Scientific Research Publishing

Current Urban Studies, 2022, 10, 697-717
https://www.scirp.org/journal/cus
ISSN Online: 2328-4919
ISSN Print: 2328-4900

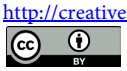
Rural-Urban Road Transportation Challenges on Food Security in Maroua, Far North Region of Cameroon

Tama Bawack Ako[1], Clarkson Mvo Wanie[2]

[1]Faculty of Economics and Management, The University of Maroua, Maroua, Cameroon
[2]Department of Geography and Planning, The University of Bamenda, Bamenda, Cameroon
Email: akotama16@gmail.com, wanimvo@yahoo.co.uk

How to cite this paper: Ako, T. B., & Wanie, C. M. (2022). Rural-Urban Road Transportation Challenges on Food Security in Maroua, Far North Region of Cameroon. *Current Urban Studies, 10,* 697-717.
https://doi.org/10.4236/cus.2022.104041

Received: September 11, 2022
Accepted: December 25, 2022
Published: December 28, 2022



Abstract

Rural-urban road transportation is very essential for mobility in most parts of the world. Its states, especially in developing countries, have posed serious challenges to the transportation of people and goods into urban centres with varying impacts. This study seeks to examine the challenges in rural-urban road transportation and coping mechanisms for food security in Maroua municipality. In order to attain these objectives, data was collected from primary sources including field observation, interviews and administration of 261 questionnaires. Secondary data was gotten from published and unpublished sources. Descriptive analysis of the results was done using SPSS version 20 and Microsoft Excel 2013. Results revealed that rural-urban roads in Maroua are dilapidated and inadequate, making movement difficult especially during the rainy season. These challenges negatively affect different dimensions of food security in Maroua. Adaptation mechanisms include urban agriculture and the rehabilitation of rural-urban road transport infrastructure. Thus, it was concluded that, there is urgent need for improvement of rural-urban road transport infrastructure by stakeholders as they remain very essential for food security.

Keywords

Transportation, Transport Infrastructure, Food Security, Maroua, Cameroon

1. Introduction

Rural transport network is key to food security and zero hunger (Sasidharan, 2017) as it makes produce to reach markets and inputs to get to the farm. Ac-

cording to Bakker et al. (2018), rural-urban transportation infrastructure is important for food production and security. It accelerates urban (Kaewunruen et al., 2016) and rural development, mobility and economic growth (World Bank 2008; Chakwizira & Mashiri, 2009). In the same vein, Olamigoke and Emmanuel (2013) opined that the development of the local economy is hinged on the adequacy, reliability and efficiency of the transportation system. Most importantly, access to the low cost road transportation makes it possible for farmers to bring raw materials from farms to factories and industries (Chakwizira et al., 2010). Yet, the provision of basic road infrastructure in developing countries is more available in urban centres compared to rural areas with impacts on food security (Fatoke, 2013), with varied challenges to resilient transportation systems (Bringshaw, 2012).

Urban farming has become an effective strategy to strengthen food security (Muhammad et al., 2022), given that integrating food production within buildings offers an opportunity that does not impinge on the city's many uses for available land (Astee & Kishnani, 2010). Developing peri-urban farming systems is also important combat food security (Filippini et al., 2018). Aberman et al. (2022) pointed gender-inclusive governance of urban food systems through support and formal participation of female vendors in the marketplace for improved market policy to ensure food security. Local governments have an important role to play in providing transport infrastructure to ensure that perishable foodstuffs reach markets quickly (Tacoli, 2017). Overcoming the obstacles to food security is critical not only to national security but also to global stability (Sheeran, 2015). Douyon et al. (2022) highlighted that emphasis should be laid on education as it influences choosing diversification strategy which helps improve diversification for food security. Tackling climate change is another important measure to ensure food security through climate-smart agricultural production with focus on small holder farmers.

In African, roads dominate the transport sector covering 80 - 90 percent of passenger and freight traffic. In spite this, the density of road networks remains low especially in rural areas with inadequate maintenance (EXIM Bank, 2018). Africa has an average of 204 km of roads per 1000 square km, of which only one quarter is paved. Thus, the density of national roads in Africa lags far behind the average of 944 km per 1000 square km. The World Bank had stressed on the fact that Africa's development is highly dependent on an adequate and reliable road system. For rural communities, a road is often an essential lifeline linking isolated villages to economic opportunities and services. At present, only one-third of rural population live within two kilometers of an all-season road in Africa, which is the lowest accessibility rate. Nwafor and Onya (2019) opined bad roads and inadequate fleets of vehicles are common features and challenges of developing world transportation system. Physical problems such as untrained transport managers and planners, capital restructuring and bureaucracies and ineffective traffic regulations equally exist (Fajir & Zidan, 2016). This puts consum-

ers in cities into food insecurity and price increase. It is common knowledge that 20% to 40% of agriculture produce in Africa is lost in transit necessitating support for local farm-based cooperatives to build community warehouses for commodity collection and aggregation (Songwe, 2012) as international food security agenda places the small farmer at the (Crush & Frayne, 2011).

In Sub-Saharan Africa (SSA), road transport is the dominant transportation mode, carrying over 75% of passengers and freight. But more than 50% of these roads are in poor condition (Zietlow, 2007). In the colonial era, roads were meant to link mines and plantations to ports, rather than to provide general connectivity within the region (Gwilliam, 2011). Most of these colonial roads are still maintained, while others have remained in dilapidated state. Akangbe et al. (2013) reported that a lot of rural farmers in Kwara State Nigeria, express difficulties in income maximization from their agro-output as a result of poor road network. According to Gbadamosi and Olorunfemi (2016), rural Nigeria is yet to witness any rapid development despite process of economic liberation before the beginning of oil production as the provision of rural road infrastructures have been neglected. This has limited the level of agricultural activities of most farmers (Olorunfemi, 2018; Olorunfemi & Adenigbo, 2017) coupled with inadequate number of transit vehicles, recklessness and highway robbery (Nwafor & Onya, 2019). Yet, in South Africa, Battersby and Peyton (2014) considered expansion of supermarkets and their even distribution across Cape Town as a way of making food available and accessible by both the high and low income city dwellers.

Roads are key in linking the Cameroonian economy and an essential support to the country's growth strategy. Transport infrastructure is still too narrowly focused on the connections of district towns with the capital cities. Endowed with enormous natural resources for agriculture, Cameroon has a large rural population, actively engaged in food production to feed the nation and respond to food insecurity. Unfortunately, Cameroon is still far from being efficient in providing institutional and support systems necessary to tap this huge potential through efficient road transportation (Steel & van Lindert, 2017), despite government's efforts in scaling up paved road network from 10% in 2010 to 17 % in 2020. In the Far North Region of Cameroon, uncertain rainfall and poor roads have made most households to face food security challenges. This has triggered support especially to Internally Displaced Persons (IDPs) in Mayo-Sava, Mayo-Tsanaga and Logone and Chari Divisions (Famine Early Warning Systems Network, 2021). The World Food Programme (2017) adopted a strategic orientation meant to ensuring that vulnerable refugees and IDPs have access to food during crisis times for achieving SDG 2.

The aim of this study is to examine the challenges in rural-urban road transportation and coping mechanisms for food security in the Maroua municipality. This is inadequately demonstrated in the existing literature given that previous studies have mostly associated food security to poverty, drought and climate change. Bringing out the challenges in rural-urban road transportation and

coping mechanisms food security-in a Sahelian city helps contribute to achieving SDG 2. Food insecurity is a problem in the Maroua municipality that calls for increased scientific attention making it necessary to assess sustainable strategies employed to ensure food security in Maroua city. This will provide an understanding of how to better food availability and accessibility.

2. Study Area and Research Methods

2.1. Study Area

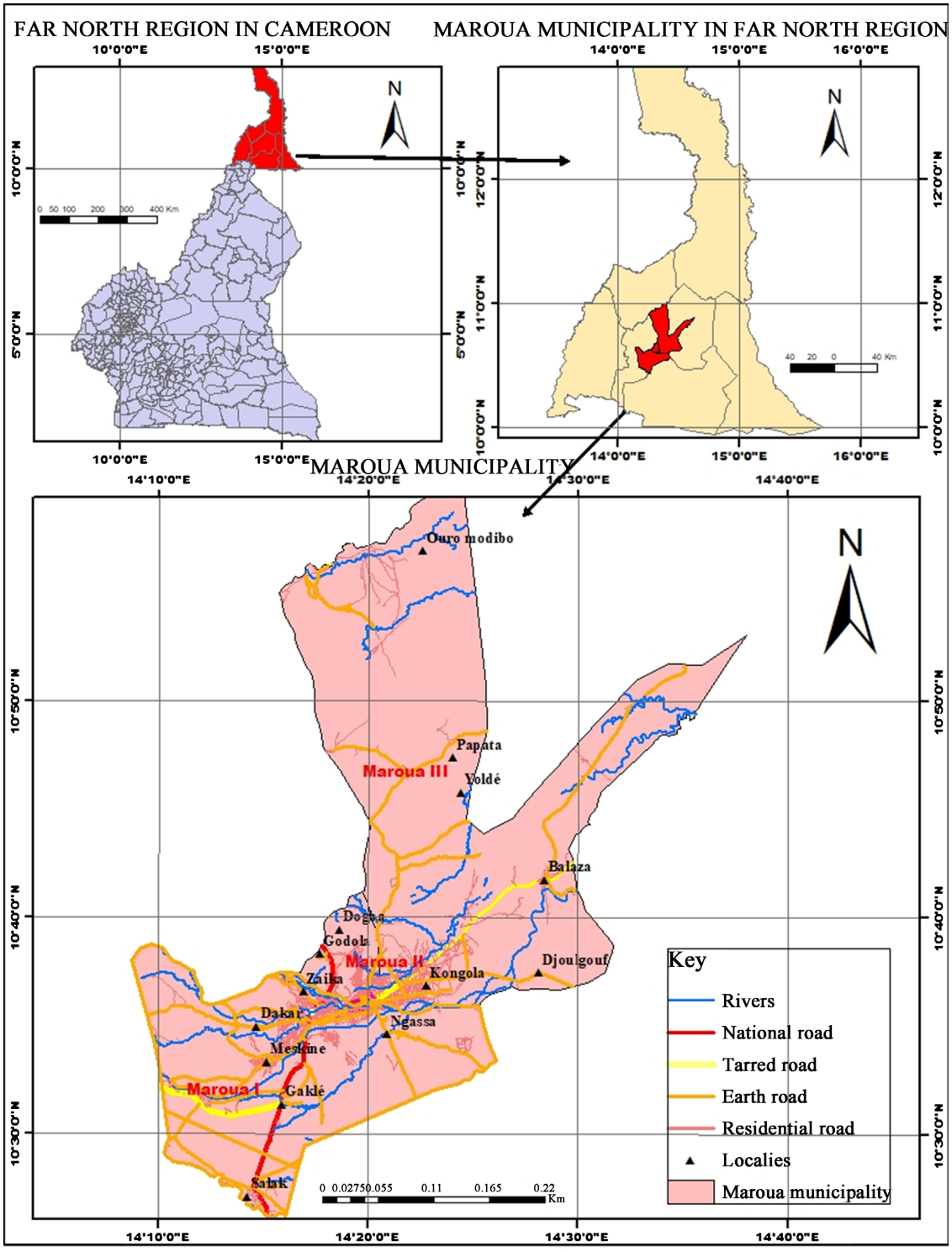
Maroua is the capital town of the Far North Region, situated in the Diamaré Division. It stretches along the banks of the Ferngo and Kaliao rivers, on the foothills of the Mandara Mountains. Maroua town is located between Latitude 10˚30'0" and 10˚50'0" North of the equator and Longitude 14˚10'0" and 14˚40'0" East of the Greenwich meridian (**Figure 1**). The Municipality covers a surface area of 127 km^2 and is composed of three Council areas (Maroua 1 - Domayo, Maroua 2 - Doualaré and Maroua 3 - Dougoï). It is bounded to the north by the Logone and Chari and Mayo Sava, to the south by Mayo Kani, to the east by Mayo Danay and to the West by Mayo Tsanaga Divisions (Wanie, 2016).

Figure 1 presents the location of Maroua Municipality, showing the three Council areas that make up the Municipality. It also presents the various administrative units that surround Maroua Municipality. These surrounding units serve as the sources of food for the livelihood of the inhabitants of Maroua city.

2.2. Research Methods

Both qualitative and quantitative research designs were used in this study in order to obtain the results. Qualitative research design was used to describe the characteristics of the variables under study. This design methodologically helped in describing the state/nature of existing road infrastructures, identify coping mechanisms for management of transport disorder due to the degraded state of roads as well as some indigenous practices of road rehabilitation in the Maroua municipality. This enabled the description of the road transport infrastructure and types of coping mechanisms on frequencies tables, plates and descriptives. Quantitative research design was useful in this study through the analysis of the questionnaires. This design helped in the understanding of the challenges or constraints of rural-urban transportation, causes of disorder in rural-urban transportation, reasons for non-maintenance of roads, measures to ensure food accessibility and mechanisms for food availability and sustainability in the Maroua municipality. Through this way, the researchers demonstrated quantitatively how road transport infrastructure relates to food security in the Maroua municipality.

Published documents were gotten from the internet using Google search, researchgate and google scholar. The Universities of Bamenda and Maroua, the Department of Geography and Planning, RADEL Library (Maroua) and *Ecole Normale Supérieur* (ENS)-Maroua libraries were visited to get secondary



Source: Modified from Cameroon Atlas for Schools and Colleges (2005).

Figure 1. Location of Maroua Municipality.

information from dissertations and thesis. Also, institutions such as the Maroua City Council and Maroua I, II and III Councils were visited to get information concerning the roads in Maroua municipality. The Regional Delegation for Pub-

lic Works in Maroua served as a reference point for information. The Regional Delegation for Agriculture and Rural Development was also visited to ascertain their actions on food security. Non-governmental organizations such as ALDEPA (Actions Locale pour un Développement Participatif et autogéré), ACEFA (Programme d'Amélioration de la Compétitive des Exploitations Families Agropastorales) and COPRESSA (Centre Optionnel pour la Promotion et la Régénération Economique et Sociale-Secteur Afrique) were visited to get information on approaches for food security in Maroua municipality. Resource persons from these institutions were interviewed to get primary data on road transportation and food security. Also, a total of 261 questionnaires were administered to transporters, middlemen, farmers and venders purposively in the three sub-divisions of the Maroua municipality. Special attention was directed on field observation of the nature of roads and mechanisms to ensure food security of which geo-referenced field photos were taken using a digital camera.

Descriptive analysis was done using Statistical Package for Social Sciences (SPSS) version 20 and Excel 2013. Since this study involved the evaluation of two variables, the chi square test function in SPSS was employed to reveal quantitatively if an association exist between challenges to rural-urban road transportation infrastructure and food security in the Maroua Municipality. In addition, with cartographic data acquired from PLANET BBBike extract in the form of zip files, Arc Map version 3.10 was used to process and produce maps. Equally, as some cartographic data (waypoints) was acquired from the field with the use of GPS, it was extracted using a cable and registered as an Excel file. After cleaning, the data was added to Arc Map. Automatically, the coordinates appeared in point form. Once the map was finished, it was exported to GPEG and attributed a name or title. As such, cartographic analysis aided in mapping poor road hotspots and urban agricultural production zones in the city.

3. Results

3.1. Challenges to Rural Urban Road Transportation in the Maroua Municipality

Rural-urban road transportation faces challenges that adversely affect road users in both the rural and the urban areas in the Maroua municipality. It was revealed that most of the roads in the Maroua municipality are seasonal. Where tarred stretches exist, they are characterized by potholes that impede smooth circulation of goods and people. Table 1 indicate the assessment of the population.

According to Table 1, the main challenges facing rural-urban road transportation common in Maroua I, Maroua II and Maroua III municipalities include dilapidated roads assessed by 35.25% of the population and overall inadequacy of road transport infrastructure (28.74%). Equally, 25.67% others pointed the seasonal nature of the roads as a major challenge. As observed, the degraded nature of tarred road makes is difficult for smooth movement. The road linking Godola to Dogba is not tarred and very seasonal. It is the same situation with the

roads linking Meskine and Djoulgouf. These roads are dusty during the dry season and muddy and almost impassable during the rainy season (Figure 2).

The photos in Figure 2 depict the challenges faced on various rural-urban roads in the Maroua municipality. Photo A is the road between Kodek and Kongola cut by water while Photo B is part of the National Road Number One at Gakle with potholes. Photo C is the stretch of road linking Godola to Dogba which is untarred while photo D is the road linking Djoulgouf to Maroua city with a "pond" at the middle. These depict the seasonal and dilapidated nature of rural-urban road transportation infrastructure in Maroua.

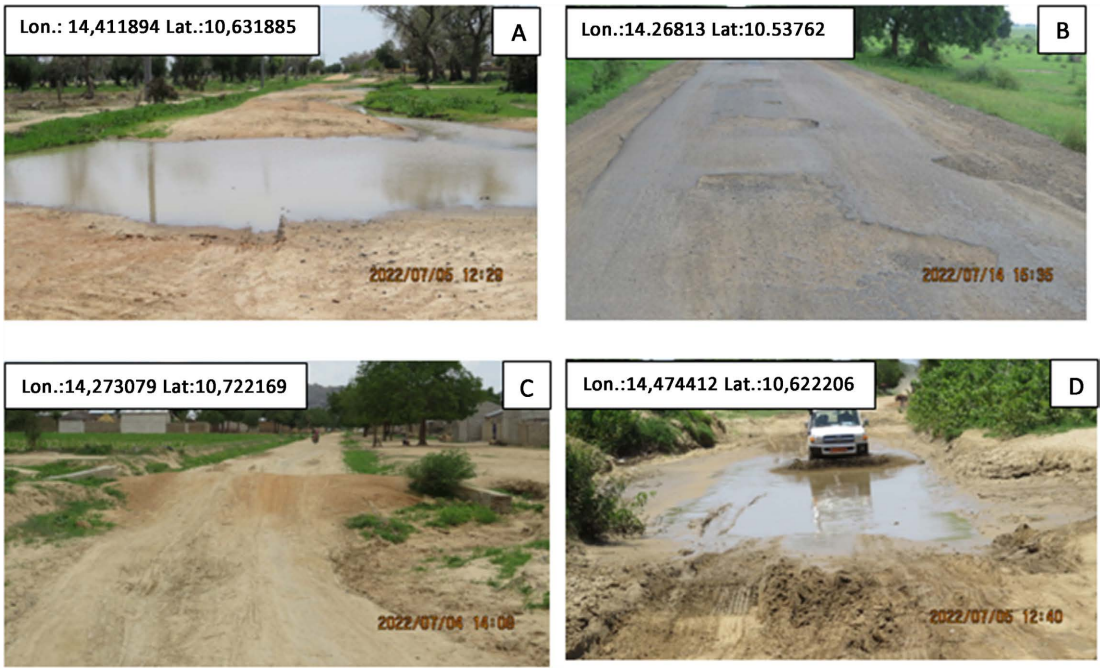
3.1.1. Disorder in Rural-Urban Road Transportation in Maroua

The non-respect of Highway Code, poor planning and management often lead

Table 1. Constraints of rural-urban road transportation in the Maroua municipality.

Challenges	Maroua I		Maroua II		Maroua III		Total	
	Frequency	%	Frequency	%	Frequency	%	Frequency	%
Dilapidated roads	35	35.0	45	43.7	12	20.7	92	35.25
Seasonality of roads	20	20.0	14	13.6	33	56.9	67	25.67
Inadequate infrastructure	32	32.0	37	35.9	6	10.3	75	28.74
Fluctuation in fuel prices	13	13.0	7	6.8	7	12.1	27	10.34
Total	**100**	**100.0**	**103**	**100.0**	**58**	**100.0**	**261**	**100**

Source: Field Work (2022).



Source: Field Work (July 2022).

Figure 2. Degraded rural-urban roads within the Maroua Municipality.

to rural-urban transport disorder, accidents and sometimes loss of lives in Maroua. The causes of disorder are perceived differently by different road users in Maroua municipality as presented in Table 2.

Table 2 confirms that disorder in rural-urban transportation is caused by poor habits of road users with a higher response rate over these municipalities coupled with inadequate traffic lights and signs post. At the same time, some road users blame the disorder on poor location of parks as 27.97% of the population indicated. The parks locations are far away from the market centres (Figure 3).

Figure 3 presents sections of the Central park in Maroua located in Dougoï in the Maroua III Council area. The park has become a shadow of itself, being used by people for other reasons. For instance, mechanics have opened their garages here. Also, there are several abandoned vehicles given its infrequent use as it is located far from the market. Road users would have preferred to have the parks close to the market centres to reduce transportation and logistics costs. Consequently, this leads to chaos in the transportation sector in Maroua municipality. This can be seen in Figure 4.

Figure 4 presents clandestine parking around the outskirts of the Maroua main food market (*Marché Abatoir*). Photos A and B show bike riders who sell produce in the clandestine park on the spot to wholesalers who then retail them either at *Petit marché de Zokok* or at the main food market in Maroua. Photos C

Table 2. Causes of disorder in rural-urban transportation.

Causes of disorder	Maroua I		Maroua II		Maroua III		Total	
	Frequency	%	Frequency	%	Frequency	%	Frequency	%
Inadequate options for traffic management	38	38.0	5	8.6	15	14.6	58	22.22
Exploitation of road users	13	13.0	10	17.2	24	23.3	47	18.01
Poor location of parks	28	28.0	21	36.2	24	23.3	73	27.97
Poor habit of road users	21	21.0	22	37.9	40	38.8	83	31.80
Total	**100**	**100.0**	**58**	**100.0**	**103**	**100.0**	**261**	**100**

Source: Field Work (2022).

Source: Field Work (July 2022)

Figure 3. The central park of Maroua.

Source: Field Work (July 2022).

Figure 4. Clandestine parking in Maroua II and IIIcouncil areas.

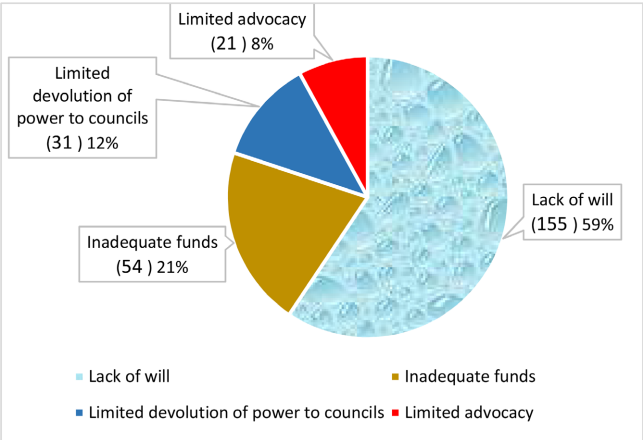
and D also show clandestine parking on the road and off-loading of millet from rural production zones close to the main food market in Maroua III council area. This area is noted for this and some of the bags are immediately opened and retailed on the spot further causing disorder. This is because of the poor location of the parks. The disorder observed in rural-urban transportation in the Maroua municipality is partly attributed to inadequate maintenance of rural-urban roads for various reasons analysed below.

3.1.2. Inadequate Maintenance of Rural-Urban Roads

It was revealed that very little is done to improve on the road network to facilitate transportation of agricultural produce into the Maroua city. This is often blamed on the authorities in charge of road construction and maintenance. **Figure 5** shows the population assessment of what impedes frequent maintenance of rural-urban road infrastructure.

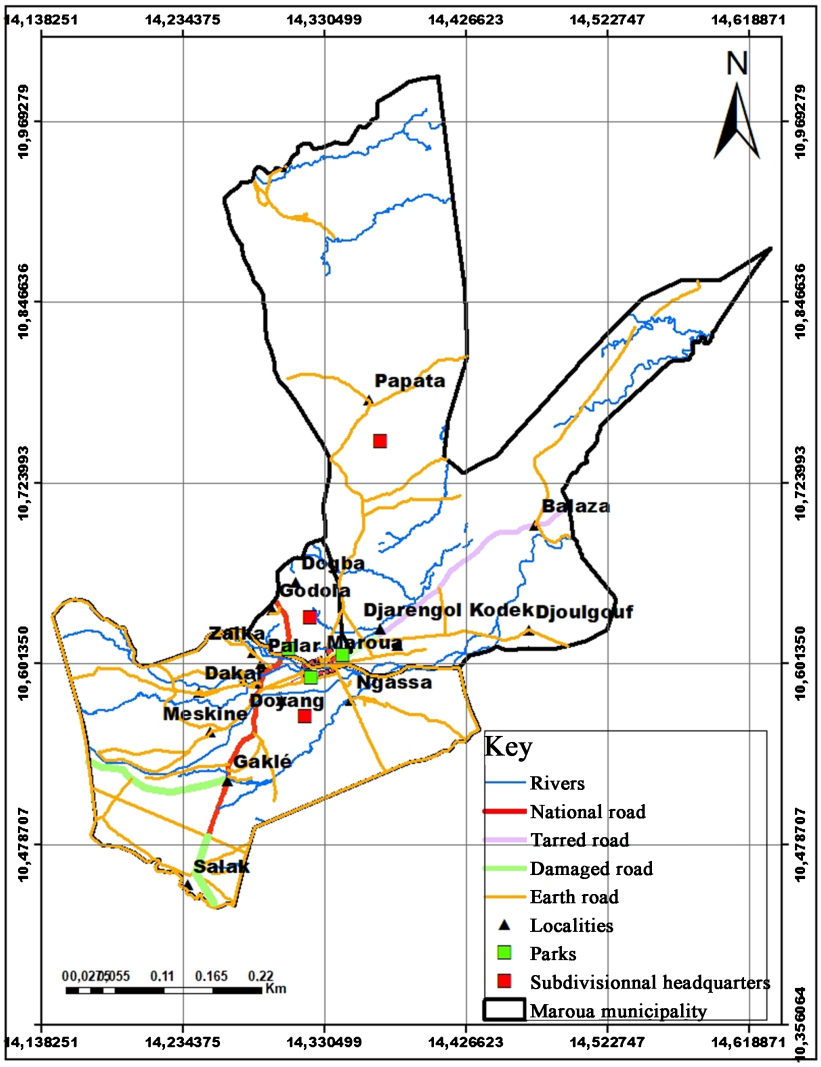
Figure 5 shows that, 59% of the population are of the opinion that roads are rarely rehabilitated because of the lack of will by the authorities. While 21% of the population also hold that it is due to inadequate funds for maintenance of roads and limited stakeholders' advocacy. Also, 12% of the population point the lagging nature of decentralization which maintains limited autonomy of councils to manage local projects to meet the population's aspiration. This has pose difficulties to rural-urban road transportation in Maroua. **Figure 6** indicates hotspots of poor road infrastructure in Maroua municipality.

Figure 6 operationalises the categories of roads in Maroua municipality, with emphasis on stretches that are challenging. A good example is the stretch of the



Source: Field Work (2022).

Figure 5. Reasons for non-maintenance of rural-urban roads.



Source: Modified from Cameroon Atlas for Schools and Colleges (2005) and Field Work (2022).

Figure 6. Poor road hotspots in Maroua municipality.

National Road Number One along the Salak-Kousseri corridor. Generally speaking, seasonal earth roads link the production basins of Meskine, Dogba, Djoulgouf and Salak to the urban markets.

3.2. Mechanisms for Food Security in Maroua

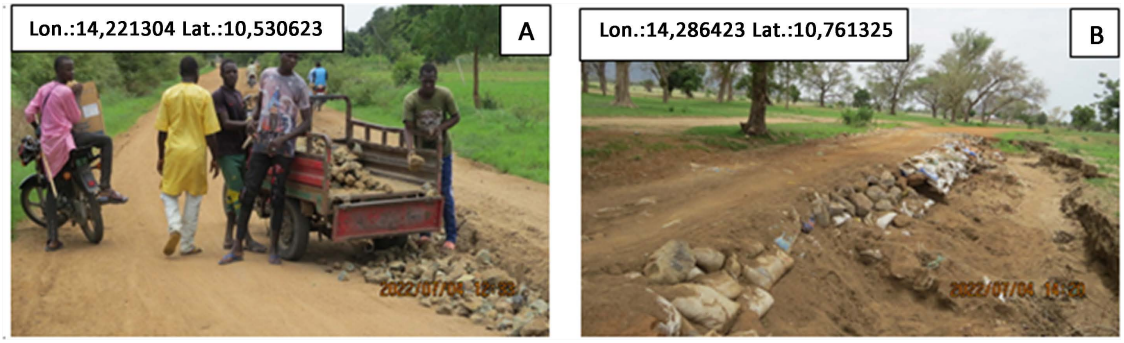
Rural roads linking up the capital city in the Maroua municipality have been revealed to be in a dilapidated state, adversely affecting movement of persons and produce to the city. Transportation and non-transportation efforts have been employed to address these.

3.2.1. Transportation-Based Mechanisms

These include rehabilitation of rural-urban roads by the local population, construction of roads and various mechanisms to manage disorder. The local population are the direct users and direct beneficiaries of roads in their areas as it is the only means by which their farm produce can be taken to the market centre in Maroua city. It was discovered that the Maroua municipality dwellers have deployed strategies to rehabilitate roads through community labour. This is carried out through joint effort to rehabilitate bad spots along the stretches of roads that often make it impossible for vehicles and motorbikes to move freely with goods. Figure 7 shows an example of this initiative being carried out in Meskine where the bad spots are filled with stones to facilitate movement of both bikes and automobile.

Figure 7(A) reveals the rehabilitation of roads in Meskine on spots that hamper free flow of goods and persons. This activity is realized thanks to concerted efforts between the villagers and some transporters. Though this is a temporal measure, it helps the farmers and transporters to easily convey their products to Maroua city with reduced difficulty. Also, thanks to efforts of the local population, the road on Photo B is made usable through loading of sand in bags and laying them on the road before filling with soil and stones. This section of the road was damaged, cutting off communication between Dogba and Maroua city.

Equally, construction of roads has also been employed as a mechanism to ensure food security in Maroua. A good example is the 37.5 km Maroua-Bogo road



Source: Field Work (July 2022).

Figure 7. Rehabilitation of road in Meskine.

that was recently handed to the State by Société Nouvelle d'Etudes et de Réalisations (SNER) Construction Company and the 224.3 km Maroua-Mora-Kousseri road that links Maroua to Godola (Figure 8). These increase the length of paved roads in Maroua and facilitate transportation.

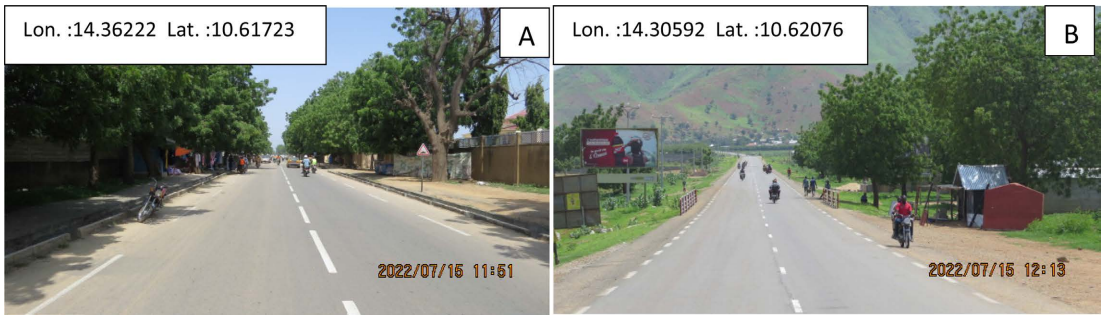
Photo A is the road linking Maroua to Bogo which passes through Kongola. Photo B is the National road number one on the Maroua-Kousseri corridor. This stretch passes through Godola. These roads in part relieve the challenges to rural-urban road transportation in the Maroua municipality.

As a measure to manage the motorbike sector in Maroua, commercial bike riders must put on a similar jacket for proper identification. These jackets are equally attributed serial numbers that are unique to each bike rider (Figure 9). This helps to check disorder. This makes bikes riders easily identified given their dominance in the transportation sector. However, bike riders from rural areas mostly do not adhere to this.

Figure 9 shows bike riders wearing the prescribed "vest" authorised by the council for identification and control of their sector. This is to limit disorder and improve control of the activities of the motorbike riders. The jackets carry a serial number unique to the bike rider's council area.

3.2.2. Non-Transportation Mechanisms

These measures include ensuring food accessibility, ensuring food availability,



Source: Field Work (July 2022).

Figure 8. Section of newly tarred roads in Maroua municipality.

Source: Field Work (July 2022).

Figure 9. Bike riders with identification jackets in Maroua.

ensuring food sustainability and the role of NGOs in ensuring food security in the Maroua municipality. The population perceive that, some measures can be employed to manage rising cost of living due to increasing prices to food accessibility as seen in Table 3.

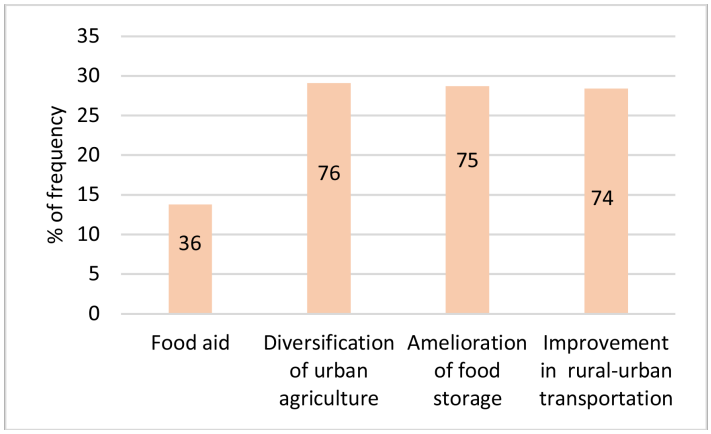
The construction of storage facilities is the most favoured option to ensure food accessibility with 31.4% of the population pointing to this. This implies that during peak harvest periods, the surpluses should be well conserved to prevent food waste. These reserves are released in times of deficit to ensure stable prices such that low-income earners can have access. Price stabilization is also an important measure to check the excesses of business persons whose sole goal is to earn abnormal profits. This is supported by 29.1% of the population, while 24.9% advocated for subsidization of food prices. This demands intervention by the government and some non-governmental organizations to ensure food accessibility to all. The transformation of agricultural produce, though with just 14.6% response rate, is also very important. This entail the creation of light industries to transform agricultural produce into states that can be better preserved.

Food availability in Maroua city will enable food self-sufficiency. From the assessment of the population as shown in Figure 10, food availability in Maroua city is very feasible.

Table 3. Measures to ensure food accessibility.

Mechanisms	Frequency	Percent
Stabilization of food prices	76	29.1
Subsidization	65	24.9
Construction of storage facilities	82	31.4
Transformation of agricultural produce	38	14.6
Total	**261**	**100.0**

Source: Field Work (2022).



Source: Field Work (2022).

Figure 10. Mechanisms for food availability.

According to Figure 10, three responses are outstanding. The first, shared by 29.1% of the total population advocates for the diversification of urban agriculture. This will require sustainable use of open spaces in the urban areas especially wetlands to ensure maximum output per unit area. The second response relates to amelioration of food storage, proposed by 28.74% of the population. This requires the construction of warehouses and also the transformation of agricultural produce into semi-finished or finished goods, in states that can be easily conserved. The third response shows an improvement in rural-urban transportation infrastructure with 28.4%. Thus, this aspect remains central for the easy flow of goods from the production basins to Maroua city at all times. It was also discovered that agricultural mechanization is being experimented to improved outputs to ensure food availability as seen in Figure 11.

Figure 11 portrays an important measure to ensure food availability in Maroua. This is through the mechanization of agriculture. This presents an experimental farm by the Agricultural Research Institute for Development (IRAD) Maroua, around the Dougoi neighbourhood in Maroua III council area. The use of tractor is to increase output per unit area in order to guarantee food self-sufficiency.

Food production is done in a way that it is not wasteful of natural resources

Source: Field Work (2022).

Figure 11. Mechanized tilling of agricultural field in Dougoi-Maroua III.

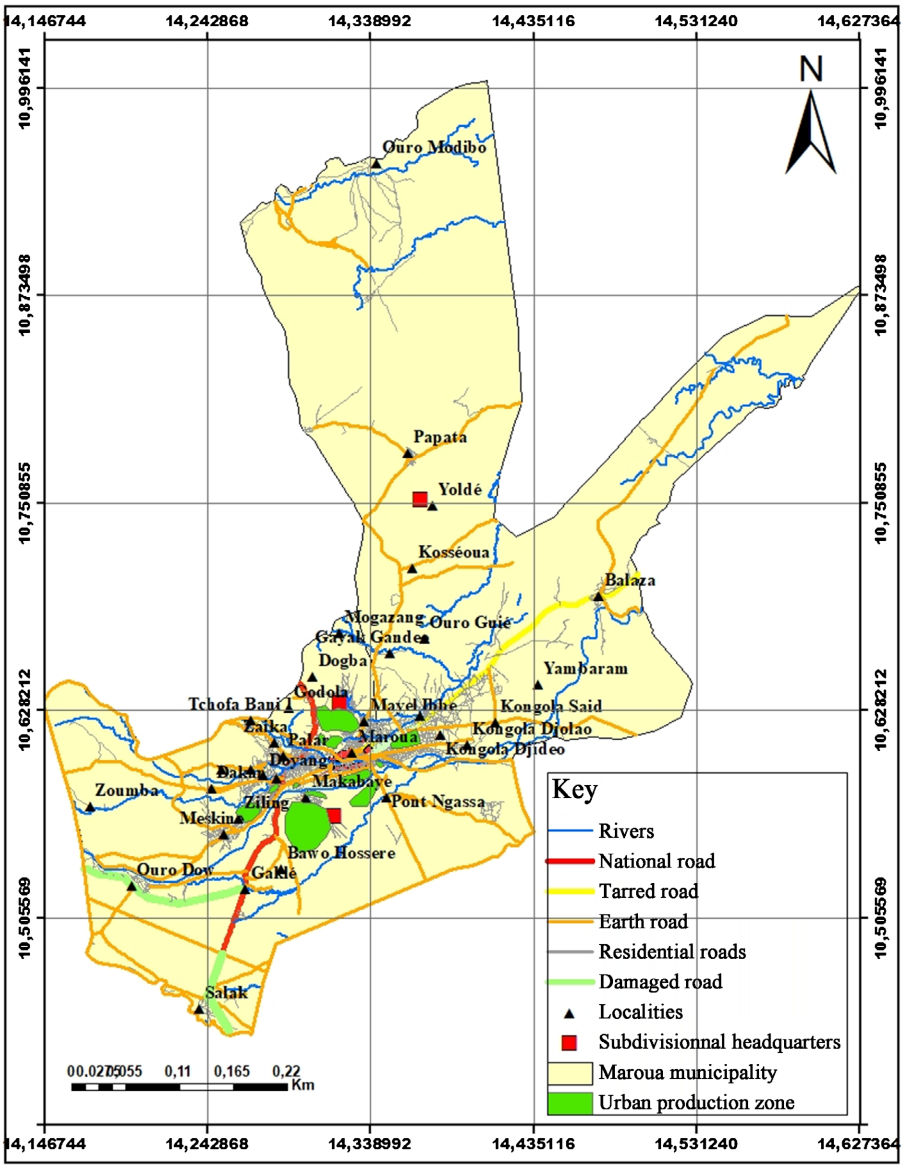
Table 4. Measures to ensure food sustainability in Maroua municipality.

Measures	Frequency	Percent
Stabilization of food prices	41	15.7
Improved roads transportation infrastructure	68	26.1
Improve transportation means	35	13.4
Construction of storage facilities	49	18.8
Government intervention	68	26.1
Total	**261**	**100.0**

Source: Field Work (2022).

and can be continued into the future without being detrimental to the environment or to the health of the population. Sustainability requires that there is controlled use of chemical fertilizers in a bid not to compromise the quality of food and livestock produced for the consumers in the city. According to Table 4, government intervention becomes indispensable in ensuring food sustainability (26.1%).

Government intervention through the provision of agricultural inputs will reduce production cost and increase the revenues of farmers. Again, improvement in road transport infrastructure resurfaced (26.1%) and the stabilization of prices still needs the intervention of the government. In Figure 12, urban agricultural production zones in Maroua city are shown.



Source: Modified from Cameroon Atlas for Schools and Colleges (2005) and Field Work (2022).

Figure 12. Urban agricultural production zones in Maroua.

Figure 12 presents areas that accompany urban production in Maroua city and most patches are currently cultivated including especially marshy areas. These are cultivated to ensure food security with food items such as vegetables, spices, fruits, cereals and livestock.

Non-governmental organizations play important role as concerns food security. The Far North Region is considered as an economically deprived region in Cameroon with low incomes and low opportunities. It was revealed that some local non-governmental organizations are actively engaged in activities related to provision of food aid to deprived persons in the Maroua municipality. This includes ALDEPA working to protect the girl child and the female gender mostly involved in crop cultivation and COPRESSA with one of its objectives to provide food aid to people who are handicapped, provision of high yielding seeds to farmers and teaching of better agricultural techniques. ACEFA is also involved in the training of farmers to carry out agricultural activities adapted to their environment, helping the local population fight against climate change which is also very detrimental to agricultural output and modernization of agricultural practices. These non-governmental organizations play a very vital role in accompanying the local population in the production of crops and livestock to feed the municipality.

Summarily, the results of the study show that rural-urban road transportation faces challenges that adversely affect road users in both the rural and the urban areas in the Maroua municipality. The main challenges facing rural-urban road transportation common in Maroua I, Maroua II and Maroua III municipalities include dilapidated roads assessed by 35.25% of the population. Other identified challenges include overall inadequacy of road transport infrastructure (28.74%) and the seasonal nature of the roads (25.67%).

Also, the non-respect of Highway Code, poor planning and management often lead to rural-urban transport disorder, accidents and sometimes loss of lives which causes disorder in rural-urban transportation in Maroua. The main identified factors of the disorder include poor habits of road users (331.8%), inadequate traffic lights and signs post (22.2%) and the poor location of parks (27.97%) as indicated by the population.

Equally, it was revealed that very little is done to improve on the road network to facilitate transportation of agricultural produce into the Maroua city often blamed on the authorities in charge of road construction and maintenance. According to 59% of the population, the roads are rarely rehabilitated because of the lack of will by the authorities concerned, 21% hold that it is due to inadequate funds for maintenance of roads and limited stakeholders' advocacy while 12% of the population point the lagging nature of decentralization which maintains limited autonomy of councils to manage local projects to meet the population's aspiration.

Results further show that both transportation and non-transportation efforts have been employed to address the dilapidated state of rural roads linking up the

capital city in the Maroua municipality, adversely affecting movement of persons and produce into the city. While the transportation-based mechanisms include rehabilitation of rural-urban roads by the local population, construction of roads and various mechanisms to manage disorder, the non-transportation mechanisms include ensuring food accessibility, ensuring food availability, ensuring food sustainability and the role of NGOs in ensuring food security in the Maroua municipality.

4. Discussion of Results

Roads in Maroua are dilapidated (35.25%), inadequate (28.74%) and seasonal as indicated by the population making movement difficult especially during the rainy season when the roads become muddy. This view is shared by Ajiboye and Afolayam (2009) who held that agricultural goods are bulky and perishable, and they ought to be conveyed to zones of consumption immediately where they will yield more returns. In the same vein, Henning-Smith et al. (2017) identified six themes describing different types of rural transportation challenges in the US including infrastructure (mentioned by 63% of key informants), geography (46%), funding (27%), accessibility (27%), political support and public awareness (19%) and socio-demographics (11%). These challenges affect food availability as agricultural produce cannot easily be transported to Maroua city from the peripheral production basins.

Regarding the study's findings that very little is done to improve on the road network to facilitate transportation of agricultural produce into the Maroua city, Sasidharan (2017) in the same light opined that "road infrastructure and the associated provision of safe, reliable, and affordable transport services in rural areas have the potential to bring about social and economic development, thereby reducing poverty, increasing food security and productivity and lessening the experience of hunger. Nevertheless, nearly one billion rural residents, approximately 68% of the world's rural population, still do not have all season access to road networks". This is often blamed on the authorities in charge of road construction and maintenance as is the case in Maroua.

The rehabilitation of rural-urban roads by local efforts is employed to ensure food security. But, Tacoli (2017) pointed out that local governments have an important role to play in urban food systems. As a measure to ensure food accessibility, 29.1% of the population pointed that food prices should be stabilized while 31.4% of the population requested that food storage facilities be constructed to limit the deterioration of agricultural produce. In order to ensure food availability in Maroua, 28.4% of the population advocated for the improvement in rural-urban transportation infrastructure while 26.1% requested government intervention through diverse mechanisms such as price stabilization, donation of improved seeds to farmers and subsidies. Also, the diversification of urban agriculture (29.1%) through the maximisation of open spaces such as wetlands for sustainable agriculture is vital in ensuring food availability.

Current non-transportation mechanisms to address the dilapidated state of rural-urban roads towards achieving food security in the Maroua municipality contrasts with the contribution of urban home gardening towards household food security and quality of life in the current context of curfew imposed during the Covid-19 pandemic in the Kanda municipality of Sri Lanka observed by Dissanayake and Dilini (2020).

Concerning the identified transportation mechanisms to address the dilapidated state of roads, Sasidharan (2017) affirmed that "improved all-season road infrastructure and the availability of transport services are effective ways to increase food security and curb hunger as it allows farmers to sell their produce to a larger market, more frequently during the year, at competitive prices. It furthermore enables the goods and services which support farming to reach farms more efficiently and at less cost. Good all season access improves the efficiency of food distribution, by providing better connectivity throughout the year and lower transport costs via shorter journey times, lower fuel consumption rates and less vehicle wear and tear".

5. Conclusion

From the analysis of the study, the major challenges to rural-urban road transportation in the Maroua municipality are dilapidated and seasonal roads; yet, authorities lack will (59%) to maintain them. This is a great threat to food security in Maroua. This has triggered the rehabilitation of rural-urban road infrastructure with local effort and the need to train farmers to ensure food security in Maroua city. This is added to stabilisation of food prices and the construction of storage and transformation facilities to ensure food accessibility and diversification of urban agriculture. However, improvement of road transport infrastructure remains most important to food insecurity in the Maroua municipality, just like in other parts of Cameroon and sub-Sahara Africa. The local and state authorities should therefore ensure the rehabilitation of rural-urban roads harnessing the potentials of community participation. The development and amelioration of services at the various parks will also prevent haphazard and clandestine parking in Maroua city.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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