000.

Javelle (2013) states that formally, most land today is considered national land, administered by the state for the public good. National lands include untitled lands occupied or used by communities. The state can evict communities from these lands and reallocate them to guarantee the lands effective exploitation. Considering the complications of obtaining a land title, land reforms in 2005 simplified land titling by reducing the number of steps and departments involved, and cut the time needed to obtain a land title from several years to less than one. Yet, it failed to address significant hurdles including contradictory laws, poor record keeping, and reliance on traditional authorities to allocate

land rights. Titles still could not be granted for land occupied after 1974 or deemed vacant or ineffectively used.

Today, as the government, urban elites, agro-industrial companies, and powerful traditional leaders acquire more land, neither legal processes nor customary tenure systems provide people with adequate security over their land. This is the reason why many urban and peri-urban farmers do not own the land they practice on but lease it at very high prices. With the increase in the value of land in Bamenda, land has become more expensive here than in bigger Cameroonian cities like Yaoundé or Douala.

Access to Water

The Mezam river sub basin in Bamenda harbours a growing urban community that relies on it for household chores, irrigation of market gardens and as a source for public water supply (Tita et al., 2013). However, the Mezam and all other streams are highly polluted. Pollution was higher in urban sites and downstream than upstream, which is in direct correlation with population density. Tita et al. (2013) concluded that the Mezam River receives contaminants on a continual basis especially in the urban tributaries impacted by commercial and domestic activities due to direct waste discharge into the rivers. The implications of these findings are that people who are dependent on the river water for domestic or agricultural uses may be exposed to health risks.



Fig.18-19: Poor waste disposal at the below Foncha neighbourhood (Pictures by SHUMAS)

Furthermore, water shortages are increasingly becoming a major problem as some streams and rivers that support irrigation in the dry season dry off half-way into the season. This is attributed to plantations of Eucalyptus trees, deforestation in the peri-urban areas, demographics and indiscriminate management of water resources without following the laws on water resource management.

Waste Management

Waste management in Bamenda generally is the responsibility of the decentralised territorial units (the municipal councils of Bamenda I, II, III and the Bamenda City Council presently employing the services of a waste management company Hygiène et salubrité du Cameroun (HYSACAM) to deal with waste in Bamenda as part of the public-private participatory approach. (Law no 96/12 of 5 August 1996) which states that they have been given authority over waste management, covering collection, storage, sorting, transportation and treatment. There isn't any space within the urban area for waste dumping. There are collection points where household waste is deposited and then collected and dumped in the landfills by the waste management company. This service is highly limited to the major streets of the urban space. There are open space dumps located in the peri-urban area. No sorting of waste is done and consequently, there is high contamination of the soil.

Generally, population increase has been the reason for the increase in the generation of waste both from household and commercial activities with the city council and the civil society taking active part in waste management either through collection and transportation, treatment, waste products and final disposal. However, the efforts put in place are insufficient to guarantee a successful waste management system in Bamenda. In addition to the fact that many localities within the municipality are not included in the collection schedule, collection intervals are not made known to the residents who then resort to inappropriate methods of disposal. From interviews carried out, it's easier to deposit wastes in the Bamenda City Council waste collection vans while 70% of the locals resort to disposing their untreated wastes into waterways, bushes and at roadsides (Asongwe et al., 2014). Most households around rivers or streams in Bamenda directly dump their waste into the rivers, while sewage pipes from homes, toilets and other waste generation units in the town are directly connected to the rivers or streams. In most cases, solid waste disposed of in water channels have blocked these channels causing devastating floods in the city, which have destroyed a lot of crops especially as many farms are located around these river banks.

Some households do selection of waste, organic waste used as manure in the farm while other solid waste like plastics is burnt. An inventory of the municipal solid wastes in the wetlands of Bamenda



indicates that, they are composed of textiles, batteries, hospital wastes, paints, plastics, metals, plants and animal residues and sewage from households. Many homes do not have latrines and the streams serve this purpose. A cow slaughter house found in the area discharges its wastes directly into the river channel.

Fig. 20: Waste in Bamenda (Picture by SHUMAS)

Livestock waste in Bamenda from pig pens, poultry farms, pose a real problem such as odour within the neighbourhood. However, the waste from these animals are used as manure in farms in the urban and peri-urban areas. Farms need to be homologated by MINEPIA for the ministry to know the specific areas of livestock rearing. Furthermore, the farms need to comply with the law on environmental impact assessment by MINEPDED (text N°002). Based on this law the council gives the notice on site situation and waste management. According to Achankeng (2004) waste management in Bamenda has five distinct stages which include: generation and storage, primary collection and transportation, secondary collection and transportation, treatment, waste products and final disposal.

Livestock Encroachment

Animal encroachment in farmlands in Cameroon in general and the North West Region in particular has been a major issue in the past decades with hundreds of farmer-grazer conflicts which has resulted to loss of crops/animals, property and even human life. However, this is more a characteristic of the peri-urban area because animal rearing of cattle, goats and sheep is more practical in these areas with vast land where the animals can feed. When these cattle are brought to town, they are taken to the cattle market where they are sold and transported to other areas or slaughtered for consumption.

Sop et al. (2015) state that many farmer-grazer conflicts (characterized by animal encroachment) are a major cause of concern in Tubah sub-division especially in the outer districts such as: Sabga, Big and Small Babanki, Bambili village and Bambui. These conflicts have increased over the years as many people are getting into the activity now unlike before when it was carried out only by the Mbororos. With limited land and need for space in these peri-urban areas, animal encroachment into farmlands has been a problem (Bessert, 2018; Feldt et al., 2018). The construction of fences around

farm lands in these peri-urban areas has been the best solution towards this problem. The situation in Tubah applies to other peri-urban areas around Bamenda like Santa, Bafut and Mbengwi. In the urban space of Bamenda City, animal rearing is mainly done in fences or specially constructed pens for pigs. Because the animals are in confinement, encroachment is very limited in the urban space.

Infrastructure, Storage and Marketing

As a result of socio-economic variations and environmental, climatic and demographic diversity of Cameroon, the potentials for food crops production are quite high. Perishability and seasonality of most food crops, poor marketing systems, and inadequate processing technologies to preserve and conserve food products constitute a great challenge to the country in its effort to attain and maintain policy measures and projects geared towards promoting small and medium size enterprises to stimulate the marketing system and sustain the food sector of the economy.

According to Abbot et al. (2001), post-harvest technology and marketing are some of the major constraints of agricultural production in Cameroon and Bamenda in particular. They state that despite the improvements made by institutional organizations involved in agriculture in terms of research, training and finances, a number of reports have highlighted persistence and even an increase in postharvest losses of food crops in Cameroon. This has been attributed partly to pre-storage and storage technologies and inefficient traditional processing and packaging technologies. In terms of marketing problems and constraints, they identified within the structure, transportation, market channels, information, standardization, marketing facilities, finance and price policy. There is also a lack of certification and labelling in the market that would provide greater transparency for the consumers. Langsi et al. (2017) show that a great portion of the cultivated and harvested maize is lost during post-harvest drying and storage treatment. In turn, marketing was only noted as a problem by around 6% of the livestock baseline survey. Another problem faced especially by peri-urban farmers is the accessibility of their farms by good roads.

Access to Finance

Access to finance has been a problem in Cameroon since the economic crisis of 1985 when the agricultural credit policy failed. The main credit instrument, National Fund for Rural Development (FONADER), found itself deprived of financial resources due to inadequate guarantee systems and approximately 70% outstanding payments. With these farmers could not have access to finances, which remains a great problem till date. The lack of capital was the second most common concern noted in the livestock baseline survey (36.7% of respondents). The biggest concern (54% of

respondents) were the high and fluctuating prices and the connected feeding costs (Forchid, 2016; Provost, unpubl. data).

Röttger (year) shows in his study on micro finance in agriculture that, providing access to capital and other financial products is one important part in the overall strategy to enhance the productivity of smallholders and improve their livelihood. Even though such “loans cannot substitute for appropriate technology, input supplies, and access to remunerative markets” borrowed funds can assist farmers with access to markets to invest in new farming technologies, high-quality inputs (e.g. quality seeds, fertilizers, agrochemicals) or mechanization and equipment. Adequate access to borrowed capital and other financial services can thus enable farmers to produce more for the market, improve their food security and raise their agricultural returns. In addition, other financial services like insurance products and saving possibilities can lower the risk of external shocks, smoothen cyclical cash flows of farmers and help them to manage their farms as a viable business.

There are specialized financing structures for investment in agricultural activities (e.g. microfinance offered by NOWEFOR) but these structures are not well-known and used. There is a lack of support from the state to the agricultural private sector to take over agricultural development. The private sector generally considers that agriculture can provide business opportunities. However, interested developers are faced with a lack of credible expertise structures, capable of advising and assisting them in developing their projects and implementing their business plans with technical consulting, land tenure security, fundraising and risk management (Achankeng, 2015).

Food Safety

Unsafe production methods, such as the usage of wastewater and agrochemicals in agricultural production put consumers’ health at risk. Research results show that around two third of respondents (68.11%) consider the potential contamination with agrochemicals when buying vegetables. However, only one third of respondents (27.57%) are aware of the health risks associated with unsafe irrigation practices. A very high percentage of respondents (80.73%) know where to get safe vegetables in Bamenda, and 72.09% of respondents already purchase safe vegetables at local markets. So far, no quality control and therefore no quality signals are available in Bamenda, which would facilitate consumers to distinguish safe vegetables from contaminated ones prior purchase (Seeger, unpubl. data). Research findings in Tamale, Ghana, show that the perception that vegetables are safe, i.e. not harmful to human health, is based on previous purchasing and consumption experience which has not caused any negative health effects (Seeger/Löwenstein, (forthcoming)).

Labelling vegetables through certification is one option for farmers to signal consumers prior purchase that their produce is safe. Consumers' willingness to pay a price premium for vegetables that are guaranteed to be safe through certification would be an incentive to farmers to produce safely and to look for a certification. In Bamenda, three quarters of respondents (75%) are willing to pay a higher price for vegetables that are certified to be safe. The price premium consumers are willing to pay for one averaged sized white certified cabbage turned out to be far above the average market price that consumers pay for a conventionally produced cabbage of the same size. Whether certification is perceived as credible depends on whether the certifying institution is a trustworthy one or not. Based on that, trust was measured for seven potential certifying institutions. The results show that a national governmental certifier, a national scientific institution, and an international governmental organization had the highest median trust level (Seeger, unpubl. data). Currently, consumers are not well organised to demand for transparency and efficient quality control in agricultural production.

Farm Inputs

Farmers in Bamenda are confronted with the challenges of ageing soils and diminishing seed vitality. Yet, farm inputs are expensive and good quality is not readily available. While liberalization of the sale of agrochemicals has led to widespread availability of chemicals, the quality of these chemicals is not being monitored and outdated or contraband products can be found in agrochemical shops throughout town.

Information and Training

Information on agriculture such as statistics are not easily available. The extension system is not equipped well enough to deliver trainings up to the needs of urban farmers. The situation is aggravated by the fact that the level of organisation is low among producers. Data from the 2017 survey shows that the participation of urban farmers in farmer cooperatives is not common and contact to extension services are also rare (Dittrich, unpubl. data).

Policy Recommendations

In view of the potentials of UPA and the constraints it faces, the following recommendations for improving UPA were made by the stakeholders. If not specified differently, responsibility for these recommendations is carried by all stakeholders in their respective capacities.

Improving Farmers' Access to Land

- The implementation and enforcement of the existing Bamenda City Plan should be made a priority. This includes the ban on purchasing of and construction on marshy areas.
- Landowners should adhere to the zonation set out in the Bamenda City Plan.
- Farmers on designated agricultural land should pay a fee to the city council in order to farm there, in the same way that market traders pay for their stalls.
- Integrated Planning should include concerned departments (Bamenda City Council etc.).
- The National Development Planning Commission should recognise the importance of urban farming and include it as a legitimate land use (UPA is currently considered at local level only). Also the Growth and Employment Strategy Plan (GESP 2010) which aims at boosting economic growth in the country in all sectors between 2010-2020 recognises agriculture as the backbone of the economy.
- A Research and Advisory Committee on land issues is required to deliberate the legal ramifications of the abovementioned, and identify possible loopholes and stumbling blocks. The councils are responsible for this.

Improving farmers' access to improved inputs

- More research is required into the current agriculture situation in order to qualify and quantify necessary inputs, including improved seeds. This information needs to inform planning and retail.
- Training on fertilizer practises, including organic fertilizers, should be made available by extension services.
- The availability of high quality fertilizer and other inputs should be guaranteed, including regular quality control.

Management of Water, Waste and Environmental Impacts

- In the short term, runoff from rain water should be harvested, and its use by individual households for backyard gardening should especially be encouraged. General training on water management should be made available by the Ministry of Environment, Protection of Nature and sustainable Development.
- The potential and development of wells and boreholes should be analysed and facilitated in the short-term.
- Municipal wastewater treatment is realistic only as a long term goal. Treated water would be channelled into centralised collection facilities near to farming zones to facilitate irrigation,

using the existing gutter infrastructure. In the meantime, households should be encouraged to divert wastewater into municipal gutters and greywater collection points could be created.

- In the long term, investigations should be made into high water pressure from large storage facilities that would facilitate filtration and drip irrigation.
- Canal dredging is an associated long term strategy to be implemented by BCC.
- Organic farming should be promoted in the interest of ecosystem and human health by MINADER.
- Waste recycling of all forms should be taken into consideration. Research is ongoing into use of human waste as a nutrient source. Examples are the VIP toilets, such as promoted by National program for Participatory Development in Cameroon (PNDP), and the ECO village in Bafut. Attention should be paid to the use of Personal Protective Equipment during application of such waste.
- The activities of the Phytosanitary Brigade of MINADER on the control, usage and use of chemicals should be reinforced. The Brigade should obtain the technical capacity to control farm produce.
- Illegal dump sites should be resolved and awareness created. BCC should confine dumping sites in order to reduce spillage.
- Waste should be sorted to limit toxification of the soils. The Hygiene and Sanitation Company should play a key role not only in depositing waste but in sorting, treating or recycling waste.

Integrated Agriculture and Livestock Management

- Animal Husbandry (as a business) should be encouraged in the specific zones in the urban and peri-urban areas, as indicated in the City Plan.
- Urban livestock rearers should ensure proper housing and tethering of their stock throughout the year and buy or harvest feed for stall feeding.
- Livestock owners need training on livestock housing construction and management.
- Available laws on roaming animals should be enforced and awareness created (publication of laws) by MINEPIA.

Institutional Development and Enhancing Governance

- Urban and peri-urban agriculture should be recognised and supported by local and national Agricultural Policy, for food security and income generation as part of urban livelihood development and city resilience. Households should be encouraged to allocate portions of their land to backyard farming. MINADER should take the lead in policy development.

- Farmer groups should strengthen themselves for advocacy, drawing from mobilisation around potential flows of external support and internal support.
- Extension services to farmers from MINADER and MINEPIA should be improved.
- Support to backyard and isolated space farmers needs to be facilitated, including organisational development (associations).
- Micro-finance and other credit opportunities should be promoted by extension agents and become more accessible to farmers.
- NGOs active in Bamenda on Agriculture and Food should include support to urban farmers.

Food Safety

- Quality control needs to be introduced and managed along the agricultural value chains from production to market in order to ensure food is safe for consumption.
- Awareness raising and capacity building is required. Financial support for this could be generated through the creation of a quality signal by the national control body.

Developing Markets and Involving the Private Sector

- Market infrastructure should be further developed and include (cold) storage facilities.
- Public-Private Partnerships (PPPs) are required, but assemblies should provide legislation and physical infrastructure, e.g. through physical market segmentation.
- Market associations should be developed. They should lobby for and source help from government, NGOs or businesses.

Promotion of Sustainable Production, Processing, Packaging and Marketing Practices

- Urban farmers need training on sustainable practices and techniques. Such training should be emphasised on the kind and usage of farm inputs by farmers.
- Research and development on (and distribution of) appropriate post-harvest storage, packaging and processing equipment, and marketing, is required e.g. mango dryers and tomato puree production facilities. Business development in these sectors is required.
- Research needs to be done to identify the most appropriate model for the development and distribution of such technology, e.g. whether it should be state-run, privately supplied, outsourced, cooperatively-run, a PPP etc.
- Research into and development of a market for new products should be encouraged.
- Specialisation in different agricultural sectors, e.g. production, processing and marketing, should be encouraged through trainings, e.g. on assorted packaging or fruits packaging.

- There is a possible role for spatial market segmentation, involving designated sections of markets for vegetables and other foodstuffs as well as for organic and conventional goods. Market design should take this into account.

Education and Public Awareness

- The lands sector agencies need to be sensitised to UPA.
- The public and particularly urban farmers must be informed and sensitised on land issues including acquisition and lease, particularly on registration.
- Sensitisation exercises may take place through:
 - The mainstream media
 - Community engagement exercises
 - Posters and flyers at chief's palaces and mentions in community meetings
 - Second cycle and tertiary institutions
 - Dedicated seminars on UPA for specific stakeholder groups
 - Meetings organised at the assemblies for assembly men and women

Conclusions

This policy narrative is based on research done within the multi-disciplinary research project UrbanFood^{Plus} and on discussions of these findings and of urban and peri-urban agriculture more generally in the Bamenda multi-stakeholder platform initiated by the project. UPA in Bamenda is a widespread phenomenon and an important activity of its residents. It is a sustainable alternative to handle rapid urbanization and to improve livelihoods that needs policy support.

This policy narrative provides information on the situation and role of UPA in Bamenda, in the North West region of Cameroon. It has been developed through the collaborative effort of researchers of the UrbanFood^{Plus} project and the project partner organisations SHUMAS and RUAF, together with the key stakeholders from Bamenda including Bamenda Central City Authority (BCCA), several ministries, universities, farmer cooperatives, civil society organisations and local media. The aim of this policy paper is to contribute to the city's sustainable development by offering both research insights and policy recommendations, and facilitate policy dialogue on UPA among the key stakeholders and UFP. An important next step in the dialogue is to recognise the role of UPA in the urban food systems of Bamenda and agree on a City Strategic Agenda on UPA to guide further action.

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