УДК 636.083.12/.13

4.2.5. Разведение, селекция, генетика и биотехнология животных (биологические науки, сельскохозяйственные науки)

СОЦИАЛЬНО-ЭКОНОМИЧЕСКОЕ ВЛИЯНИЕ РЫНКА КОРМОВ БУРИНГА НА РАЗВИТИЕ БУРУНДИ

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Было проведено исследование для оценки социально-экономического воздействия рынка кормов Буринги на развитие Бурунди. Это исследование длилось один год и состояло из двух основных частей: количественная оценка

UDC 636.083.12/.13

4.2.5. Breeding, selection, genetics and biotechnology of animals (biological sciences, agricultural sciences)

SOCIO-ECONOMIC IMPACT OF BURINGA FODDER MARKET IN THE DEVELOPMENT OF BURUNDI

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The article presents a research to evaluate the socio-economy impacts of Buringa fodder market in the development of Burundi. This research took one year and had two essential parts, which are the quantification of fodder marketed and the estimation of margin profit of

продаваемого корма и оценка маржинальной прибыли различных участников, с одной стороны, и исследование, которое затронуло 50 продавцов кормов с другой стороны. Эти части были дополнены тщательными личными наблюдениями и позволили понять социально-экономическое значение, которое представляет этот рынок. Результаты показали, что существует значительная разница (P<0,05) в количестве реализованного корма и его минимальной, максимальной и средней цене в разные месяцы этого исследования. Цена корма была высокой в сухой сезон и низкой в сезон дождей. Рынок кормов Буринги имеет большое значение для различных заинтересованных сторон, включая продавцов, местный муниципалитет и клиентов. Все продавцы фуража используют серп для стрижки и велосипед в качестве средства транспортировки. Количество корма, загружаемое на велосипед, служит единицей измерения при продаже корма. Кроме того, отсутствие ассоциации торговцев кормами, отсутствие кредита для проектов саморазвития и затрудненный доступ к медицинскому обслуживанию являются серьезными препятствиями для развития рынка кормов Буринга

Ключевые слова: СОЦИАЛЬНО-ЭКОНОМИЧЕСКИЙ, РЫНОК, ФУРАЖ, БУРИНГА, РАЗВИТИЕ

various actors in one hand and an investigation which had affected 50 fodder sellers in other hand. These parties were completed with rigorous personal observations and had made it possible to fill understand the socio-economic importance that this market represents. The results showed that there was significant difference (P<0.05) in fodder quantity marketed and its minimum, maximum and average price during the different months of this research. The fodder price was expensive in dry season whereas it was cheap in rain season. Buringa fodder market has high importance for various stakeholders include traders, local municipality and customers. All fodder sellers use a sickle for cut and a bicycle as transporting mode, the fodder loaded by bicycle serves as referral unit for selling fodder. In addition, the lack of an association of fodder traders, the lack of credit for self-development projects and the difficult access to medical care are serious obstacles to the development of Buringa fodder market

Keywords: SOCIAL ECONOMY, MARKET, FODDER, BURINGA, DEVELOPMENT

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1 Introduction

Burundi is a country where 94% of the population lives from agriculture and livestock (MINIPLAN, 2006). Livestock farming plays an extremely important role in improving the quality and quantity of the food ration through its supply of nutrients such as proteins and lipids from animal (Soulé, 2014;Burnakov, 2020). It is also an indispensable support for agriculture by its great contribution for increase agricultural products throughout the fertility of the soil of which it is the basis by its contribution of manure. The marketing of livestock products generates a lot of revenue for all stakeholders including the State (Katzenberger, Rauch, Erhard, Reese, & Gauly, 2020; Kuhl, Flach, & Gauly, 2019; Neto et al., 2018; Surovtsev, Nikulina, & Dunyasheva, 2017).

The peri-urban areas of Bujumbura in general are home to milk-producing cows, especially the Buringa and Maramvya areas, which have a large number of cows,

which therefore produces a significant quantity of milk consumed in Bujumbura city (Sindaye, 2016).

Previously, most of these cattle were in the capital, inside the Rusizi National Park, palm grove sector (Rukoko) and others in the vicinity of Bujumbura. As a result of administrative measures and for the purpose of protecting the environment, these cattle have been moved to these two areas (Buringa and Maramvya) where it is difficult to find sufficient and sustainable feed for the livestock (Masharabu et al, 2019). When crossing the National Road number five (RN5) around the Buringa area in Gihanga commune and Maramvya in Mutimbuzi commune, you meet many cyclists carrying green grass bundles and who head mainly to the Mpanda cemetery where you see next to which a group of bicycles loaded with fodder bundles, a few vehicles, several people thus forming a real place of sale and purchase of fodder (Sindaye, 2016).

It is precisely this unusual market in Burundi that has attracted our scientific curiosity (fodder market) to fill understand the socio-economic importance that this market represents, the origin of the plant species harvested to feed the cattle of the locality, the owners of the fodder, the sellers of the fodder, the quantity of fodder sold per day, per month or per year on this market, the margins profit of the various stakeholders and the strategies which can be adopted to develop this market.

However, this study was conducted for evaluate the socio-economic impact of Buringa fodder market in the development of Burundi. The overall objective of this work is to ensure the sustainability of the exploitation of fodder in natural pastures in order to increase livestock production and preserve plant diversity. The answers to these different questions make it possible to understand the added value of this novelty in the livestock systems known in Burundi. The various parameters analyzed also make it possible to take measures aimed at increasing the number of crops in order to improve this mode of feeding, to ensure the conservation of fodder plant diversity and to extend this feeding system in Burundi wherever it is possible as well as the government of Burundi had ordered that from 4th October 2021 domestic animals must be in permanent stabling (Announcement number 1/21 of 4th October 2018).

2 Materials and Methods

2.1 Location of Buringa fodder market

This study was conducted on Buringa fodder market located in Gihanga commune, at 7 kilometers from Melchior NDADAYE International Airport and near the national road number five (RN5). It is a trading center where fodder traders go to stock up on food and refreshment. This center and the Buringa fodder market are in inter-dynamic relations due to their proximity. Around 500 m away (east side of the RN 5), begins the extension of a large number of farmhouses. It is part of the Imbo plain whose breeze positively influences the climatic state (MINIPLAN, 2006).

Imbo is one of the natural regions of Burundi that characterized by a low altitude about 1000 m and a warm climate. The Imbo natural region is composed of the Rusizi Plain and the coastal plain of Lake Tanganyika. The Imbo plain is located between $2^0$45' and $4^0$27' south latitude and 29^0 and $39^0$40' east longitude(Lawin, Manirakiza, & Lamboni, 2019). It forms the western free of Burundian territory. The plain is bounded by two large horsts. The first is that of Burundi, which constitutes the watershed ridge of the Congo and Nile basins. The second is that of ITOMBWE which borders the plain to the west in Congolese territory. These mountain ranges culminate respectively 2600 m and 3200 m of altitude. This particular situation in an overheated basin and the south-east trade wind that crosses it further accentuates the semi-arid climate that characterizes it(Lawin et al., 2019). The figure 1 shows the location of Buringa fodder market.

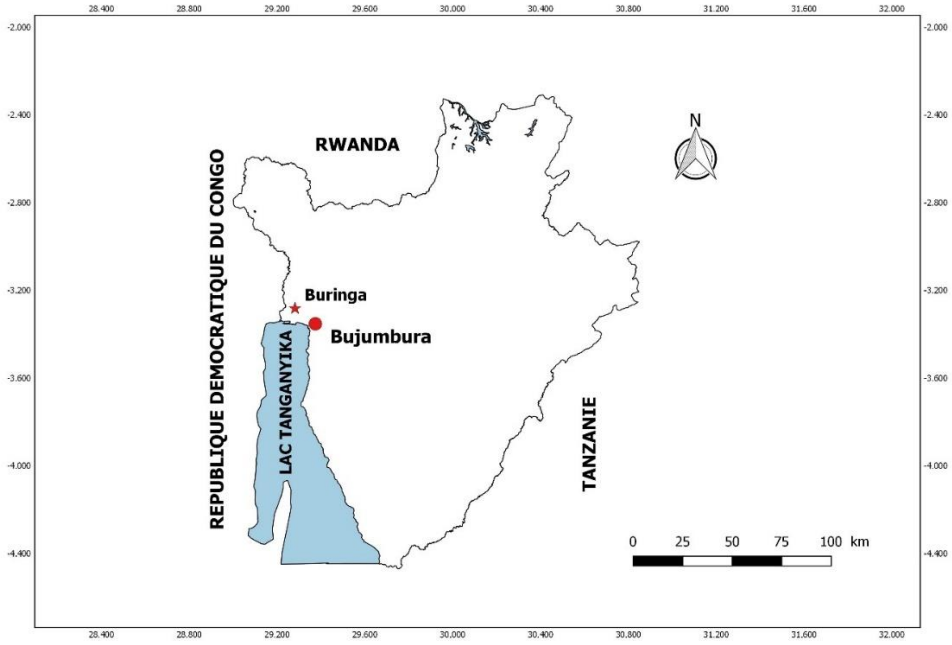

Figure 1: Location of the Buringa Fodder Market (Burundi)

The structural conditions of the market are bad. It is an open space that is not covered, no construction has been put and the sun burns the agents of the market in the open air. The following picture shows the state of the Buringa fodder market.

Figure 2: Illustration of Buringa fodder market

2.2 Historical overview of the Buringa fodder market presentation of Buringa fodder market

Historically, the market that was the subject of this study was created in the image of another that preceded it in time and which currently no longer works. This first market was located near the former livestock breeding site around Lake Tanganyika (kumase). This site no longer exists legally. The whole market history of fodder began after the 1993 crisis. Driven back from the border provinces of the capital and from some other localities in the interior of the country because of the insecurity that prevailed there at that time, cattle found themselves in large numbers around Lake Tanganyika. With the impossibility of producing the fodder and having the pastures nearby, the farmers had no choice but to proceed with the purchase of the fodder and thus the fodder market was born.

In 2006, with the new policy aimed at the cleanliness of the city and the protection of the human lives of the entire capital and the biodiversity of Lake Tanganyika, the Government of Burundi ordered that all cattle must be mobilized from the city and near the lake to the site of Maramvya in the commune of Mutimbuzi. Thus, the site of Maramvya was created at the same time as the site of Buringa which was not targeted, but which the majority of breeders appreciated very much because of its conditions which respond favorably to their pastoral preferences. The agglomeration of these cattle could not remain without effect, farmers would have to continue to obtain supplies by the same means as before and thus the Buringa fodder market was put into operation.

In 2007, the administration of the municipality Gihanga saw that this fodder market of Buringa which was in front of the church and presenting a small area (about 800 $m^2$of bare land), was at the origin of many accidents because located less than 2 m from the RN 5, ordering that this market must be transferred near the Mpanda cemetery where is until today. It should be noted that recently (2014) the security issue pushed the Government of Burundi to send back all the cattle that were in the Rukoko nature reserve to the east side of the RN 5.

2.3Data collection

In data collecting of this research, a rigorous observation of the facts on the one hand and an interview followed by a transcript of the answers on the other hand served as a real key for data collection. As far as observation is concerned, we proceeded by looking, listening, understanding and interpreting the facts. The interview was currently between the principal investigator and the subject person. Sometimes an unspecified question was found in the questionnaire subjects and in this case, the opportunity was taken to transcribe the answers on the questionnaire during the interview.

2.3.1 Presentation of the survey questionnaire

The survey questionnaire used consists of four parts: the identification of the respondent, the state of the market in the survey area, the harvesting and transport of fodder to the market and questions relating to fodder traders. The identification of the respondents made it possible to gather the necessary information on their origin. The market status of the survey area provided information on its functioning. The harvesting and transport of fodder to the market provided information on the origin and quantity of fodder sold and, finally, questions relating to fodder traders made it possible to gather information on the whole process involved in fodder marketing. In all of these four parts, information on the diversity of fodder species used for feed cattle in the study area and the margins price were provided.

2.3.2Sample selection

Constitute a sample is to choose a group of people with the same characteristics as the population to be studied (Xie, Luo, & Zhou, 2016; Zhang, 2020). The sample chosen is made up of 50 fodder traders. All these fodder sellers were interviewed on the spot at the Buringa fodder market and the selection of the sample was made at random. As it was difficult to interview the owners of the farms due to their availability, holding a meeting with them first and that of the local administration afterwards allowed us to collect their information.

2.3.3 Data reliability

The sources of error are of several kinds. If sampling errors are neglected, the other errors are related to the interviewer, the respondent, and/or the wording of the questionnaire (Gumbert et al., 2016; Minhee Kim & Lee, 2018; Xie et al., 2016). The big part of the questionnaire was consisted of closed-ended and/or multiple-choice questions. Respondents were not entitled to the error of misunderstanding. However, the interview was conducted by the leader investigator without use of other investigators; it is believed that these types of errors were more minimized.

2.3.4 Investigation conduction

The investigation took place over a period of one year and consists of the following two essential parts: The first concerns the registration of the bicycles loaded with fodder that entered the Buringa fodder market every day from the entrance of the first bicycle loaded with fodder until the exit of the last one. As the chief investigator had at his disposal two other investigators employed for this purpose, who he would have to check daily from morning until evening, the recording of the number of bicycles loaded with fodder that arrived at the market was done twice a day (at noon and in the evening) and then calculated the total daily sum of the number of bicycles loaded with fodder already entered the market. As the market has two different entrances, each investigator placed himself near the entrance and the leader investigator regularly checked that his investigators did not make any mistakes. More attention has been drawn to each particular observation that has caught up in this Buringa fodder market during this period, especially in relation to the system of fodder marketing. Throughout the period of this investigation, the minimum price and the maximum price of fodder loaded by a bicycle were estimated every day. In order to find the daily turnover price, the total number of bicycles loaded with fodder that were presented daily on the Buringa fodder market was multiplied by the minimum or maximum price of one bicycle loaded with fodder for each day. To facilitate the presentation of these results, the monthly sum was calculated. The average monthly turnover was calculated by adding the minimum and maximum monthly turnover and halving the sum found.

To compare the daily average of the number of bicycles loaded with fodder sold between the different months of our research and their minimum, maximum and

average prices, we calculated the daily average during the month considered as a repetition first and we compared the different daily averages obtained from different months.

During this first part of the investigation, the mass, length and circumference of the fodder bundle were also measured. As the measurement of the fodder was practically difficult to carry out on the market before the sale of fodder (because of the traders need to keep time for returning cut other forage), it was done in a farm of the farmer where the scales were placed and the measurement is done directly after the fodder traders delivered it. To see if there are any differences between the seasons, forage measurement was carried out during two different seasons (the dry season and the rainy season). The determination of the market area was made using a GPS. The second part consists of the survey work of the fodder traders on the market site and the choice of the trader to interview was made at random.

It should be noted that in order to obtain more information on the entire process related to the marketing of fodder, three meetings were held with local authorities, farmers (buyers) and fodder traders respectively. These last 2 groups consisted of 30 people chosen on the basis of their knowledge on the whole process related to fodder sale.

2.3.5 Data processing

The collection and recording of information were done during the interviews. The data collected was checked every evening. Once the investigation had been completed, the questionnaires were counted. To analyze a questionnaire is to identify the interesting results within the framework defined by the working hypotheses(Xie et al., 2016). Following this principle, the interesting data contained on each questionnaire were identified and grouped in characteristic tables.

2.3.6Statistical analysis

The location of Buringa fodder market was generated using the QGIS Desktop 2.18.11 software. Statistical analysis was handled by the SPSS programming toll (IBM SPSS. 25）using One-Way ANOVA followed Duncan's multiple ranges tests and the comparison between groups was made using Statistix8.0 software

processing by LSD method. Percentage calculation and graphics were made using Microsoft Office Excel. The measurement of Buringa fodder market area was handled by GPS processing by rectangular coordinates.

3. Results

3.1 Source of fodders old

The results of this survey reveal that the fodder sold on Buringa fodder market comes from5 natural pastures located in the Gihanga, Mutimbuzi communes and their border communes. These natural pastures include Rusizi nature reserve, the Rukoko natural forest, rice plots within the SRDI perimeter, within the perimeter of NDADAYE International Airport, from the coastal region of the Democratic Republic of Congo near the Gatumba area of Mutimbuzi commune.

3.2 Cutting and transport of fodder sold

The results of this survey showed that 100 % of fodder traders use a sickle for cut the fodder sold and the bicycle as a mode of transporting the fodder from the cutting site to Buringa fodder market and until the farmhouse after the sale because they are the ones who are responsible for depositing the fodder in the farmhouse enclosures.

3.3 Fodder marketing system

Fodder marketing system concerns two methods of sale: the fodder sale on the Buringa fodder market and the direct supply of farms. The fodder sale concerns fodder from spontaneous fodder species and residues or by-products of harvest such as green rice straw, false stems of sweet potato, maize stalks, to a lesser extent. Supply and demand are exchanged like those of others goods or products sold at the market. The direct supply of farmhouses is a form of sale governed by the contract between fodder traders and farmers. This contract determines the terms of delivery of the fodder and the payment deadline. The fodder is transported directly to the farmhouses without going to the market. The forms of fodder sold are the same as those of fodder marketed at the Buringa fodder market. It should be noted that 100%of fodder traders are responsible for delivering the fodder to the farmhouses and most of them prefer sell the fodder at the market. The figure 3

showed the meeting of sellers and buyers of fodder at the buringa fodder market during the investigator.

Figure 3: illustration of the meeting of sellers and buyers of fodder at the buringa fodder market

3.4 Fodder sellers and customers identification

The survey targeted individuals who could provide relevant information on the situation of the marketing of fodder. The figure4 shows the origin of fodder sellers.

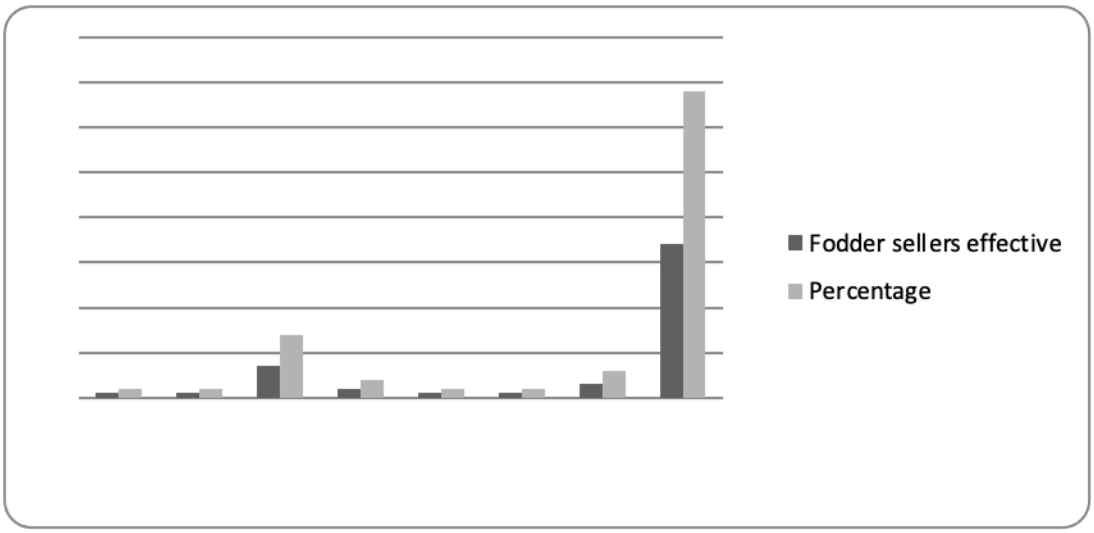

Figure 4: Origin of fodder sellers(n=50)

The results of figure 4 showed that 98% of fodder sellers are from others different provinces of the country. Most of them are from Ngozi province (68%) and Gitega

province (14%) while 2% of fodder traders are Bubanza province where is Buringa fodder market. The figure 5 represents the range of age fodder traders.

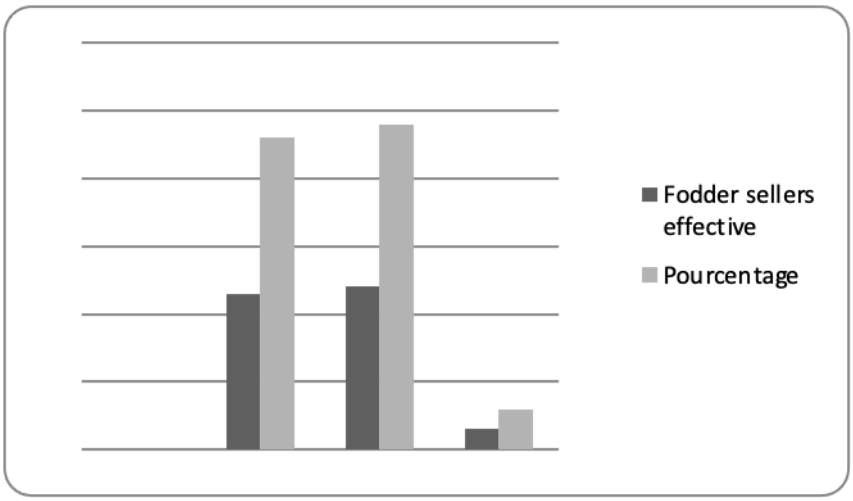

Figure 5: Age range of fodder sellers (n=50)

The figure 5 shows that the fodder trade is carried out by people who are mostly young (94% of the respondents are under 40 years old) and no one is under 18 years old (0%). The figure 6 represents the matrimonial status of fodder sellers.

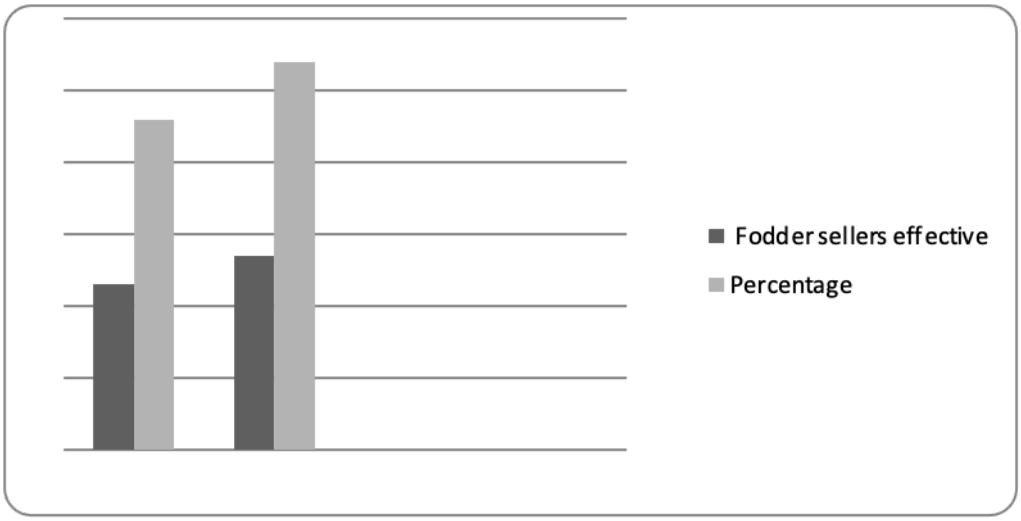

Figure6: matrimonial status of fodder sellers (n=50)

The figures number 6 shows that 54% of the interviewees are singles and 46% of them are married. The figure 7 represents the education of fodder sellers

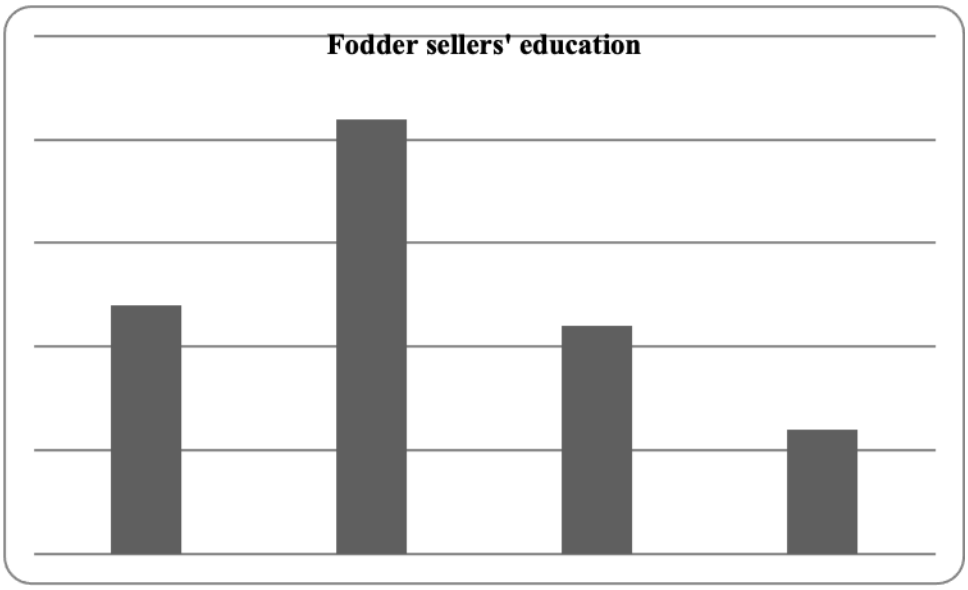

Figure 7: Range of fodder sellers' education (n=50)

The results of figure 7 showed that fodder sellers haven't high education. 21 fodder sellers (42%) had uncompleted primary school level education while 12 of them (24%) hadn't any education. No one (0%) had completed secondary school.

According to the information obtained on the spot from the market, supplemented by personal observations and the meeting with the breeders, the buyers are breeders who come from all social categories belonging to the various functions of daily life, with varying levels of education and prosperity. Their homes are mostly based in Bujumbura city and the daily work of their farms is carried out by employees and sometimes, some mandate someone who is in charge of the purchase of fodder and he informs him (her) every day the situation of the fodder selling price.

3.5Buringa fodder market organization

The market that was the subject of this study has an area of 2080,866 m^2 (Annex 1). This area occupied by the Buringa fodder market is sufficient because there is no lack of parking for bicycles loaded with fodder or buyers' vehicles even when demand is below supply.

The organization of the fodder market is the responsibility of the fodder traders themselves without any intervention by the public authorities. The conditions for acquiring the fodder to be put on the market shall determine the time at which the market is opened and closed. According to the annual field observations, the

opening time is about 8:50 a.m except in the case of a few peculiarities because at that time, the sellers of the fodder would have already collected the sufficient quantity of fodder to put on the market. The closing time is around 6:30 pm and each seller returns after selling his fodder or finding that there are no customers. At 10:00 a. m and 4:00 p.m every day, were the time that there was many fodder traders and buyers in the market.

The entry and exit of market actors are free. Fodder traders and buyers in a sense of need may meet deliberately at the exchange location. The Buringa fodder market is held every day of the week. The number of all fodder traders who frequent the market remains unknown since they do not frequent the market in the same way. It should be noted that fodder traders are not organized in any association and that there are no state regulations governing the market; not to mention that no particular strategy is adopted by traders in this regard.

3.6Marketing of fodder on Buringa market during the investigation period

The commodity constituting the basic unit of market existence is fodder which is exchanged for money (FBU). There is no weighing system that is planned; the quantities exchanged are estimated with the naked eye and the fodder loaded by a bicycle serves as a reference unit. The quantity of fodder transported by a bicycle and constituting the reference unit shall be the number of three bundles of fodder. All fodder traders are well and truly aware of this reference unit because throughout the period of investigation, none of them was observed with the fodder loaded by bicycle with the number of bundles less than or exceeding three. This means that in order to know the exact number of bundles of fodder sold, the total number of bicycles loaded with fodder exchanged must be tripled. The table1 shows the daily average number of bicycles charged of fodder and their minimum, maximum and average price during the period of this work.

Table 1: Daily average number of bicycles charged of fodder and their minimum, maximum and average price

Month	Number of bicycles charged of fodder	Minimum price	Maximum price	Average price
March	658±89^{a}	3383.33±703.23^{c}	5166.66±1002.86^{bc}	4275.00±805.02^{c}
April	635±81^{abc}	3700.00±876.90^{b}	5600.00±1539.14^{b}	4650.00±1181.02^{b}
May	650±66^{ab}	3250.00±598.12^{c}	5416.66±777.74^{b}	4333.33±620.52^{bc}
June	604±76^{cde}	3200.00±726.35^{c}	5266.66±1157.68^{bc}	4233.33±904.80^{c}
July	586±23^{ef}	4250.00±888.14^{a}	7433.33±827.68^{a}	5841.66±783.67^{a}
August	575±17^{ef}	3816.66±425.14^{b}	7450.00±1003.01^{a}	5633.33±381.31^{a}
September	589±62^{def}	3166.66±273.33^{c}	6883.33±7233.40^{b}	4350.00±452.95^{bc}
October	601±56de	2266.66±388.03^{d}	4150.00±559.40^{de}	3208.33±420.81^{e}
November	622±33^{bcd}	1800.00±281.62^{e}	3233.33±365.14^{f}	2516.66±262.06^{f}
December	564±78^{fg}	2266.66±253.70^{d}	3833.33±746.63^{e}	3050.00±479.76^{e}
January	520±73^{h}	3266.66±486.60^{c}	4900.00±443.34^{c}	4083.33±427.16^{c}
February	537±73^{gh}	3116.66±582.55^{c}	4366.66±753.53^{d}	3741.66±644.88^{d}
***P* -Value**	**0.000**	**0.000**	**0.000**	**0.000**

The results of table 1 show that there was significant difference on daily average number of bicycles loaded with fodder and their minimum, maximum and average price during our research ($P<0.05$). The number of bicycles charged of fodder was high for the first 3 months (March, April and May) and decreased in December, January and February. The minimum price was observed during October, November and December while the maximum price was observed during July, August and September. The average price was high during July and August and lower during October, November and December. It should be noted that July, August and September correspond to dry season and others months represent rain season. The table 2 shows the measure of fodder marked at Buringa market during rainy season and summer season.

Table 2: Measure of fodder bundle marketed at Buringa market

Item	Summer season	Rainy season	*P*–value
Circumference (cm)	100.47±10.14	98.32±8.25	0.176
Length (cm)	151.90±15.98^{b}	157.51±15.37^{a}	0.036
Weight (kg)	25.47±5.92^{b}	27.50±4.29^{a}	0.022

The results presented in table 2 showed that there was significant difference in fodder's length and their weight between rainy and summer season ($P<0.05$). The length and weight are higher in rainy season than summer season. As the number of

bundles loaded by a bicycle is always three bundles, the net weight of fodder loaded by bicycle is equal to the sum of tree bundles weight because all bundles did not have the same weight. During our research, the number of bicycles charged of fodder sold by interviews for one week was calculated and their results are present in the following figure:

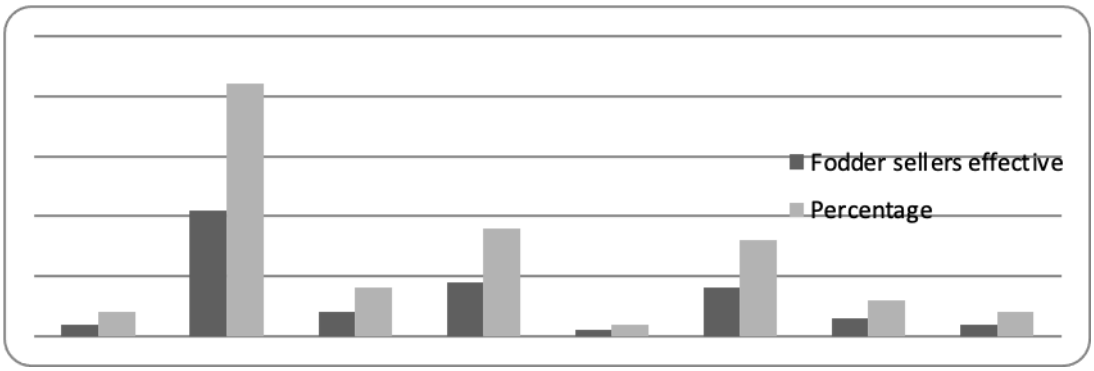

Figure8: Range of bicycle charged fodder number sold by interviews per week (n=50)

Table 3: Margin profit of Gihanga commune The figure number 8 shows that the fodder sellers who bring the fodder to the market every day are numerous compared to those who supply the fodder to the farmers and who occasionally come to the market to look for the supply money (number of bicycles charged fodder sold is less than or equal to 7). It has been noticed that there was no one fodder seller who can bring to the market more than two bicycle charged fodder in one day.

3.7 Profit margins of the various stakeholders

The taxation of the fodder sold is not carried out on the market site, but on the contrary along the way from the place where the fodder is cut to the market. The tax fees for each trader vary according to the number of municipalities crossed before arriving at the market and the number of rounds performed. The taxes amount is 100 FBU per bicycle charged fodder at each crossing and per municipality crossed. They are fixed by the municipalities where the fodder passes.

For estimate the profit margins of Gihanga commune where is Buringa fodder market, we have calculated the sum of all bicycle charged fodder which entered in this market and their results are presented for each month as the following table:

Month	Number of bicycle charged fodder sold /month	Tax per bicycle charged fodder	Tax per month
March	19731	100	1973100
April	19052	100	1905200
May	20146	100	2014600
June	18116	100	1811600
July	17568	100	1756800
August	17243	100	1724300
September	17681	100	1768100
October	18697	100	1869700
November	18661	100	1866100
December	17513	100	1751300
January	15604	100	1560400
February	15521	100	1552100
Total	**215533**		**21553300**

The result of table 3 show that 215,533 bicycles charged fodder were presented at Buringa fodder market and the profit of Gihanga commune is equal to 21,553,300 Francs Burundi (FBU).

Fodder traders have a special behavior. The market system is characterized by the "price war" between the fodder merchants with the customers. This attitude sometimes leads buyers to reduce the price of fodder as well as each seller wants to sell the fodder very early because it is in this condition that he can save the time for going and cutting other fodder.

The following table shows the minimum turnover, the maximum turnover and the average turnover for each month of the period in which this investigation was carried out.

Table 4: Minimum, maximum and average monthly turnover of the Buringa fodder market

Month	Number of bicycle charged fodder sold /month	Minimum monthly turnover in FBU	Maximum monthly turnover in FBU	Average monthly turnover in FBU
March	19731	66274500	100539500	83407000
April	19052	67245500	100693500	83969500
May	20146	64655000	108344500	86499750
June	18116	57100500	94103500	75602000
July	17568	59201000	99897500	79549250
August	17243	59744500	104817000	82280750
September	17681	55976000	97223000	76599500
October	18697	42172500	77360000	59766250
November	18661	50146000	59984500	55065250
December	17513	39903500	66342000	53122750
January	15604	50290500	76085000	63187750
February	15521	60442000	66421000	63431500
Total	**215533**	**673151500**	**1051811000**	**862481250**

The results of table4 show that the minimum, maximum and average monthly turnover varies respectively from 39,903,500 to 67,245,500 FBU, 59,984,500 to 108,344,500 FBU and from 53,122,750 to 86,499,750 FBU. The minimum turnover is smaller in December and it is higher in April. For the maximum turnover, it is higher in May while it is lower in November. The average monthly turnover is lower in December and it is higher in May. In general, the minimum, maximum and average turnover are higher in May while they are lower in December.

3.8 Summary overview of the fodder sale

The physical contact almost non-existent in the modern economy between producers and the final consumer is greatly strengthened in this system of marketing fodder. The fodder passes directly from the hands of the traders to the hands of the final consumer (farmer). Thus, the operations that take place in these two systems of sale of fodder deviate a little from the circuits observed in the modern economy. These two systems for selling fodder can be summarized by the following diagram:

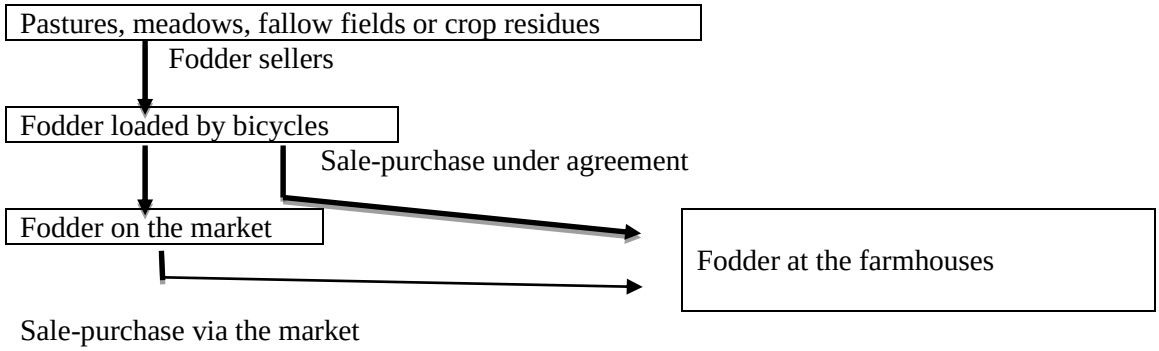

Figure 9: Diagram of fodder marketing general circuit

This diagram (figure 9) shows that the marketing circuit for fodder is characterized by the absence of commercial intermediaries. It is the fodder traders and the buyers (breeders) who are in direct contact. The fodder sold at the Buringa fodder market comes from natural pastures and meadows or fallow land. This fodder is picked and transported by the fodder traders using bicycles to the point of sale, which is either the market where the latter is sold via the negotiation of the price between the fodder trader and the farmer before being transported to the farmer's farm by the

fodder trader himself, or the farm if the fodder is sold under contract between the fodder trader and the farmer.

3.9Main income allocations from fodder sale

The results of this research revealed that the allocations of income from the sale of fodder differ from one trader to another depending on their needs and the marital status that characterizes them. The main priority items include renting houses, buying food and beverages, buying clothes, getting children into school, building houses, buying goats, renting plots to grow mainly for rice and small businesses. It should be noted that the very first founders of the fodder market abandoned this profession and some of them became breeders, traders of other products and the owners of many restaurants observed on the trading center where fodder traders currently go to supply themselves.

3.10Future prospects for the Buringa fodder market

Fodder traders encounter problems in their profession but of unequal dimensions. The following table shows the distribution of fodder traders according to the constraints encountered.

Table 5: Distribution of fodder traders according to the constraints encountered (n=50)

Constraint encountered by fodder traders	Number of forage traders who face constraints	Respondents percentage
Long distance to travel before arrive to market	2	4
No have bicycle	4	8
Accident during transport	3	6
Preservation of unsold forage	1	2
Lack of recognized association	50	100
Lack of credit for self-development projects	50	100
Difficult access to medical care	50	100

The data of table 5 showed that three major constraints should be noted for all fodder traders involved in the fodder marketing circuit. These are the lack of a legally recognized association to guarantee this profession, the lack of credit for self-development projects and the difficult access to medical care. The other constraints are not large (no constraint affects more than 8% of the interviewees).

4. Discussion

To understand how to act, it must recognize that buyers are completely without forage plots and that whatever the conditions, they are forced to buy fodder to feed their cattle. As for fodder traders, they are mostly migrants and deprived of fodder storage opportunities. They have no other alternatives when they absolutely must have money for their daily supply. Fodder traders obtain fodder free of charge through the physical effort provided, which does not pose any profitability constraint for them.

Asthey are not from the locality, no one fodder trader has his own pasture or fallow land which he exploits for sell the fodder. Fodder traders cut fodder without any protection rules; they do not even pay for cut fodder on areas that do not belong to them. The majority of the fodder comes from the rice plots, on the contours, in Mpanda cemetery and in Rukoko nature reserve as these places are opened to everyone(Masharabu et al., 2019).

The area covered by this work is in one of the regions with low rainfall (69.906 mm/month on average) (IGEBU, 2015), so that during the dry season, fodder traders travel many kilometers for searching fodder. They even arrive in the Democratic Republic of Congo in the region near the Gatumba area of the Mutimbuzi commune because they do not easily find fodder in the surrounding pastures of the Buringa fodder market. This is due to the gradual disappearance of some fodder species(MEEATU, 2013; Pang, Ma, Hung, & Hau, 2018; Ruprecht, 2006).

The result of this survey showed that all fodder sellers use a sickle for cut the fodder because it is small, cheap, easy to manipulate (during fodder cutting) and transport. The main mode of transporting fodder from the cutting origin to the destination is by bicycle because it is a cheapest mode of transport, the relief of the plain is easy to navigate and young people can transport a lot using the bicycle. Not all fodder traders have their own bicycles; some of them use rented bicycles. Regarding to the quantity transported, no weighing system is put in place, only the number of three bundles of fodder that are transported by a bicycle constitutes the reference unit for the sale of fodder and the latter is known by all actors (buyer or seller).However, this system of fodder marketing is similar to others fodder

markets of some west Africa countries including Niger (Soulé,2014), Burkina Faso (Sanou et al., 2016) et Ivory Coast (Faustine et al., 2016)

The mass and length of fodder loaded by a bicycle is higher in rainy season and lower in the dry season. This difference in weight and length between seasons is due to the water content of the forage species composing the mixture which is higher in the rainy season compared to the dry season(Hellwing et al., 2015; Macoon et al., 2003; Mapato & Wanapat, 2018; Thomas, Hersom, Thrift, & Yelich, 2017). It should be noted that in most pastures water plays the essential role for the regeneration of these forage species because forage species are much denser in a humid place(Mi et al., 2019).

In this work, two categories of forage resources available to feed livestock were identified. These include spontaneous forage species and agricultural crop residues. There is an absence of fodder crops. Agricultural residues are derived from the main crops characteristic of family field found in this study area. Spontaneous forage species account for almost all of the forage sold on the Buringa fodder market. Grasses are fodder species much more observed in the Buringa fodder market because they constitute the majority of spontaneous fodder species found in the natural pastures on which the fodder sold is cut. Compared to the fodder species of the legume type, the grasses are more resistant to overexploitation(Senoussi et al., 2021).

Fodder is marketed like others goods or products; it does not involve commercial intermediaries as modern marketing products (Bogdashjov, 2012). The fodder passes directly from the hands of the fodder trader to the hands of the farmer because the market is located not far from the farmhouses. There were two different system in fodder marketing observed include direct supply of farmhouses throughout the contract between fodder sellers and farmers and the fodder sold at Buringa fodder Market. In these two systems, the form (quantity and quality) of fodder sold and the price were the same.

Fodder traffic is performed by mostly young people (94% of interviewees are under 40 years old), all are male and migrate from others provinces of the country (98% of the interviewees) and haven’t education (no one had completed secondary school). This is due to the fodder trade which is a very demanding profession given the long distances between the origin of the fodder and its destination (farms), the

mass of fodder loaded by bicycle and the number of turns made per day and per fodder trader and where they come, they are accustomed for cutting the fodder. Most interviewees are from Ngozi (68%) and Gitega (14%) because they are among the densely populated provinces of Burundi and young people of these provinces are used to work with their hand and walking long distance on foot or ridding bicycle. They go to the different localities of Burundi for find a job. This is relative to others citizen of others countries because unemployed people want to go where they can find a job (Lyu et al., 2019). They settled in the localities of Buringa and Maramvya at the time of the exercise of this profession of fodder sale because of the small distance that separates these two sites with Buringa fodder market. Most of Gihanga commune's people (where is Buringa fodder market) located in Bubanza province are accustomed working in Mpanda cemetery and in agriculture of rice. These works are not demanding as fodder sale profession and constitute another source of money for local population. It should be noted that only the men work in Mpanda cemetery.

There was no fixed time for open and close Buringa fodder market only the conditions for acquiring the fodder determine the time for open and close it. The quantity of fodder available on the Buringa fodder market is not always the same. Several factors are at the origin of this variation: the length of the dry season, irregularities in working hours especially when the climatic conditions are not favorable, the decrease in fodder traders number during the rice harvest period because they are involved in the transport of rice, the movements of fodder traders especially on festive days (Christmas , new year, Passover), the temporal relocation of the fodder market to another place (next to the basic school of Buringa) on the day of the burial of the high dignitaries and the fodder sale during the journey before reaching the point of the fodder market of Buringa. The quantity of fodder available on the Buringa fodder market fails to cover all the demand for fodder throughout the year, especially in the dry season when spontaneous fodder species experience their temporal disappearances and, in this case, buyers will wait for fodder on the streets before the fodder sellers arrive at the Buringa fodder market.

The results of this survey showed that the setting of the price of fodder depends on the number of traders and buyers of fodder who are present on the market, the quantity and quality of fodder loaded by a bicycle, the season and the climatic factors of the day (Sindaye, 2016). The price of fodder is not always constant

throughout the year. It is higher during the dry season period and on festive days (including Christmas, New Year, Passover) when fodder traders go to the interior of the country because at this time the demand for fodder exceeds the supply. Even during a day, this price varies; its fixing depends on the number of traders and buyers of fodder that are present on the market and the climatic factors of the day, especially during the rainy season. This kind of market is understandable because it is the law of supply and demand as others goods (Fruteau, Voelkl, van Damme, & Noe, 2009; Liu, 2011; Makowski, Piotrowski, Sladkowski, & Syska, 2017).

The frequency of some fodder traders at the Buringa fodder market is not regular. There are some who, even if they do not constitute the majority, deliver the fodder directly but from time to time to the farm. There are others who rest two or three times per week or bring the fodder every day but only in the mornings. This job being one of the most tiring, we can understand them as to the rest of their organisms(Zumbakyte-Sermuksniene, Kajeniene, Vainoras, Berskiene, & Augutiene, 2010).

Given the money flowing on Buringa fodder market in one year (862,481,250 on average), it contributes enormously to the development of Burundi through the employment that it offers to these non-educated young people, the filling of the communal crates where fodder passes and local population benefits only in a secondary way. The municipalities where fodder passes thank to the taxation of 100FBU per bicycle loaded fodder and per lathe, to clean up their coffers like Gihanga commune of which thirty percent (30%) of the revenue comes from the fodder trade (Gihanga, 2016). Unbelievable but true!

Depending on marital status, income allocations are mainly directed towards the acquisition of small businesses, the rental of plots for rice cultivation and the construction of dwelling houses. Given that the fodder traders come from other regions, such behavior is understandable and justified: these young people are seeking to settle permanently in Gihanga or Mutimbuzi and if possible, leave this very tiring profession in favor of another. This is possible in this study area which has several socio-economic potentialities, but it requires a certain discipline in the use of the income received. However, this attitude is similar to others citizen of others countries because every people wants a good job (Jaejoon Kim & Lee, 2019).

Despite the several socio-economic potentialities in fodder trade, the lack of a legally recognized association to guarantee this profession, the lack of credit for self-development projects and the difficult access to medical care are the serious obstacles to the development and marketing of fodder. Despite these constraints, fodder traders say they cannot relax their activity while the customers still exist. Their main wish is that cows multiply more because an increase in the number of cattle leads to an increase in the number of customers and therefore an effective livelihood for fodder traders becomes available as the latter have confirmed this reality. This is relative to the law of supply and demand because the increase of offer also increases the demand (Faustine et al., 2016).

5. Conclusion

The fodder trade is a demanding job, reserved for men, coming from interior of Burundi who settles in Buringa at the time of the exercise of their profession, which promotes the influence of the Buringa center and its surroundings. The availability of fodder offered on this market results from the combination of several factors, each playing its specific role. The bicycle is the only transport mode used and there is no method for knowing exactly what biomass is transported and sold. Buringa fodder market is helping the country to solve the problem of high demographics and also the employment of non-educated young people. The fodder sold comes from various places where the sellers arrive easily for collection and transport it to the market or even to the farm. Like others markets, Buringa fodder market prices follow the law of demand and supply. Buringa's fodder market provides its actors with income that allows them to satisfy their needs and if possible, invest in other less tiring activities (aware that this profession will not occupy them all their life). Price volatility, the lack of an association of forage traders and self-development projects as well as the difficult access to medical care are serious obstacles to the development of traders and the Buringa fodder market. The sale of fodder on a given public space is a phenomenon that remains new in Burundian livestock; certainly, its evolution will lead to significant change in Burundi livestock systems known.

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Annex 1: Buringa fodder market area calculation

Latitudecoordonates	**Longitudecoordonates**	**Latitude coordonatesin minutes**	**Longitude coordonatesin minutes**	**X (in meter)**	**Y (in meter)**	X_{i+1}-X_{i-1}	Y_{i-1}-Y_{i+1}	$Y_i(X_{i+1}$-$X_{i-1})$	$X_i(Y_{i-1}$-$Y_{i+1})$
3°16,110’	29°18,787’	196,11	1758,787	363846,217	3263107,42	-46,382925	-33,395706	-151352467	-12150901,3
3°16,088’	29°18,776’	196,088	1758,776	363805,4	3263087,01	-38,961657	27,829755	-127135277	10124615,1
3°16,089’	29°18,772’	196,089	1758,772	363807,255	3263079,59	-5,565951	16,697853	-18162141,1	6074800,07
3°16,085’	29°18,767’	196,085	1758,767	363799,834	3263070,31	-11,131902	3,710634	-36324179	1349928,03
3°16,083’	29°18,7770’	196,083	1758,77	363796,123	3263075,88	-11,131902	-1,855317	-36324240,9	-674957,132
3°16,079’	29°18,768’	196,079	1758,768	363788,702	3263072,17	-7,421268	16,697853	-24216133,1	6074490,27
3°16,079’	29°18,761’	196,079	1758,761	363788,702	3263059,18	63,080778	18,55317	205836312	6749433,63
3°16,113’	29°18,758’	196,113	1758,758	363851,783	3263053,62	57,514827	-48,238242	187673964	-17551570,4
Sum								-4161,732	-4161,732

The negative sign of the total sum comes from the fact that the measuring followed was in the opposite of clockwise direction. However, the total market area is (4161.732) /2=**2080.866 m^2**.