



Research Article

This article is published by
JAH, *Journal of Arts and
Humanities*, Volume 5, N. 1,
Sept., 2021.

ISSN: 2710-3013 (Print)

ISSN: 2788-6360 (Online)

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Article detail

Received: Nov. 1st, 2021

Accepted: Feb. 11th 2022

Published: March 5th 2022

Conflict of Interest: The
author/s declared no conflict of
interest.



Rurbanisation and Agricultural Dynamics in Bambili and Bambui, North West Region of Cameroon

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ABSTRACT

The transformational path of a rural settlement into semi-urban and urban areas in the world dates back to the Industrial Revolution. Urban expansion is one of the determinants of agrarian system dynamics. In the Bambili-Bambui area, farm sizes are becoming relatively smaller within human settlements and tend to increase towards the rural fringes. The aim of the study is to examine the impact of rurbanization on agricultural dynamics in Bambili and Bambui. This is based on the premise that there is a direct impact of rurbanization on agricultural dynamics in Bambili and Bambui area. The methodology uses historical and correlational designs, divided into two periodical trends. A random sampling technique was used to administer 200 questionnaires to the population. Findings reveal



that the process of rurbanization in this area has been profoundly linked to increasing land uses and space occupation at a rate of 80%. There has been a perfect positive correlation between rurbanization and agricultural dynamics. The study concludes that rurbanization has led to a reduction in farm sizes by 75%, resulting in competing land uses that have promoted the increase in land acquisition at the peripheries of Bambili and Bambui. This has headed to land pressures that have resulted to decrease in farm sizes at the peripheral areas. The study recommends the need for sustainable land use planning in the context of increasing over duplication of land uses. This can ensure sustainable urban development (Green Urbanism), agricultural sustainability and sound ecological management.

Keywords: *Agricultural Dynamics, Bambili and Bambui, Land uses, Rurbanization*

1. INTRODUCTION AND THE PROBLEM

The transformational path of a rural settlement into semi-urban and urban areas in the world dates back to the Industrial Revolution. The concomitant tertiarizations of economies through the unprecedented growth in urban centres around the world have been witnessing the drawing upon of the resources from their rural counterparts. The influence of urban centres on its rural settings has been so conspicuous. This rural-urban continuum ends up with the introduction of many urban aspects into the rural areas and the corresponding transformation (rurbanization) of these rural areas to reflect urban characteristics. Such reciprocity between the town and rural areas around it can be evidenced and one can perhaps call the rural neighbourhoods around a town as the 'economic footprint' of the town (Murawski, 2020). These transformations of the rural areas have corresponding effects on the agricultural practices depicted through the dynamics in the patterns of these agricultural practices.

This process of rurbanization process does not only affect and introduce dynamics in the agricultural sector. It also highly affects the geographical, political, environmental, and economic settings of the rural areas (Amit et al., 2019). Rural transformation is based on the effective implementation

of government schemes as a heedful prerequisite for the transformation process. Globally, the rural-urban front has specific dynamics such as smaller farms, multiple cropping systems, intensive use of organic manures and fertilizers, production of food crops like vegetables for immediate consumption as well as mobility (commuting) of people living in the centre towards the urban periphery to practice agriculture. If well managed, intensive crop cultivation within rural-urban front can guarantee food security for both rural and urban areas (Walker et al., 2020).

In the developed world, agricultural systems and land use dynamics resulting from the ruralization process has been favoured by improvement in technology and increasing suburbanisation. Agricultural systems are increasing mechanised with high technology inputs (Bengs and Schmidt, 2018). In the developing world, the process of ruralization is very slow and occurs spontaneously in the different continents and regions with a little degree of planning. The agricultural land use dynamics can be classified into subsistence farming which can further be sub-divided into intensive and extensive subsistence farming. Intensive subsistence farming is practiced in areas where population density is high and land is scarce (Readon et al., 2018). Irrespective of the regions across the world, increasing evidence points to the fact that there is the loss of agricultural lands to urban development. This has bestowed negative impacts on agricultural dynamics (Fombe and Acha, 2020); (OECD, 2020). In Cameroon, there is still rapid and unplanned urbanization. The expansion of the urban space to the rural areas is evident with agricultural practices at the rural-urban front widely practiced (Papito, 2017). There is uncontrolled intensification of farming systems towards the peripheral areas as the case in the towns of Douala, Yaounde, Bafoussam and Bamenda where it is more alarming. Agriculture in ruralized landscapes have improved access to a cheap source quality food and improved as poor families' livelihoods. This has been regarded as a complementary strategy to cope with the problems of rapid population growth, reduces urban unemployment, poverty and food insecurity, it is also accompanied by

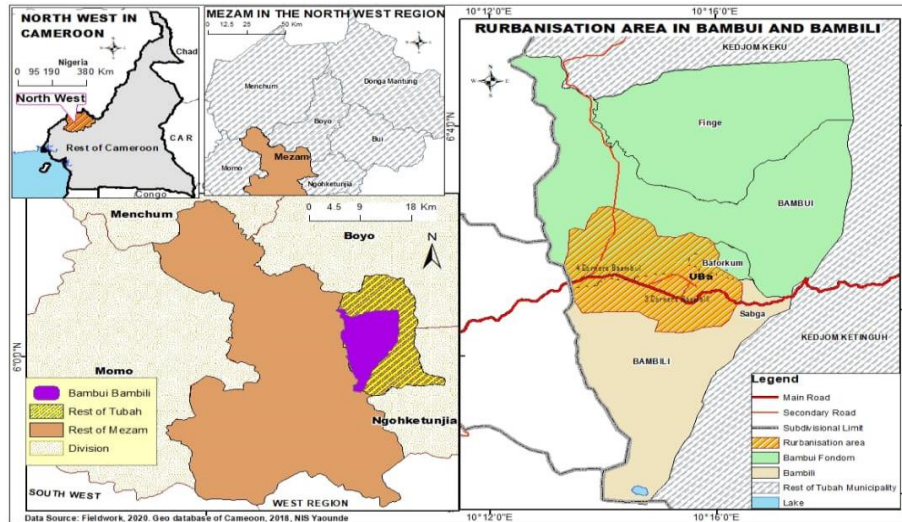
negative consequences on the landscape (Fombe and Acha, 2020); (Gwan and Kimengsi, 2020).

In the Bambili and Bambui area, the process of rurbanization triggered by the growth of the University population has affected the agricultural landscape. The rurbanization trend has been accelerated especially since 2010 with rapid population growth through net migration (from 18627 in 2010 to 37257 inhabitants in 2017 and projected to 38357 in 2020 (Author, 2020). Urban encroachment into valuable agricultural lands has affected the resilience of social-ecological systems at the rural-urban front. Sustainable agricultural land use dynamics in practices and technologies are evident (IRAD, 2021). These farming dynamics and technologies include modern crop and livestock production systems, agro-forestry, reduced tillage, improved grazing and sustainable agricultural land management. Farmers have been gradually switching from subsistence cultivation to semi intensive cultivation. Rurbanization has taken a negative toll on agricultural systems in this area with incompatible activities of human settlement expansion, infrastructural development, vis-à-vis agricultural land use. There is much competition for space. Land owners are sandwiching between land speculators who want to buy up the remaining land for future development and the need for the indigenous land owners to preserve their ancestral land for posterity. The aim of this study is to examine the impact rurbanization on agricultural dynamics. The study is based on the premise that there is a direct impact of rurbanization on agricultural dynamics in Bambili and Bambui area.

2. STUDY AREA AND METHODOLOGY

Bambili and Bambui are located in Tubah Sub-Division in Mezam Division in the North West Region of Cameroon. It is found in the Peri-urban area of Bamenda City. The area lies between longitudes 10015.25' and 10016.05' East and latitudes 50 54.95' and 60 09.56' North. It covers a surface area of about 450km² (Figure 1).

**Figure 1: Location of Bambili and Bambui in Tubah Sub-Division,
North West region of Cameroon**



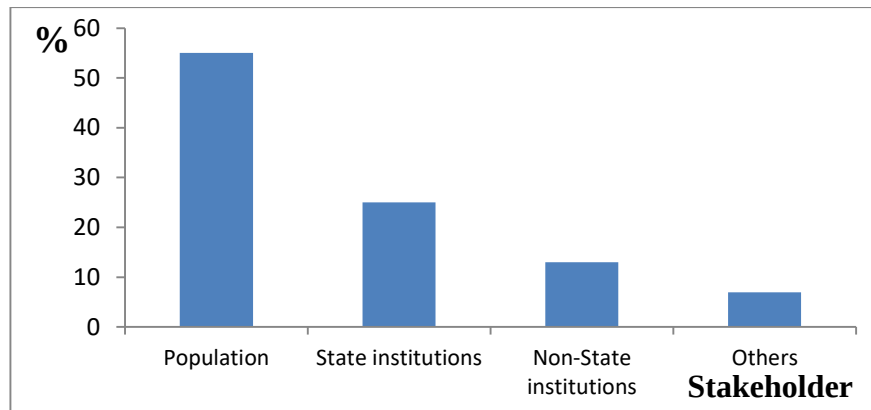
This study was carried out using a historical survey and correlational approach of field investigations. It covered two periodical trends (before 2010 and from 2011-2020). Primary data was collected from the field through three complementary techniques involving questionnaires, formal and informal interviews and direct observation of land uses. A random sampling technique was used to administer 200 questionnaires to the target population of 1000 inhabitants (20% of the target population). A 20% of the target population was then being adopted as the sample size for the study. Therefore, the sample size = 20% of 1000: $S = 20/100 \times 1000 = 200$. Where: S is the sample size. The target population were those living and involved in any land use practice in the rubanised areas of the two villages. Primary data was complemented by secondary data obtained from specialised institutions in the management of rural lands as well as published and unpublished documents. Descriptive and inferential statistical techniques were used to relate the extent of the impact of the rubanization process on agricultural dynamics. The analysis was done in Microsoft Excel software Version 2010, SPSS Version 20. Spatial changes in land uses were analysed in ArcGIS version 20 from Landsat Images gotten from www.usgeologic system.com.

3. RESULTS AND DISCUSSIONS

3.1 Stakeholders in the rurbanization process in the Bambili and Bambui area

The dynamic patterns and trends in the rurbasnisation process in Bambili and Bambui area is driven by multiple stakeholders. These stakeholders are involved in different domains of competences in the process of transforming the rural landscape into the urban environment in this area (Figure 2).

Figure 2: Stakeholders in the rurbanization process in Bambili and Bambui area



Source: Field survey (2020)

The greatest proportion of the stakeholders contributing to the rural transformation process in Bambili and Bambui is the resident population (55%). This constitute a high percentage involved in construction and agricultural land uses. These constructions are mainly in the form of houses which are either residential or commercial houses. This is the main determinant of high rate of infrastructural transformation from rural to urban residential areas. This infrastructural transformation is the major indicator of rurbanization. State institutions make up the second highest 25%. These state institutions have been increasing in the area through the creation of many Ministerial Sub-Divisional delegations linked to urban development, agriculture and education (Fombe and Balgah, 2012). These

delegations through the multiple services offered are mainly directed towards the transformation of the rural landscape to an urban landscape. There are non-state institutions like commercial banks and microfinance institutions, religious institutions and NGOs. Others (7%) like VDAs, CBOs and international organizations offering urban function is in the area. They are least in the rurbanization process as a result of the fact that most of them are mostly concerned with rural development and to lesser extent urban development.

3.2. Trends of rurbanization in Bambili and Bambui

Rurbanisation in the Bambili and Bambui area have evolved and changed in historical times. For the purpose of clarity, it is imperative to consider the periods of significant change of the different ruban spatio-temporal indicators in the rurbanisation process (Table 1).

Table 1: Spatio-temporal changes in the rurbaization process in Bambili and Bambui

Period of significant change	Frequency	Percentage
Creation of the University (2010)	89	44.5
Creation of ENSAB (1967)	35	17.5
Past 5years (2015)	57	28.5
Creation of the Colleges of agriculture	19	9.5
Total	200	100.0

Source: Field survey (2020)

The trend of rurbanization has been linked to population increase and accompanying land use changes. From table 1, the rurbanization process significantly increased from the period of the creation of The University of Bamenda in 2010. The 44.5% rate is accounted for the fact that the creation of the University of Bamenda located in Bambili and Bambui increased the capacity to take in more student populations in these two villages of Tubah Sub-Division. The increase in the influx of students to study in the different faculties and colleges has been accompanied by the increase in the construction of residential buildings and other related infrastructures to



accommodate the high population. The evolution in the student population in reflects a steady increase (Table 2).

Table 2: Growth of the student population of The University of Bamenda from 2011-2021

Faculty/School	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
HTTC	3544	3752	38903	3803	4006	3511	2684	2281	1929	2118	2120
HTTTC	2059	3150	3527	3540	2600	3868	3698	3581	2554	2984	2987
HICM	213	706	1281	1333	1650	1651	1770	820	1045	1011	1045
FHS	109	345	911	495	1320	1031	855	842	990	1198	1200
FS	144	311	495	911	911	2460	1595	1784	1601	1441	1488
COLTECH	/	198	413	413	614	783	938	840	257	157	200
HITL	/	/	/	0	93	173	371	389	564	817	850
FLPS	/	/	/	0	306	950	793	1070	1417	1876	1890
FA	/	/	/	0	0	1201	1873	1972	2259	2588	2600
FEMS	/	/	/	0	0	724	787	1892	1295	886	900
FED	/	/	/	0	0	0	0	179	536	1632	1690
NAHPI	/	/	/	0	0	0	0	302	276	300	330
Total	6609	8462	10430	10495	11500	16352	15364	15956	15801	17008	17300
% increase	/	26.8	23.2	11.5	9.6	42.2	-0.06	3.8	-0.01	7.6	1.7

Source: The University of Bamenda (2020)

Based on table 2, there has been a steady increase in the student population from 2011 to 2016. This increase was accompanied by an increase in the demand for urban facilities and infrastructures. The slight drop between 2017 and 2019 was accounted for by the increasing socio-political crisis affecting this area. This however did not affect the steady growing pace of rurbanization in this area. The 2010-2020 period was marked by an annual population growth rate of 2.7%, corresponding to a yearly increase of about 420,000 inhabitants. This increase is mostly recorded among the

youthful population (student population). Since the youths (aged 14 to 25 years) account for more than 50% of this population demanding for educational facilities. The population rose at an accelerated pace from 14% in 1950 to 58% in 2010 and to 79% in 2020. The response has been the provision of infrastructures with corresponding effects on agricultural land use as remarked by Fombe and Acha (2020) in Bamenda. These have resulted to the evolution and change rural features have also evolved in the two periodical trends (Table 3).

Table 3: Dynamics in rurbanisation features in Bambili and Bambui area

Rurban features	Bambili			Bambui		
	Before 2010	2011-2020	Net-change (%)	Before 2010	2011-2020	Net change (%)
	Growth Rate	Growth Rate		Growth Rate	Growth Rate	
Population	24	26	+2	27	28.4	+1.4
Building space	13	13	0	14	14.7	0.7
Educational infrastructures	22	27	+5	20	12.6	-8.6
Markets	10	11	+1	9.5	12	+3.5
Roads	9	7	-2	9	9.5	0.5
Government structures	17	10.3	-7.3	18	21.1	+3.1
Religious institutions	5	5.6	0.6	2	4.2	+2.2
Total	100	100	/	100	100	/

Source: Field survey (2020)

The rurbanization characteristics in Bambui and Bambili have been changing positively. This change reflects an increase in the indicators and triggering mechanisms of the rural transformation process. The greatest change has been on the aspects of population increase and, increase in educational facilities and building space. The change has been more rapid between 2011 and 2020. This was echoed by Amit et al. (2019) that the process of rural transformation can be periodically measure using the transformation space with infrastructure. Due to population increase,

there has been a significant transformation of space through the different land uses. The evolution and change in the rurbanization process is therefore considered using land use cover changes in the different periodical trends (Murawski, 2020). These changes in the evolution of rurban process are quantified using percentage changes in land cover changes. These quantifications are based on the statistics derived from the processing of Landsat images of 2000, 2010 and 2020 (Table 4).

Table 4: Periodical changes in land uses from 2000- 2020 in Bambili and Bambui area

Land use	2000 (km ²)	2010 (km ²)	2020 (km ²)	% change from 2000 to 2020
Settlement	5.68	6.57	11.91	+52.3
Farmland	33.62	42.52	40.02	+16
Secondary forest wood land	25.76	23.23	22.29	-15.6
Wood land	19.48	13.42	12.82	-52
Grassland	31.39	30.19	28.89	-8.7
Water bodies	0.14	0.14	0.14	/
Total	116.07	116.07	116.07	/

Source: Landsat image processing (2000, 2010 and 2020)

Figures 3,4 and 5 present the spatial patterns of the different land use changes in the area.

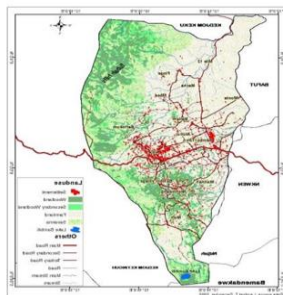


Figure 2: Land use cover in 2000 in Bambili and Bambui area

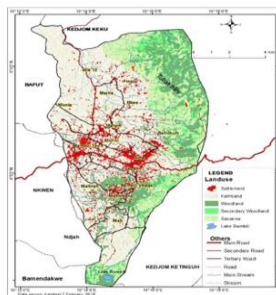


Figure 3: Land use cover in 2010 in Bambili

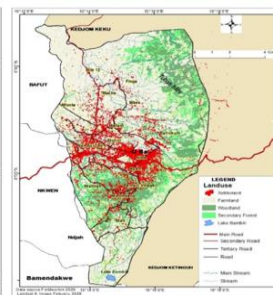


Figure 4: Land use cover in 2020 in Bambili and Bambui area

Source: Landsat image processing (2000, 2010 and 2020)

There have been variations in the different land uses resulting from the high population numbers from natural increase and net migration from the student population. Figure 3 presents land use in the year 2000 where the cultivable land was the highest with 33.62km² as compared to the built up area which was made up only of 5.68km². This was due to the low population densities and enough land for bush fallowing and shifting cultivation. The population had no diverse economic activities but for agriculture which was dominantly practiced there by soliciting most of the land for farming. This subsistence agriculture and evident farmlands were more in Bambili than in Bambui. The main driver was due to expansion of the farming populations and the fact that these areas are far off from the administration which was concentrated in Bambui. This means rurbanisation started and grew faster in Bambui than in Bambili. These areas had the highest rate of bush fires. This is compared to Bambili zone with a highest percentage of primary forests compared to secondary forests.

The second trend of evolution in the land cover changes from 2000-2010 (Figure 4). Build up areas and farming lands increased from 5.68km²-6.57km² (a 3% increase) and 33.62km²-42.52km² (a 7% increase) respectively at the detriment of the secondary forest and woodland that dropped by 7.16% and 10.2% respectively. In addition to the reasons accounted for in the first trend, another driver was the fact that the encroachment into the forested areas by the increasing agricultural population was higher. By 2020, built up which is the utmost indicator of rurbanisation increased from 6.57-11.91km² in 2020 and farm lands, secondary forests, woodlands and savannah dropping (Fombe and Acha, 2020; Gwan and Kimengsi, 2020). This drop in these land uses was replaced by a corresponding increase in rurbanisation land uses like build up. The constructions were seen in the University infrastructure, government sponsored projects and private student residential areas across Bambili and Bambui area. The study also considered the land uses linked build up in and around the campus of the UBa (Figure 6).

The construction space in the area was more in 2020 than in 2009. This means more land has been used for construction in 2020 than in 2009. This

is accounted for by the advent of The University of Bamenda that brought in more services and infrastructure that demanded more land for the location of this university. According to the officials of the University, there has been a general increase of 70% in constructions 36% by 2009. The evolution and change in the different space occupation land uses linked to the rurbanization has had a significant impact in the agricultural changes (Palvoluic, 2010).

4. DYNAMICS IN AGRICULTURAL SYSTEMS RESULTING FROM RURBANIZATION

The villages of Bambui and Bambili highly depend on agriculture for subsistence and commercial purposes. However, with the upsurge of rurbanization, there has been an increase in the number of institutions amongst which are agricultural system dynamics and institutions. The population has also benefited directly and indirectly benefited from the services of these institutions to impact changes in the various agricultural systems through modern farming techniques and ustainable land use management. Different agrarian systems have been carried in the study area in the rurbanization process which has witnessed significant modifications (Table 5).

Figure 6: Construction land uses in and around the University of Bamenda from 2009-2020

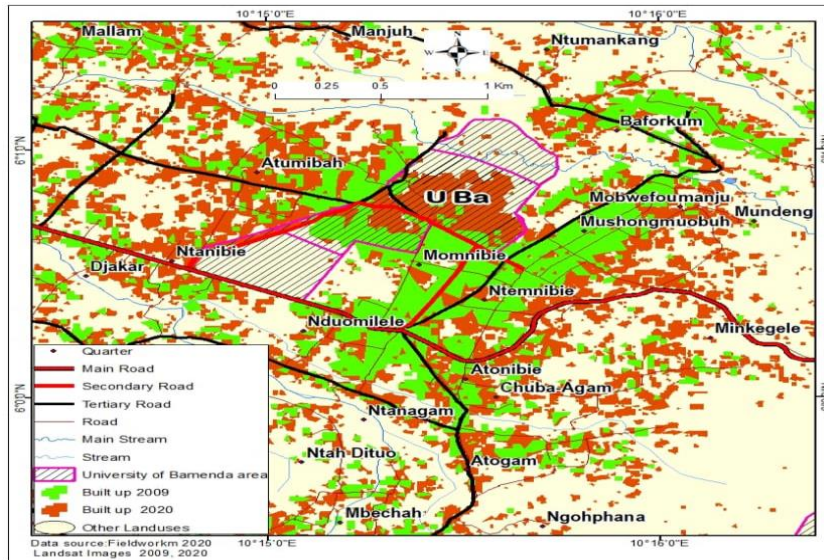


Table 5: Agrarian systems modifications resulting from rurbanization

Agrarian systems	Frequency of practice	Percentage
Food crops farming	13	6.5
Cash crops	70	35
Poultry farming	26	13
Piggery	16	8
Cattle rearing	59	29.5
Cultivation of indigenous crops	15	7.5
Total	200	100

Source: Field survey, (2020)

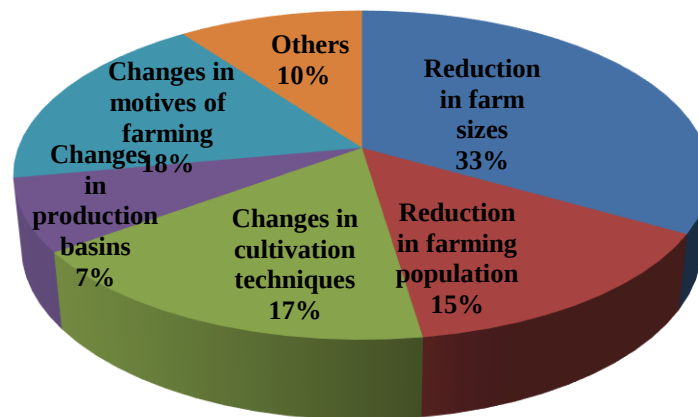
Cash crop cultivation and cattle rearing have witnessed the greatest changes. These cash crops included Coffee and Kolonuts with the Zebu cattle that were produced by the indifenuous population before the process of rubanisation. This was the period of more land availability for extensive subsistence agriculture. The greatest changes are attributed to the fact that there has been a drastic reduction in land as the buildup area is expanding. The cultivation of indigenous crops witnessed the least modification (7.5%). This is explained by the fact the population is strongly attached to

their culture and rurbanization has not reduced the cultivation of indigenous crops such as cocoyam used for the production of Achu which is their staple food. Most of the crops cultivated now are market gardening crops like tomatoes, cabbages, vegetables and spices. Rurbanization has led to increase in the sale of land for cultivation and this has greatly affected coffee farms and output in Bambili and Bambui as they are highly sold for investors in house in the construction of houses amongst others.

4.2. Dynamics in cropping systems resulting from rurbanization in Bambili and Bambui

Changes in the various farming systems in the study area have been witnessed in a number of dimensions. These dimensions are reduction is seen in Figure 7.

Figure 7: Dimensions of changes in farming practices resulting from rurbanization



Source: Field survey (2020)

4.2.1. Reduction in farm sizes resulting from rurbanisation

There have been tremendous changes in the farm sizes resulting from rurbanization. Reduction in farm sizes constituted 33 % of the changes. This is because rurbanization has led to increase in built-up area from 6.57

Km² in 2010 to 11.91 km² leading to a reduction in arable land with a direct bearing on farm sizes. This is also blamed on the increasing population that has been exerting pressure on the present housing infrastructures in the ruralised quarters of Bambili and Bambui. This is consistent with findings of Readon et al. (2018) who pointed to the fact that increasing demand has resulted to more land being used for constructions rather than agricultural practices. This means that there is an increasing competition in the use of land for settlement and urban functions at the detriment of agriculture. Changes in the farm sizes resulting from ruralization appeared not to be uniform amongst the various farming systems in the study area. This is attributed to the fact that different cropping systems occupied different average farm sizes and different cropping systems basins have witnessed diverse changes resulting from ruralization (Table 6).

Table 6: Farming systems and changes in farm sizes in Bambili and Bambui in hectares

Farming system	Average farm Size before 2010	Average farm size 2011-2020	Percentage change
Market gardening	2	1	50
Intensive mixed cropping	3	2	-33.3
Intensive arable farming	2	1.5	-25
Extensive arable farming	3	1.5	-50

Source: Field survey (2020)

Extensive arable farming system has been severely affected (-50% decrease in the average farm sizes from 2010 as compared to the situation before 2010). This is attributed the fact that this farming system required large area for cultivation and the upsurge in urbanization this has resulted from the conversion of land to other alternative uses leading to a reduction in arable land. Market gardening also witnessed a 50% increase. This is attributed to the fact that even though land have been converted to houses the intensification of farming has improved this practice. Intensive mixed cropping witnessed a 33.3 % decrease and intensive arable farming

recorded an average of 25% decrease in average farm size as compared to the situation in before 2010 (Plate 1).

Plate 1: Dynamics in market gardening farm sizes in Bambili and Bambui



Photo A: Small scale cabbage farm

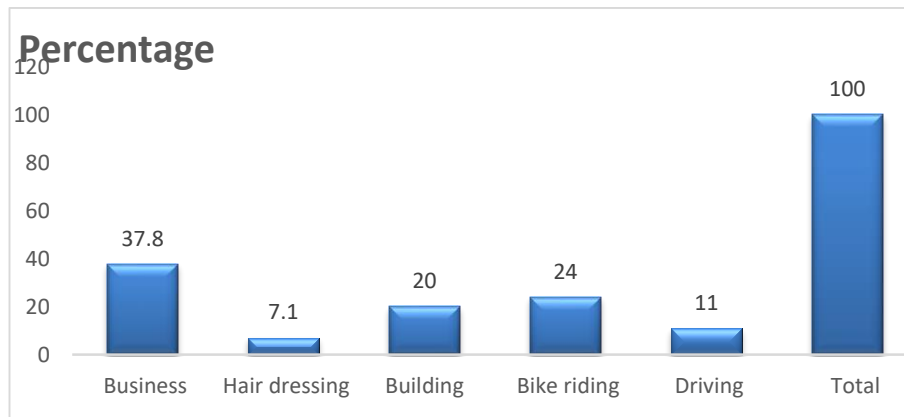


Photo B: Large scale Irish Potatoes farm

Source: Field survey (2020)

The changes in farm sizes for market gardening crops in Bambili and Bambui has led to an increase in small farm sizes due to pressure on land by an increase in the number of market gardeners ready to satisfy the growing demand for market gardening products by the growing student population in Bambili and Bambui. Quantitative and qualitative, the reduction in farm sizes also led to a corresponding increase in farming population. Reduction in farming population is attributed to the switch from farming to alternative livelihood activities ushered by the process of urbanizations such as business, craft and academic oriented activities. This has led to a gradual reduction in farming population indicated by the switch from farming to other livelihood activities (Figure 8).

Figure 8: Alternative livelihood activities resulting from rurbanization from 2011-2020



Source: Field Survey, (2020)

About 37.8% of the population switched from farming to business. This was as a result of the fact that increases in urbanization especially after 2010 after the creation of the university led to increase in business opportunities to the population. Bike riding constituted 24% attributed to increase in the demand for the services by students and other workers, hair dressing constituted 7.1%. This results from the fact that there has been an increase in the demand for hair dressing services by female students and workers.

4.2.2 Improvement in the literacy level of farmers as a result off rurbanization

The surge in academic institutions in the study area also led to increase in the rate of scholarisation of farmers. This resulted from the fact that rurbanization led to increase in academic institutions. It also led to increase in the number of agricultural oriented institutions in the study area which led to improvement in the quality of education of farmers (Table 7).

Table 7: Changes in scholarisation rate of farmers before and after 2010

Level of education	Before 2010		2011-2020		% change
	Frequency	%	Frequency	%	
No formal education	22	10.5	12	6	-3.5
FSLC	65	31	36	17.2	13.8
OL	50	23	65	31	8
AL	35	16	40	19	3
B/A	13	6.5	20	10	3.5
Agric Diploma	15	7.1	27	13	5.9
Total	200	100	200	100	/

Source: Field Survey, (2020)

There has been a positive change in the level of scholarisation of farmers in the study area in all the respective levels before and after 2010. There has a reduction in the proportion of farmers with no formal education from 10.5% before 2010 to 6% after 2010 representing a -3.5% decrease. All have contributed in the agricultural revolution evident in the Bambili and Bambui area.

4.2.3. Improvement in farming techniques resulting from rurbanization

Reduction in farm sizes, led to a reduction in farming population. This also placed the population at a disposal of improving farming techniques so as to maximize yields. There has been an improvement in farming techniques. According to the population, 50% of the population strongly agreed that there were changes in farming techniques. In the same light, 25 % agreed. Those who were in the affirmative are typical farmers who have experienced the changes with a desired objective to improve on output. In the same light, 15% of the population strongly disagreed, and 6.0% disagreed. These are farmers who have just been in the process for less than 10 years and are not aware of the previous and current changes in the activity. This shows that a greater percentage of the population were of the view that there are changes in or improvement in farming techniques.

4.2.4. Changes in the farming tools resulting from rurbanization

There was the need for the study to examine the changes with respect to farming tools. Findings showed that changes in farm sizes and well as farming population also led to corresponding changes in the farming tools. According to the population, 59.5% of the population strongly agreed, 24.3 % agreed that there have been changes in farm tools. This is highly linked to farmers who have been involved in agriculture since 2000 and have undergone mutations in the tools used from 2000 to 2020 resulting from modernization and the impact of agricultural institutions in the study area. Out that 2.70% of the population disagreed. This is highly linked to farmers who have recently involved in agriculture and are not conversant with the previous trends in the tools used by farmers (IRAD, 2021). In this light, it was the study found out that 97.3% of the population was of the view that there have been changes in the types of tools used as a result or rurbanization (Table 8).

Table 8: Changes in farm tools used by farmers before and after 2010

Changes observed before and after 2010	Frequency	%
From the use of Cutlasses and hoes in clearing and weeding to high use of herbicides	151	75.5
From the use of manual watering of crops to the use of sprinklers and mechanical pumps	35	17.5
No changes	14	7
Total	200	100

Source: Field survey (2020)

There has been an increase in the use of cutlasses and hoes for clearing and weeding of crops to the use of herbicides as shown by 75.5% of the population. This is attributed to the fact that almost all the farmers are involved in the use of herbicides to as an alternative way of weeding their crops in the study area. There has been an increase in the use of sprinklers and mechanical pumps as opposed to manual watering of crops and canalization used more in subsistence farming before the period of remarkable rurbanisation. Presently, 17.5% of the population indicated

that they now use modern water pumps to water their farms in periods of soil moisture deficit.

4.2.5 Changes in farm inputs resulting from rurbanization

There have been changes in the farming inputs according to the population. These changes have been triggered by a drastic reduction in arable land. These changes were evaluated in terms of capital in form of seeds, manure, insecticides and pesticides (Table 9).

Table 9: Dimensions of change in input before and after 2010 in Bambili and Bambui

Changes in inputs used before and after 2010	Frequency	%
From the use of organic mixtures (tobacco and wood arch) to the use of insecticides	36	17.2
From high use of old species of crops to the use of improved seeds	57	27
From high dependence on natural fertility of the soil to use of manure and fertilizers	100	47
No changes	7	3.5
Total	200	100

Source: Field survey (2020)

There have been changes from heavy dependence on the natural fertility of the soil to the use of manure and fertilizers to maximize yields as indicated by (47%) of the population. This was very common amongst farmers who are highly involved in the use of manure and fertilizers to improve yields. There are some farmers who have not witnessed any change in inputs used as represented by (3.5%) of the population. These are farmers who have either been using improved seeds and inputs before 2010 or farmers who are adamant to change. The types of improved crops and inputs used are explained in the next chapter under sustainable agriculture through agricultural intensification as supported by Paveluic-Olariu (2010).

4.2.6. Changes in farm sites resulting from rurbanization

The rapid rate of rurbanization also witnessed a reduction in arable land from 42.52 km² in 2010 to 40.02 km² in 2020 and an increase in build-up



area from 6.57km² in 2010 to 11.91km² in 2020. This has resulted to changes in the cultivation sites of some crops or farming practices in the study area. This is triggered by the fact that some localities where some particular crops are cultivated have been transformed to settlements and farmers have moved to other new areas for cultivation. On a spatial dimension market gardeners have migrated to areas like Nfonta, lake Bambili and Finge, lessening the pressure on the rubanised land. Neighbourhoods such as Nibye, Ntemnibye, and Ntigiti were highly used for market gardening where average farm sizes of 2 hectares were used for market gardening. However, with an increase in rurbanization, there is an outward migration of market gardeners to new sites such as Ntah, Lake Bambili, Nfonta, and Macha and increase in the demand for market vegetables has led to the expansion of farm sizes as was the case before where farmers and an average farm sizes are large with an average farm size of 1 hectare (Table 10). This is contrary to the findings of Von Thunen who posited that the intensity of agriculture decrease with distance away from the city center (Bengs and Schmidt, 2018).

Table 10: Crop production sites before and after 2010 in Bambili and Bambui

Village	Situation before 2010		Situation after 2010	
Bambili	Neighbourhoods	Types of crops cultivated	Neighbourhoods	Types of crops cultivated
	Agam	Maize , beans , plantains	Ntah	Plantains, maize and beans
	Mile 10 Bambili	vegetables	Ntigeh and lake Bambili and Ntembang	Vegetables,
Bambui	Atunibah	Maize/ beans	Fonta	Maize , beans
	Mesuoh	Vegetables	Finge	vegetables

Source: Field survey (2020)

Before 2010, there has been the production of maize, beans and plantains in Agam in Bambili. As from 2010, with increase in rurbanization and reduction in arable land, the population had to relocate the production of these crops to Ntah neighbourhood in Bambili because of available land. Large scale vegetable cultivation was carried out in Mile 10 neighbourhoods in Bambili and due to the impact of rurbanization;

farmers have relocated the production zones to area like Ntigh, Ntembang and areas around lake Bambili. In Bambui, there has been the ruralization has led to a reduction in arable land and farmers have changed the cultivation of maize from neighbourhoods like Atunibah to Nfonta and vegetable producers have relocated to Finge due to available land.

4.2.7. Changes in farming motives resulting from ruralization

Ruralization is associated with changes population in the study area from 35531 in 2010 to 52365 in 2020. These changes in population also led to changes in the motives of agriculture. There have been changes in the motives of agriculture from highly subsistence to commercial agriculture and with some farmers there were no changes (Table 11).

Table 11: Changes in the motives of farming resulting from ruralization

Dimensions of change in motives of production	Frequency	Percentage
From subsistence to commercial	89	42
From commercial to subsistence	76	36
No change	35	17.5
Total	200	100

Source: Field survey (2020)

There have been changes from subsistence to commercial agriculture as indicated by 42% of the population. This is very common amongst farmers who decided to increase the sale of production so as to supply farming products like vegetables, plantains and maize to the growing population. There has been a change from commercial to subsistence agriculture as indicated by 36% of the population. This was common amongst farmers who were previously cultivating on a large scale before 2010 for commercialization and had decided to sell their land because of increase in land value in the study area. These farmers are left with small pieces of land which are presently cultivated for subsistence purposes. The study found out that there are some farmers who have not witnessed any change in the motive of production 17.5%. These are farmers who were both cultivating for commercialization or consumption or both before 2010 and

have continued with the same motive after 2010 as echoed by (Amit et al., 2019).

5. CONCLUSION AND RECOMMENDATIONS

There have been changes in agricultural systems linked to changes rural transformation (OECD, 2020). These changes are seen in line with crop production systems and in livestock rearing system. The process of rurbanization in Bambili and Bambui has been evident linked to increasing land uses and space occupation through the different land uses expanding from the University and market as well as residential areas to the peripheries (Gwan and Kimengsi, 2020). This is proven with the expansion in buildup area and increasing urban facility and service development. Also, there has been a positive relation between rurbanization and agricultural development. This is seen in the field through increasing agricultural intensification and diversification as well as the general improvement livelihoods linked to food security. The growth in social and economic capital in terms of social development infrastructures and micro financial institutions have ushered an upward spiral in agricultural sustainability through agricultural intensification and the promotion of environmentally friendly agriculture through the increase use of organic manure occasioned by increase in environmental awareness. This is rooted on increase in the rate of scholarisation in the study area. Although rurbanization has led to a reduction in farm sizes at the center resulting from competition land uses (Papito, 2017), it has also promoted the increase in land acquisition at the peripheries of Bambui and Bambui and pressure on these peripheral areas has also led to decrease in farm sizes at the peripheral villages. The study recommends the need for sustainable land use planning in the context of increasing over duplication of land uses. This can ensure sustainable urban development (Green Urbanism), agricultural sustainability and sound ecological management.

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