



# ECONOMIC AND ENVIRONMENTAL IMPLICATIONS OF FODDER PRODUCTION IN KANO METROPOLIS

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## *Abstract*

**T**he paper assessed the economic and environmental implications of fodder harvest and sales in Kano metropolis. The methods used include: Inventory and mapping of fodder production areas and selling points; direct field observation; in-depth interview; and Focus Group Discussion (FGD). The result shows that marginal and partially protected institutional and administrative areas in Kano metropolis, yield very huge and excellent amount of fodder, on which about one-third (1/3) of urban small-holder livestock production depends on. The economy of open fodder harvest in the metropolis has a good prospect and high potential. The study concluded that the current practice of open fodder harvest and sales in Kano metropolis is economically feasible and environmentally friendly. It is therefore recommended that, it should be recognized, cherished and developed by both formal and non-formal sectors.

**Key words:** Fodder, Production, Kano, Metropolis

## 1. INTRODUCTION

Apart from increasing aridity in the drier regions of the world, largely accentuated by climate change, urbanization together with arable farming are considerably the limiting factors to livestock farming in urban and peri-urban areas of the developing countries. In urban and peri-urban areas of Northern Ghana, for example, Opong-Anane (2013) reported that 'declining grazing areas for livestock and increased demand for livestock feeds to meet the feed need of growing number of animals is due to rapid urbanization'. Thus, the declining availability of natural pasture especially in urban areas, due to expansion of infrastructure, has put more pressure on urban farmer to explore other sources of feed for



their animals and contributed to high demand for crop residue. Similar trend has been reported in Ethiopian highlands in which about 70% of crop residues are being used as animal feed (Zinash and Seyoum, 1991). The feed limitation for livestock production in the urban areas has led to high demand of feed in the markets and motivated feed sellers to harvest naturally occurring browses, crop residues and gather agro-industrial by-products in an increasing rate for sale (Huseini et al., 2011) especially to small ruminant traders for stall feeding and fattening of market oriented animals.

As a result of increasing demand for collected fodder, especially in urban and peri-urban areas, Konlan et al (2015) reported that, livestock feed markets are emerging in northern Ghana with the most visible commodity being crop residues to satisfy the growing feed demand. In Kano metropolis also, the combined effects of urbanization due to high population growth and crop production, have purged grazing areas and range lands; raised the value animal feed; and limit urban livestock production to few small holder individuals under homecare. Moreover, the few urban households that keep livestock, due to the reasons of culture, economic gain, or hobby, are facing a serious challenge of supplying their livestock with needed or necessary feed. Cultured fodder, such as crop residue and agro-industrial by-products, are relatively very expensive compared to natural browse and forage; which are very cheap and more nutritious. Therefore, such alternative is mainly sourced from limited special locations or places in the metropolis such as marshy areas, around ponds, streams and gutters, and in protected institutional and industrial premises. Open access nature to these fodder sources together with ready market in Kano metropolis, made unemployed male adult population to fetch fodder grasses and sell to the urban based livestock owners. The aim of this paper, therefore, is to assess the economic and environmental implication of fodder production, based on cut and carry, in Kano metropolis with a view of identifying its economic potentials, viability, and ecological well being or otherwise.

## 2. MATERIALS AND METHODS

The study covers some parts of marginal areas and protected institutional and industrial premises in Kano metropolis, where due to their peculiar nature, produce fodder grass in wet and dry seasons. Kano metropolis is the capital city of Kano state, Nigeria. It is located between latitude 11°59' and 12° 02' N and longitudes 8°33' and 8°40'E with a total urban land area of 137Km<sup>2</sup> and 499Km<sup>2</sup> metropolitan area. It is made up of six Local Government Areas (Dala, Fage, Gwale, Municipal, Nasarawa, and Tarauni) and some parts of Kumbotso, Ungogo, and Tofa Local Government Areas. Kano metropolis has an estimated population of over 4 million people with a male – female ratio of about 1 to 1.32 (Ibrahim, 2014a). Over 70% of the adult workforce draw their livelihoods off agriculture. Kano is the biggest commercial and industrial centre in Northern Nigeria. It has 43 existing marketplaces and over 400 privately owned manufacturing industries (Ibrahim, 2014b). Kano metropolis is about 481 meters (or about 1580 feet) above sea level. The climate is a hot, semi-arid type with an annual average rainfall of about 690mm (27.2 in); majority of which falls from June



through September. The vegetation is a savanna type, while Kano and Challawa rivers are the major water bodies that drain the metropolitan area (Ibrahim, 2014b).

The methods used includes: Inventory and mapping of fodder production areas and selling points; direct field observation; in-depth interview; and Focus Group Discussion (FGD). The inventory covers fodder production and selling areas in Kano metropolis; the total number of people involved in fodder business; and different kinds of grasses used as fodder. Based on the inventory, seasonal calendar pattern and preference ranking; fodder production areas and selling points map were produced. The in-depth interview involved two full term fodder producers and sellers with over ten years experience. Some of the issues raised include: entry skill and capital, profit margin and risk, and other management strategies. The Focus Group Discussions were held in two sessions; each with different set of respondents in Kofar-Naisa and Kofar-Nasarawa. In the Kofar-Naisa group, ten (10) people were involved with an age range of 25 to 30 years; while the Kofar-Nasarawa group consisted of eight (8) people with an age range of 35 to 40 years. Some of the issues raised include: nature and types of people involved in fodder business; types of grasses used as fodder; fodder production sources; fodder flow and harvest calendar pattern; changes over time in fodder supply, price, and demand; risk and uncertainty; and general management strategies.

### 3. RESULT AND DISCUSSION

#### 3.1 Fodder Production Areas

Marginal land areas within and around Kano metropolis, such as streams, unprotected gutters, marshy land, ponds and protected institutional, industrial and uncompleted residential areas, serve as the major sources of fodder for livestock rearing in the urban Kano. Some of the marginal areas that are habitually wet throughout the year produce fodder throughout the year while the protected institutional, industrial and uncompleted residential areas mainly produces fodder during wet season. An inventory of fodder producing areas shows there are a total number of fifteen (15) major fodder sources in Kano metropolis; about 40% of which produces fodder throughout the year (marginal lands), while the remaining 60% are mainly in the wet season, but with ample yield of dry matter (hay) from November up to April. Table 1 shows the list of fodder sources in Kano metropolis together with their respective ranking based on yield, easy access and fodder quality; Plate a illustrates heap of fodder at one of the protected institutional sources while Figure 1 shows their spatial distribution. Here it should be noted that, the marginal lands in Kano metropolis, despite their fragile nature to degradation or susceptibility to unproductive forces, they yield ample amount of fodder that support livestock production in urban Kano. Respondents attributed this, to moisture and nutrient supply by municipal waste water; availability of residual seeds and protection by urban setting.

As it can be observed in Figure 1, where the distribution pattern shows fodder production sources are mainly concentrated at the outskirts of the urban Kano where population density



is relatively low, while the selling points are concentrated at the inner city where population density is high and moreover where urban livestock are concentrated. It also entails the length of distance the people involved in fodder business cover in order to source open fodder.

**Table 1: Major Open Fodder Sources in Kano Metropolis**

Location	Preference Ranking			Seasonality
	Yield	Access	Quality	
Abdu Bako Secretariat	5 <sup>th</sup>	Easy	Excellent	Wet season
Airport	1 <sup>st</sup>	Difficult	Excellent	Wet season
BUK New site	2 <sup>nd</sup>	Fair	Excellent	Wet season
BUK Old Site	4 <sup>th</sup>	Fair	Excellent	Wet season
FCE Kano	7 <sup>th</sup>	Fair	Excellent	Wet season
Goron Dutse	15 <sup>th</sup>	Easy	Good	Wet season
Gyadigyadi	10 <sup>th</sup>	Easy	Very Good	Annual
Kabuga	12 <sup>th</sup>	Easy	Very Good	Annual
Kofar Ruwa	16 <sup>th</sup>	Easy	Good	Annual
Northwest Uni.	3 <sup>rd</sup>	Fair	Excellent	Wet season
Railway Stat.	8 <sup>th</sup>	Fair	Very Good	Wet season
Sharada	13 <sup>th</sup>	Easy	Good	Annual
Trade Fair Ground	6 <sup>th</sup>	Fair	Excellent	Wet season
Tudun Wada	11 <sup>th</sup>	Easy	Good	Annual
Tukuntawa	14 <sup>th</sup>	Easy	Good	Annual
Zoo Garden	9 <sup>th</sup>	Fair	Excellent	Annual

Source: Field Work, 2016

(a)

(b)



Plate (a) and (b): Harvested Fodder in Bayero University, Kano New Site Premises

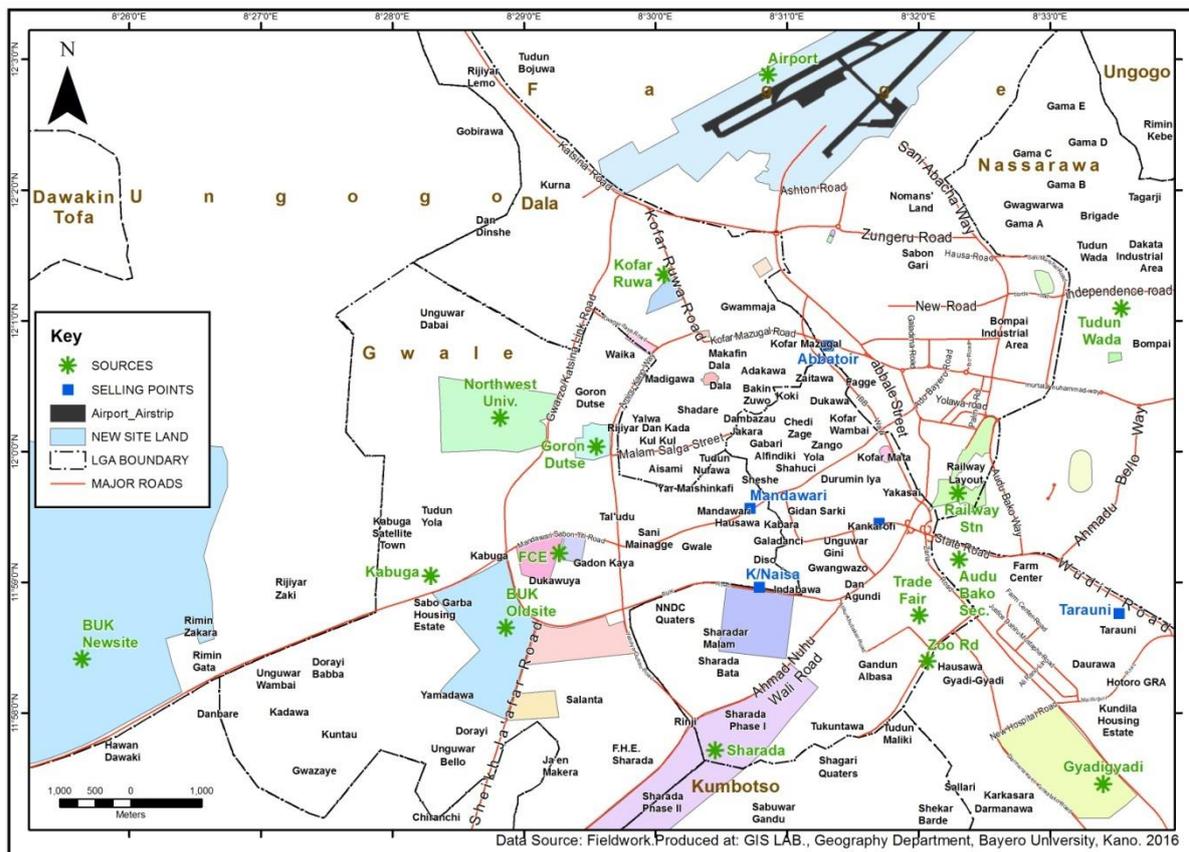


Figure 1: Spatial Distribution of Fodder Sources and Selling Points in Kano Metropolis

### 3.2 Types of Fodder Grasses



Based on the results of the focus group discussion and field inventory, there are fifteen different types of grasses used as fodder, based on cut and carry basis, in Kano metropolis. Among these, respondents described *Kiriri*, *Kansuwa* and *Harkiya* as the most preferred in terms of nutritional value to animals, market price and availability. While *Aya'aya* and *Gemun Kwado* were ranked least in terms of price, but can be obtained in fresh-form throughout the year, as they grow well in marshy areas and saturated gutters and streams. Respondents maintained that despite the challenges of climate change (high temperature), streams water and urban gutter contamination with urban waste and limited space, yet these fifteen inventoried grasses are flourishing and have not shown signs of depletion. The detail is presented in Table 2.

**Table 2: Types of Grasses Used as Open Fodder in Kano Metropolis**

Type	Preference Ranking			Seasonality
	Price	Access	Nutrition	
<i>Aya'aya</i>	15 <sup>th</sup>	10 <sup>th</sup>	10 <sup>th</sup>	Annual
<i>Balaksana</i>	5 <sup>th</sup>	4 <sup>th</sup>	7 <sup>th</sup>	Annual
<i>Daburi</i>	4 <sup>th</sup>	6 <sup>th</sup>	3 <sup>rd</sup>	Annual
<i>Gemun Kwado</i>	14 <sup>th</sup>	5 <sup>th</sup>	10 <sup>th</sup>	Annual
<i>Geron Tsunstu</i>	8 <sup>th</sup>	9 <sup>th</sup>	6 <sup>th</sup>	Annual
<i>Gudegude</i>	6 <sup>th</sup>	2 <sup>nd</sup>	4 <sup>th</sup>	Seasonal
<i>Harkiya</i>	2 <sup>nd</sup>	7 <sup>th</sup>	5 <sup>th</sup>	Seasonal
<i>Kansuwa</i>	3 <sup>rd</sup>	5 <sup>th</sup>	2 <sup>nd</sup>	Seasonal
<i>Kirikiri</i>	1 <sup>st</sup>	1 <sup>st</sup>	1 <sup>st</sup>	Annual
<i>Komaiya</i>	9 <sup>th</sup>	6 <sup>th</sup>	4 <sup>th</sup>	Seasonal
<i>Roba</i>	11 <sup>th</sup>	8 <sup>th</sup>	9 <sup>th</sup>	Annual
<i>Soso</i>	12 <sup>th</sup>	10 <sup>th</sup>	6 <sup>th</sup>	Annual
<i>Tofa</i>	10 <sup>th</sup>	8 <sup>th</sup>	9 <sup>th</sup>	Annual
<i>Yaryadi</i>	7 <sup>th</sup>	7 <sup>th</sup>	5 <sup>th</sup>	Annual

Source: Field Work, 2016

### 3.3 Fodder Selling Points

As a convention, products or commodities after being produced, processed, or manufactured require specific marketing destination, where potential consumers can obtain. Equally, fodder products in Kano metropolis have their specific selling points or markets. The result of field inventory shows, there are seven (7) major fodder selling points (market) in Kano metropolis, whose locations are based on proximity to potential customers. Five, out of these fodder selling points namely: Kofar-Nasarawa, Kofar-Mazugal, Goron-Dutse,

Abattoir and Mandawari are located within the Old Kano City while Kofar-Na'isa and Tarauni at the outskirts (Figure 1). Other attributes of these fodder selling points are presented in Table 3. Respondents maintained that the characteristics of the customers in these selling points vary according to the kinds of livestock they keep. In Kofar-Nasarawa and Mandawari selling points their major customers are those who keep horses while in Kofar-Naisa, Abattoir, and Tarauni, the major customers are those who keep cattle, sheep and goats. Column 5 of Table 3 gives the detailed findings, while plate 2 shows fodder stuff on display at selling points.

**Table 3: Fodder Selling Points in Kano Metropolis**

Location	Nature of Operation	Kinds of Fodder	Volume	Top 3 Customers
Abattoir	Daily	All Kinds	Highly Stocked	Cattle <sup>1</sup> Sheep <sup>2</sup> Camel <sup>3</sup>
Goron-Dutse	Wet Season	Single	Low Stock	Horses <sup>1</sup> Sheep <sup>2</sup> Cattle <sup>3</sup>
Kofar-Mazugal	Wet Season	Single	Low Stock	Sheep <sup>1</sup> Goats <sup>2</sup> Cattle <sup>3</sup>
Kofar-Na'isa	Daily	Single	Moderately Stocked	Cattle <sup>1</sup> Horses <sup>2</sup> Sheep <sup>3</sup>
Kofar-Nasarawa	Daily	All Kinds	Moderately Stocked	Horses <sup>1</sup> Cattle <sup>2</sup> Sheep <sup>3</sup>
Mandawari	Daily	All Kinds	Moderately Stocked	Horses <sup>1</sup> Sheep <sup>2</sup> Cattle <sup>3</sup>
Tarauni	Daily	All Kinds	Highly Stocked	Sheep <sup>1</sup> Cattle <sup>2</sup> Goats <sup>3</sup>

Source: Field Work, 2016



**Plate (c) and (d): Fodder Selling Points**



### 3.4 People Involved in Fodder Business

An inventory of people involved in selling fodder based on cut and carry basis from all the previously mentioned fodder selling points revealed a total of 261 adult male, as at the time of the survey, are engaged in fodder business. Out of this figure, about 47% take fodder business as their main livelihood option while the balance of about 53% consider it as an option only during the wet season while in the dry season, they pursue other options. An in-depth interview with one Malam Salisu Yahaya; a full term fodder business man with 25years experience, revealed that, 'most of the people that engage in fodder business during the wet season did so in anticipation of generating starting capital for other business. Another reason is that, fresh fodder based on cut and carry basis in dry season is limited to peculiar locations, as such not everybody can endure the competition involved and cost of transportation, thus they opt out until wet season'. The distribution of people involved in fodder business according to the seven (7) inventoried selling points is presented in Table 4. Among other things, column 4 of Table 4 portrays the amount of pressure marginal lands in Kano metropolis sustain annually; population of about 124 people are drawing their livelihoods.

**Table 4: Number of People Involved in Fodder Business**

Location	Wet Season	Dry Season	Difference
Abattoir	62	24	38
Goron-Dutse	11	0	11
Kofar-Mazugal	13	0	13
Kofar-Na'isa	60	30	30
Kofar-Nasarawa	30	21	9
Mandawari	28	17	11
Tarauni	57	32	25
Total	261	124	137
Average	100%	47.5%	52.5%

Source: Field Work, 2016

### 3.5 Fodder Economy

Naturally growing plants on open spaces within and around Kano metropolis and elsewhere in Northern Nigeria, generally, are considered as common property resources. Therefore, access to fodder grasses for either personal use or economic gain is free to all interested parties that is both community members and strangers. In this context, unemployed people, mainly youth, from different parts of Kano metropolis fetch freely growing grasses, mainly from the above inventoried sources, and sell as fodder for urban based livestock. The result of focus group discussion revealed that on average a person can



generate about ₦1,700.00 daily from the sales of fodder in wet season and about ₦1,000.00 daily in the dry season. On monthly basis, this amounts to about ₦51,000.00 in the wet season and about ₦30,000.00 in the dry season; which is equivalent to the salary of a grade 06 and grade 04 workers respectively at the state government level.

Respondents maintained that, the requirements for fodder business are principally hard work and determination; capital entry is almost zero, except for transporting the fodder stuff from collection ground to selling points. Consensus views from all the two FGD sessions revealed that economic risk and uncertainty are very low, as they hardly encounter any loss. Cases of market glut in all the inventoried seven fodder selling points is almost zero, as respondents maintained that in the last five years (2010-2016), they did not encounter market glut; their customers are forthcoming and in some cases they place order ahead of delivery. According to one Malam Salisu, 'open fodder business has a hidden secret that most people do not know' (*Sana'ar ta na da sirru wanda ba kowa ya sani ba*); 'it is a business that you don't need to get anything, except your courage and determination, but you can get anything out of it' (*Sana'a ce wanda baka bukatar komi, amma zaka iya samun komi a cikin ta*).

### 3.6 Environmental Implications

Apart from economic gains, derived from fodder business in Kano metropolis, the system of cut and carry basis has as well promoted 'zero-grazing' which on environmental terms is ecologically friendly. According to Rotz et al. (2005), zero-grazing systems reduce nitrate losses from grasslands, because urine and dung patches are associated with high nitrogen concentrations and are "hot spots" for nitrate leaching. Moreover, it promotes better grass utilization; avoids trampling effects of grazing animals; and increase grass yield due to improved utilization and reduced sward damage (Muel, et al. 2012).

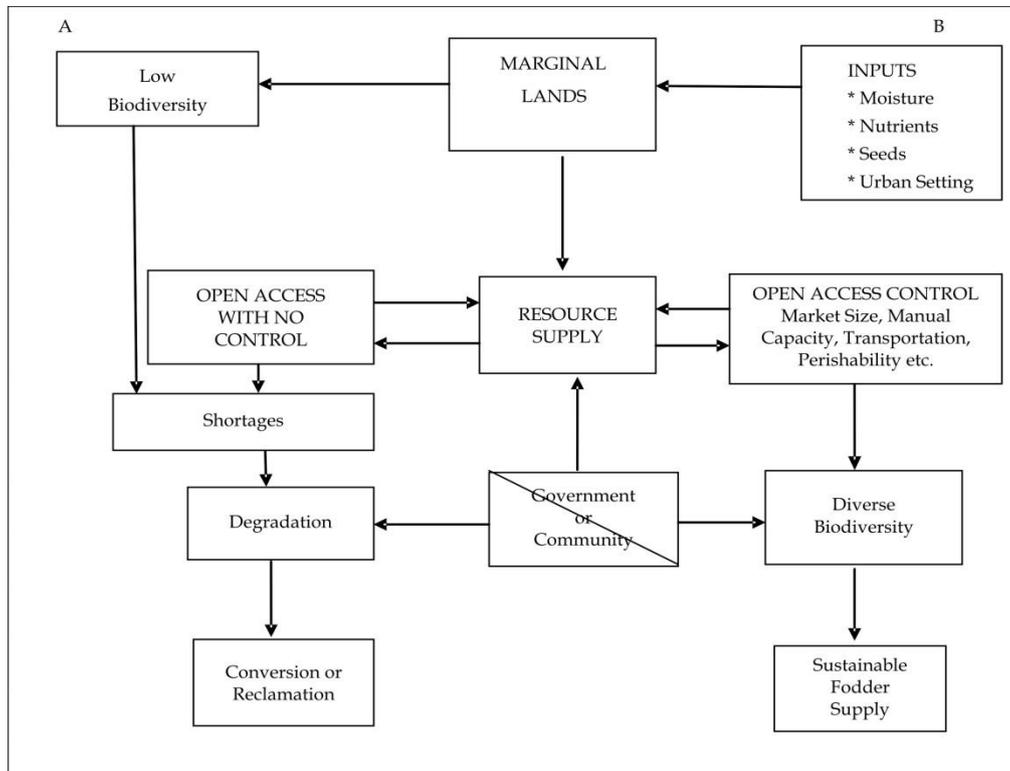
In terms of open access, however, the environmental implications of Kano metropolis open fodder production, can be best identified and explain based on the theories of common property resource, especially the tragedy of commons (Hardin 1968) and anthropological model of community or institutional control (Steward, 1955). In both the former and the latter, all the scenarios are bound to happen, given the circumstances surrounding the system of open fodder production in Kano metropolis, but with the latter being the current disposition. These have been presented in a simplified model based on the observed field data and open fodder production trend (Figure 2).

The model depicts two basic scenarios; part A and part B. The A part portrays the likelihood of resources under stress conditions coupled with unregulated use as contained in the tragedy of commons theory, while the B part succinctly describes, in line with the 'cultural-core' model, the existing situation and the possible future of open fodder production in Kano metropolis. It shows that (B-part) despite the fragile nature of marginal lands, yet in Kano metropolis, they are capable enough in producing a diverse grass species that support a sustainable supply of open fodder to Kano urban livestock production for over ten years.



This according to the observed models' pattern is associated with three main factors: supply of inputs, open access control and government response. The supply of inputs, especially to marginal lands in Kano metropolis, such as moisture and nutrients from urban waste water, availability of residual seeds; and the nature of urban setting which does not allow wide spread of open grazing of livestock, promote the growth of ample grass species (15 dominant species) which a population at least 124 people draw their livelihood from selling derived fodder stuff.

The open access controls such as market size, perishability of fodder stuff, manual capacity and transport cost, provide a check against resource depletion or degradation due to overexploitation, as postulated by the theory of tragedy of commons and its supporters such as Ruitenbeek (1992). Result of FGD shows that the identified 'cultural-core' reduces incentives to deplete ample supply of fodder, particularly in the inventoried marginal lands. Indeed, this observed control system practically supports the views of Steward (1955) that 'people who depend upon natural resources for their survival have always developed certain cultural systems and socio-political institutions to regulate their relations with nature'. Therefore, these identified existing cultural-core, can serve as a dynamic adaptive mechanism to the environment unless threatened by external forces.



Source: Developed by the Authors (Field work), 2016

**Figure 2: Model of Sustainable Open Fodder Supply in Kano Metropolis**



However, government's or community response to this observed system of fodder supply in Kano metropolis and elsewhere with similar pattern, is the most probable external force that can either promote or threaten sustainable fodder supply. Government's favourable response such as converting or declaring marginal lands as green land or areas in the metropolis will promote and sustain fodder supply (last stage of B-part) while contrary to that, such as reclaiming or converting marginal spaces into other urban uses, can negatively reverse the observed trend to the unsustainable side as contained in last stage of A-part.

Based on these basic scenarios; zero-grazing and sustainability model, it can be affirmed that, open fodder production, based on cut and carry, in Kano metropolis is environmental friendly. However, more detailed study is required on the health implication of the hitherto fodder production, especially from marginal lands, on Kano urban livestock production; implications of polluted urban waste water on grass cover in Kano metropolis and other forms of traditional fodder sources.

### **3.7 Challenges**

Long distance trip to and from fodder sources, non-formal market space and government policy are the major challenges facing fodder production based on cut and carry in Kano metropolis. Consensus views from all the two FGD sessions revealed that the respondents always spend a minimum of one hour to get to the identified fodder sources and the same or more is spent on transporting the procured fodder stuff to selling points. This according to respondents consumes a lot of their time and energy, in case of walking and cart pushing; and transport money, in case of hired vehicles, which could have been used for more productive activity.

All the inventoried seven major fodder selling points are not formally designated for that purpose rather, a non-formal arrangement by fodder sellers to reach their customers easily by operating mainly along open spaces adjoining main access roads. This deficiency made the fodder sellers to face several kinds of inconveniences such as quit notice from government officials and distortion of selling activities during big occasions or ceremonies. This problem according to respondents at times gives them an insecure feeling regarding the future of their livelihood. Their current response to this problem is constant prayers, lobbying and sometimes bribe.

Unfavourable government policy towards marshy areas and other marginal lands that produce fodder in Kano metropolis such as conversion or reclamation is another envisaged challenge that fodder producers (based on cut and carry) may face in the near future. Currently a strip of green-land from Kofar-Famfo to Kofar-Gadonkaya (about 1.5Km long and 15 to 30 metres width), which habitually produces good fodder throughout the year, has been converted to commercial land-use. This kind of action, according to respondents if extended to the rest of green areas in the metropolis will no doubt put their livelihoods at a stand-still.



### 3.8 Sustainability

The sustainability of fodder production in Kano metropolis based on cut and carry cannot be fully attained without overcoming these challenges that have been pointed out, for they constitute a serious threat to fodder supply, sales of fodder stuff and indeed the entire livelihood based on it. However, apart from that, the system can be regarded as moderately sustainable based on the observed trend and factual field data that are in agreement with four basic sustainability indexes. Economically, the open fodder business is economically feasible; it is standing as a source of livelihood to a population of over 300 people, it is highly profitable, has zero-capital entry, very low risk and uncertainty and ready market. On social grounds, the system is socially just; as the fodder suppliers are the employers of themselves; the price of fodder stuff is determined by market forces; middle-men are involved and based on the field evidence, there is no element of social operation or subjugation attached to its operational processes and activities. Equally, the system is culturally acceptable as it poses no harm to any group or individual, belief, or any societal value. It is indeed among the top-most *Halal* (permissible) profession going by the Islamic belief; which is the dominant religion of the people involved. Environmentally, also, it can be judged as nature friendly; for it is promoting zero-grazing as against over-grazing; it has portrayed practical evidence of 'cultural-core' model which is contrary to the views contained in the theory of tragedy of commons; and it has sustained the growth of diverse grass species under urban set up and fresh fodder supply to urban based livestock.

### 4. CONCLUSION

Based on the discussions, it can be concluded that the current practice of open fodder harvest and sale in Kano metropolis is economically feasible and to a great extent environmental friendly. It is therefore recommended that, the identified challenges should be overcome and the fodder supply system should be recognized, cherished and developed by both formal and non-formal sectors. There is the need for further research on the quality of the fodder stuff and its health implications on the livestock being fed with.



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