



Impact of urban development on the availability of fodder in the harvesting areas of the District of Abidjan, Côte d'Ivoire

Kouassi Akossoua Faustine¹, Mangara Ali², Tra Bi Loh Armel³

¹ University Félix Houphouët-Boigny (Côte d'Ivoire), Abidjan, Côte d'Ivoire

^{2,3} University Nangui Abrogoua (Côte d'Ivoire), Abidjan, Côte d'Ivoire

Abstract

A study dealing with the impact of urban development on the availability of fodder in the harvestings areas of the district of Abidjan was carried out. The objective of this study was to assess the effect of urbanization on the supply areas of fodder plants in the District of Abidjan. Some statistics and surveys of fodder operators were carried out both on the harvest sites, the fodder sale outlets and on the livestock sale markets where the fodder harvested were sold. The surveys and observations carried out made it possible to identify the fodder sampling sites present in the study area such as Yopougon (Gesco, BAE, Bonikro, Km 17 and the high school crossroads), Abobo (Adjin, Quartier cimetière, Abobo-Baoulé, Paris village), the Adjamé - Abobo (Paillet, Williamsville cemetery) and Port-Bouet 1 axis. A total of 45 loads containing bundles of fodder have been identified and in which 23 species divided into 8 families have been identified. The poaceae family is the most dominant with 35% of species encountered. Each bale of fodder is usually made up of a mixture of several plant species. The results of the survey indicate to us that, the sampling areas are increasingly very distant due to urbanization, which leads the forage farmers to travel long distances to obtain their supplies. According to the latter, despite the long distances to travel for the harvest, this has no influence on the floristic list of species and on the quantity and cost of their product. However, the actors are aware of the degradation and disappearance of the forage harvesting areas in favor of urbanization.

Keywords: Abidjan, Urban livestock farming, Forage, harvesting area

1. Introduction

Livestock farming, which is also an activity developed in the city is undoubtedly an income generating activity. However, animal feeding remains a major constraint in this activity, in particular the feeding problem which is commonly mentioned by breeders (Sanon *et al.*, 2014) [14]. This problem arises crucially in the urban environment, where there is a lack of space for grazing due to urbanization (Ali *et al.*, 2003, Sanou *et al.*, 2011, Kouassi *et al.*, 2014) [1, 15, 10]. Hence the development of an activity sector consisting of sellers of fodder of various types, across the major axes of urban centers, in order to make up for this fodder deficit, but also to generate income for the workers. Indeed, urbanization impacts the availability of fodder plants (Kouassi *et al.*, 2014) [14]. The accessibility to these fodder plants, then becomes a major challenge in meeting the needs for the supply of livestock feed (Hailu, 2015) [4]. As a developing country, Côte d'Ivoire is no exception to this trend. It is deficient in animal production, particularly in terms of cattle and sheep production (Minagra, 1999) [12]. However, we note that several cities in the country are home to these types of occasional and traditional breeding for commercial purposes. Abidjan, the largest city in the country, also has livestock activities including cattle raising. However, livestock breeders are faced with many problems, namely animal feed. Animal feed is mainly made up of available natural fodder resources (Kouassi *et al.*, 2010, Kouassi, 2013) [8, 9]. Forage farmers harvest the plants in several areas of the city to market them as fodder to livestock sellers. However, given the urbanization of the city of Abidjan (INS, 2015) [6], fodder traders are obliged to travel long distance to obtain fodder. The development

dynamics of the city and the strong urbanization cause land pressure on the places of supply of animal feed (Armar – Klemesu, 2000; Mougeot, 1994) [3, 13]. This farming activity is threatened. Since it constitutes an important source of income for the cattle breeders and the sellers of fodder, if solutions are not found to this food problem, the people engaged in this activity will be faced with income shortage. The sustainable management of these fodder resources is one of the guarantees for the sustainability of livestock farming and environmental protection in the city of Abidjan. It is in this perspective that this study entitled * Impact of Urban Development on the Availability of Fodder in the Harvesting Areas of the District of Abidjan * was conducted. The objective of this study is to assess the effect of urbanization on the supply areas of fodder plants in the District of Abidjan.

2. Material and method

2.1 Conduct of surveys

The surveys that have been carried out in the District of Abidjan have consisted in identifying the forage harvesting areas and the communes that still harbor some brush relics containing fodder plants. Then a census of the forage harvesters and sellers in the same area was taken. Using a GPS (Global Positioning System), the geographic coordinates of these different sites have been positioned to produce a summary map which highlights the new harvest areas.

Subsequently, surveys of fodder operators were carried out both at the harvest sites, the fodder sale outlets and at the livestock sales markets. The surveys were done according to the availability of the actors. A total of 33 forage operators

were interviewed. The survey consisted in questioning farmers on the socio-demographic characteristics of the workers, the impact of urbanization on harvesting areas, the available fodder resources, the constraints that harvesters must face to obtain fodder and the perception of farmers regarding the availability of fodder in the face of urbanization. Among the operators interviewed, only those who had some experience in the field and a long number of years in the exercise of this activity were surveyed.

2.2 Inventory of Floristic species

An inventory of the plant organs was made using an inventory sheet on several loads of fodder ready to be transported to the point of sale. It consisted in listing all the forage species of the loading unit in order to notify the impact of urbanization on the floristic composition of the available forage species.

2.3 Statistical analysis

The data were coded, entered in Excel and analyzed with the r. program. Descriptive statistic (averages and percentage) were applied to the data collected. The processing of socio-economic survey data from the surveys was manual. For the variables concerning the respondents' perception of the availability of fodder in the face of urbanization, we calculated the trend-impact of responses using the formula proposed by Leray (2008)^[11] which is as follows:

$$TI = \frac{UI(+)-UI(-)}{UI(+)+UI(-)} \times 100$$

This is the total of positive (+) information units minus the total of negative (-) information units divided by the sum of positive and negative units, multiplied by one hundred. This gives an index which is either favorable or unfavorable on a scale going from -100 to +100.

3. Results

3.1. Identification of sampling sites

The surveys and observations carried out made it possible to identify the fodder sampling sites present in the study area. The geographic positions of these sampling sites are plotted on the map of the city of Abidjan (figure 1). The municipalities currently housing the places of collection or places of harvest in the city of Abidjan are: Yopougon (Gesco, BAE, bonikro, km 17 and the high school crossroads), Abobo (Adjin, Quartier cimetière, Abobo – Baoule, Paris Village), the Adjamé-Abobo Axis (Paillet, Williamsville's Cemetery) and Port-Bouët 1. These different fodder sampling sites located on the periphery or on the border of the different municipalities are roadsides, unfinished constructions, abandoned sites or old abandoned sites.



Fig 1: Representation of the different fodder sampling sites in the city of Abidjan

3.2. Floristic composition of harvested fodder

A total of 45 consignments containing bundles of fodder have been identified and of which 23 species distributed among 8 botanical families have been identified (Table I). The Poaceae family is the most dominant with 35% of species encountered of all the inventories of forage loads,

followed by cyperaceae 22% and then fabaceae 17%. The specie *Panicum maximum* Jacq. has been identified 18 times on the total number of loading encounters i.e. 45% of presence, followed by *Chloris pilosa* Schumach. Each bale of fodder (figure 2) was made up of several plant species.

Table 1: Species, families and frequency of presence in the different sampling areas

N°	Species	Families	Observation frequency
1	<i>Ageratum conyzoides</i> L.	Asteraceae	3
2	<i>Andropogon canaliculatus</i> Schumach.	Poaceae	2
3	<i>Brachiaria lata</i> (Schumach.) Hub	Poaceae	4
4	<i>Brachiaria miliiformis</i> (Trin.) Hitchc.	Poaceae	2
5	<i>Baphia nitida</i> Lodd	Fabaceae	2
6	<i>Baphia bancoensis</i> Aubrev.	Fabaceae	1
7	<i>Borreria verticillata</i> (L.) G.Mey	Rubiaceae	1
8	<i>Centrosema pubescens</i> Benth.	Fabaceae	4
9	<i>Chloris pilosa</i> Schumach	Poaceae	12
10	<i>Commelina benghalensis</i> L.	Commelinaceae	7
11	<i>Commelina erecta</i> L.	Commelinaceae	3
12	<i>Cyperus esculentus</i> L.	Cyperaceae	3
13	<i>Cyperus rotundus</i> L.	Cyperaceae	2
14	<i>Desmodium adscendens</i> (Sw.) DC.	Fabaceae	2
15	<i>Digitaria gayana</i> (Kunth)	Poaceae	6
16	<i>Digitaria horizontalis</i> Willd.	Poaceae	6
17	<i>Ficus exasperata</i> Vahl	Moraceae	2
18	<i>Ipomoea triloba</i> L.	Convolvulaceae	4
19	<i>Mariscus cylindristachyus</i> Steud.	Cyperaceae	3
20	<i>Mariscus longibracteatus</i> Cherm	Cyperaceae	2
21	<i>Mucuna pruriens</i> (Bak).	Fabaceae	7
22	<i>Panicum maximum</i> Jacq.	Poaceae	18
23	<i>Paspalum vaginatum</i> SW.	Poaceae	3

**Fig 2:** Bale of fodder displayed on a sales site.

3.3. Impact of urbanization on forage harvesting sites

The results of the survey tell us that the sampling areas have become very distant because of urbanization. Forage operators are obliged to travel several kilometers to obtain fodder. Because of this, the fodder operators leave for the cutting areas around four (4 a.m.) in the morning to return to the city around midday (12:00 a.m.), the second part of the day is devoted to the sale of fodder bundles from the load.

3.4. Use of other products in cattle feed in the face of urbanization

For difficult access to fodder linked to the remoteness of the harvest sites, the farmers joined the cattle markets quite late. This leads livestock keepers to turn to other feeds to make up for this deficit.

These include:

- cereal seeds (corn grains, millet grains, sorghum grains)
- roots and tubers (small-scale use of cassava, yam peel, potato and banana)

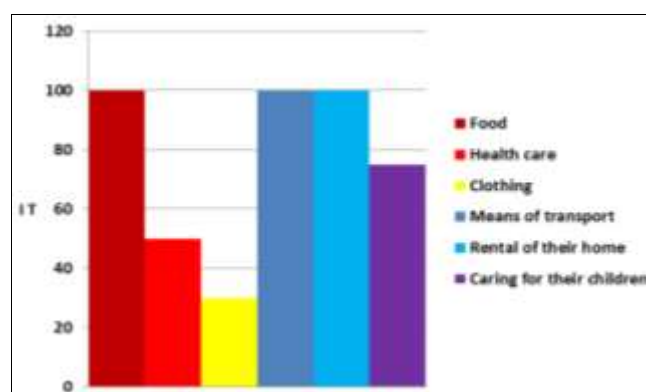
- brewery by-products (spent grain is the main brewery by product, most used in our farms)
- by – product of sweets (these are by-products of manufacture of sweets which are most used in the feeding of ruminants. They are molasses and bagasses)
- mineral supplements (cooking salt, rock salt, locally produced lick stone, industrial lick stone, multi nutritional block)

3.5. Impact of urbanization on the floristic composition of fodder

According to the operators, the floristic composition of fodder species has not been affected by urbanization. The harvested species are the same species they have encountered for years. Some species such as *Panicum maximum*, *Chloris pilosa*, *Mariscus cylindristachyus* remain the most abundant on the sales sites and on the cattle markets

3.6. Impact of urbanization on the economic aspect of fodder

The results show that the fodder operators are mostly men because women have no interest in this activity. They travel long distances to harvest the maximum amount of fodder, which is then sold on the cattle markets. The delivered fodder is generally fresh and made in the form of a bunch. The unit price (UP) of a bunch of fodder is on average 100 FCFA and 200F CFA in case of high crowds during the holidays periods. According to them, although they travel long distances for the harvest, this has no influence on the sale of their product. All respondents say that they have food at least 2 to 3 times / day. The activity covers health care (50% of respondents), clothing (30% of favorable respondents), as well as the costs of repairing bicycles, tricycles and vehicles, the means of transport ultimate (100% of favorable respondents). As none of the respondents owns a house, the activity allows them to pay for the rental of their home (100% of respondents supportive). All respondents say they have food at least 2 to 3 times/day and cover the school fees of their children through the sale of fodder (figure 3).

**Fig 3:** Socioeconomic characteristics of actors in the district of Abidjan. IT = Impact Trend

3.7. Perception of actors facing the threat of urbanization

According to our surveys, the stakeholders are aware of the degradation and disappearance of the forage harvesting

areas. However, 20% of farmers display a state of manifest disinterest in the problematic situation of fodder resources. The majority of respondents who have more than 20 years of experience believe it is time to take action to protect not only forage species, but also biodiversity in general. Concerning the worker's perception of the means of procuring fodder plants other than that of spontaneous vegetation, they are thinking of adopting regulations for the exploitation of fodder and the protection of fodder species by strengthening the management capacities of harvest areas. On average 15% of stakeholders think that it would be wise to obtain plots for forage crops in order to avoid several constraints on their activities. The availability of sampling sites is the main constraint for collectors due to the rapid urbanization of the city. Also, the imposition of fines on some collection sites, namely Adjin, Williamsville cemetery, Abobo-Baoulé and Abobo Paillet, is a hindrance to the fodder harvesting activity.

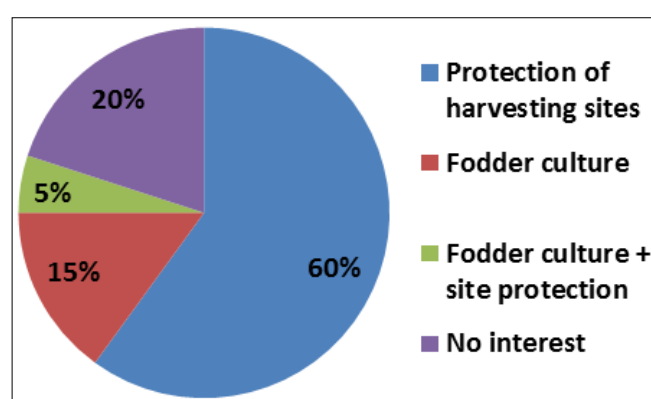


Fig 4: Rate of the perception of stakeholders on the proposals to improve the exploitation of fodder in the face of urbanization

4. Discussion

This work focuses on the impact of urban development on the availability of fodder plants in the District of Abidjan. Several communes (Yopougon, Abobo, Port-Bouet, et Adjamé) shelter the places of sampling of fodder in the city of Abidjan (Kouassi *et al.*, 2010, Kouassi, 2013)^[9, 8]. These different sampling sites of which the fallows (the lowlands, the approaches of the roads, as places of supply), constitute floristic banks of food of the sheep present on the markets of the city of Abidjan, given the absence of other sources of fodder supply (Kouassi *et al.*, 2010)^[9]. The forage harvesting areas observed in the field with the vendors of fodder plants show that several former areas of fodder harvesting listed by Kouassi *et al.*, 2010^[9] have disappeared, giving way to building construction and other human activities. In fact, the mapping of forage harvesting sites highlights new harvest areas compared to that observed by these authors. The areas formerly identified by Kouassi (2013)^[8], have experienced a disappearance or a drastic drop in their areas in favor of construction. This is explained by the fact that real estate companies build economic housing, in addition to spontaneous habitats in precarious neighborhoods (Kouakou *et al.*, 2010)^[7]. Also, the presence of some of these neighborhoods would be active in the socio-political crisis of 2011 which caused a massive displacement of populations, with illegal and anarchic constructions. According to Kouakou *et al.* (2010)^[7], the development of the commune of Yopougon and the demographic growth of almost 4%, would have caused

significant pressure on urban and peri-urban agricultural land. The influence of urbanization on animal feed supply areas has also been observed in Burkina (Hamadou *et al.*, 2002)^[5] and Congo Brazzaville (Andre *et al.*, 2006). Regarding the floristic diversity of fodder plants encountered in the sampling areas, the Poaceae family is the most dominant with 54, 63% of the species encountered, followed by that of Cyperaceae and Fabaceae. Species such as *Panicum maximum* and *chloris pilosa* are the most encountered in the sampling areas. These results corroborate those of (Kouassi, 2013)^[8] who showed that according to sheep sellers, these species are the most encountered in the feeders present on the cattle markets, and would be the most taken by the animals. Also, this could be explained by the fact that the two studies were carried out in the city of Abidjan.

Finally, regarding the stakeholders' perception of the impact of urban development on the availability of fodder, they believe that this rampant urbanization has a negative impact on the areas of fodder collection. Thus, to reduce the food constraint which is particularly important for animal husbandry, the state as the first responsible must opt for the introduction of fodder crops in production systems. And this in collaboration with researchers through the achievements in agronomic, zoo technical and economic terms, research and development work of certain research institutes, development projects and non-governmental organizations (Sikora, 1982)^[16]. All this work will help to identify the blocking factors and promote a massive support from stakeholders for the proposal to produce fodder. The knowledge of these factors should facilitate the insertion of fodder crops on farms in order to reduce the nutritional stress of animals and ultimately improve production and farmers income. According to the stakeholders a good awareness-raising policy on how to improve fodder production, the regulation of the exploitation of fodder and the protection of green spaces serving as a sampling area in the city of Abidjan would be important.

5. Conclusion

The preliminary results of these exploratory surveys indicate the negative impact of urbanization on the availability of forage space in the District of Abidjan. In fact, plants are threatened with disappearance, and this situation compromises animal feed on the livestock sales markets. To prevent the degradation of these natural resources, research will have to be undertaken for their safeguard and their proper management in the agricultural and animal production systems in the city.

6. Références

1. Ali L, Van den Bossche P, Thys E. Issues and constraints of urban and peri-urban breeding of small ruminants in Maradi in Niger: what future? Review Elev. Med. Vet. Country Trop. 2003; 56(1-2):73-82. DOI: <https://doi.org/10.19182/remvt.9879>
2. Andre M, Bitemo M, Niko S, Guido VH, Eric T. Urban agriculture and household subsistence in a post-conflict zone in Central Africa. Biotechnol. Agron. Soc. Envir, 2006, 10(3). [Online] URL: <http://popups.ulg.ac.be/Base/document.php?id=1081>.
3. Armar-Klimesu M. "Urban Agriculture and Food Security, Nutrition and Health, "in Growing Cities, Growing Food, 2000.

4. Hailu M. Feeding livestock in Africa, Indispensable fodder. The magazine of agricultural and rural development in ACP countries, Spore, 2015, n ° 174.
5. Hamadou S, Kamuanga M, Kanwé A. Factors influencing the adoption of fodder crops in peri-urban livestock farms in Bobo-Dioulasso (Burkina Faso), CIRDES, PROCORDEL, socio-economic studies, working document, 2002, N ° 3, 27 p.
6. INS. General Population and housing census 2014, socio-demographic data of localities. National Institute of Statistics: Abidjan, 2015.
7. Kouakou YE, Koné B, Bonfoh B, Kientga SM, N'go YA, Savane I, *et al.* Urban sprawl at the risk of agro-pastoral activities in Abidjan. Published in Vertigo - the electronic journal in environmental sciences, 2010, 10(2).
8. Kouassi AF. Agrostological and Socioeconomic study of fodder farms in urban and peri-urban areas of the city of Abidjan (Ivory Coast). Unique Thesis, UFR Biosciences, University Félix Houphouët Boigny Abidjan, 2013, 173 p.
9. Kouassi AF, Majorein V, Ipou IJ, Adou Yao CY, Kamanzi K, Feeding sheep to livestock sales markets in the city of Abidjan, Ivory Coast. African Agronomy. 2010; 22(1):1-95. ISSN n ° 1015-2288.
10. Kouassi AF, Koffi KJ. N'GORAN KSB., IPOU IJ. 2014. Potential for fodder production in a grazed area threatened with destruction: the case of the Port-Bouët and Grand-Bassam coastline. Journal of Applied Biosciences. 2014; 82:7403-7410. ISSN 1997 - 5902.
11. Leray C. Content analysis: from theory to practice, the Morin Chartier method. Presses of the University of Quebec, Quebec, Canada, 2008, 180 p.
12. MINAGRA. Ivorian agriculture at the dawn of the 21st century, Ministry of State, Ministry of Agriculture and Animal Resources of Côte d'Ivoire, Abidjan, 1999, 312 p.
13. Mougeot LJA. Urban Food production: Evolution, Official Support and Significance, With Special Reference to Africa. Ottawa, Canada, IDRC, 1994.
14. Sanon HO, Drabo A, Sangare M, Kiendrebeogo T, Gomgnibou A. Characterization of cattle fattening practices in western Burkina Faso. Int. J. Biol. Chem. Sci. 2014; 8(2):536-550. DOI: <http://dx.doi.org/10.4314/ijbcs.v8i2.13>
15. Sanou KF, Nacro S, Ouédraogo M, Ouédraogo S, Kaboré-Zoungrana C. Marketing of fodder in urban areas of Bobo-Dioulasso (Burkina Faso): market practices and economic profitability. Cah Agric, 2011; 20:487-93. DOI: <https://doi.org/10.1684/agr.2011.0530>
16. Sikora I. Forage crops: summary report 1975-1981. Bobo-Dioulasso: IVRAZ-CERCI, 1982, 40 p.23.