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Evaluation of the use of agricultural inputs in the plateaux of Batéké, Kinshasa province in Democratic Republic of Congo

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Abstract

The study evaluates the level of the use of the inorganic or organic fertilizers, the pesticides (insecticides, fungicides and herbicides) and of the seeds by the farmers of Bu administrative organization in the plateaux of Batéké, commune of Maluku, Kinshasa province in the DR Congo. It looked also at the sex and the sizes of the farms of these farmers and where they obtain the agricultural inputs. A sample of sixty farms was selected and the descriptive and documentary methods in combination with the direct observation, the interview and the questionnaire techniques were used to collect the data on the selected parameters. The results of the survey showed that most of the farmers of the area are men (81.7%) and most of them (83. 4%) use the organic materials as source of nutrients than the inorganic fertilizers for their crops, mainly cassava and maize. Some authors however made an observation that if the women farmers could have the same access to the productive resources as acquiring the agricultural land, as for men, they could have increased the crop yields and free many people from hunger. The traditional practices of incorporating the organic materials in the farms and their availability in the area can justify the interest of their use. The inorganic fertilizers are used at a very low level by the farmers (16.6%) probably because of their unavailability and high cost on the local market. This can also be due to the weak levels of the knowledge of the farmers on the importance and the use of fertilizers. Among the pesticides, purchased in small local shops in Kinshasa streets, the fungicides (22.2%) and the herbicides (16.7%) are the least used than the insecticides (61.1%) by farmers to combat insects and pests. But due to their high cost, which may be the same case as for the fertilizers, the government should assist the farmers with the grants to allow them purchase these inputs. In addition, the farmers buy theirs planting materials and seeds mainly of cassava and maize in local markets (34.43%), from two technical services, SENASEM and TECHNISEM (27.15 %), the INERA M'vuazi and Kiyaka (26.96%) and some are provided by the FAO (11,46%). These results show that the DR Congo agriculture is still lagging behind with regards to the use of fertilizers and pesticides. The effort must be done to make the agricultural inputs available to the farmers and to facilitate the acquisition by women of agriculture lands so that they also can be more implicated in the agricultural sector.

Key words: Evaluation, inputs, use, farms, size, sex

Résumé

L'étude évalue le niveau d'utilisation des engrais minéraux ou organiques, des pesticides (insecticides, fongicides et herbicides) et des semences par les agriculteurs du groupement Bu dans les plateaux de Batéké, commune de Maluku, ville province de Kinshasa en RD Congo. Elle a également relevé le sexe de ces agriculteurs et la taille de leurs exploitations et d'où ils obtiennent les intrants agricoles. Un échantillon de soixante exploitations a été sélectionné et les méthodes descriptives et documentaires en combinaison avec les techniques d'observation directe, d'entretien et de

questionnaire ont été utilisées pour collecter des données des paramètres retenus. Les résultats de l'enquête ont montré que la plupart d'agriculteurs de la zone sont des hommes (81.7%) et utilisent plus les matériaux organiques comme source de nutriments pour leurs cultures que les engrais inorganiques, principalement le manioc et le maïs. Certains auteurs ont fait une observation que si les agricultrices pouvaient avoir la même facilité d'accès aux ressources productives telles que l'acquisition des terres agricoles, comme pour les hommes, elles auraient pu augmenter les rendements des cultures et libérer de nombreuses personnes de la faim. Les pratiques traditionnelles d'enfouissement des matériaux organiques aux champs et leur disponibilité dans la zone d'étude peuvent justifier l'intérêt de leur utilisation par les agriculteurs. Les engrais inorganiques sont très peu utilisés probablement à cause de leur indisponibilité et de leur coût élevé sur le marché local. Cela peut aussi être dû au faible niveau de connaissance des agriculteurs sur l'importance et l'utilisation des engrais. Parmi les pesticides, achetés dans les petits commerces de proximité dans les rues de Kinshasa, les fongicides (22.2%) et les herbicides (16,7%) sont les moins utilisés par les fermiers que les insecticides (61.1%) dans la lutte contre les insectes et les ravageurs. Mais en raison du coût élevé des pesticides, qui peut être le même cas pour les engrais, le gouvernement devrait assister les agriculteurs avec les subventions pour leur permettre de s'en procurer. Par ailleurs, les agriculteurs achètent leur matériel végétal et semences principalement de manioc et de maïs sur les marchés locaux (34,43 %), auprès de SENASEM et TECHNISEM (27,15 %), de l'INERA M'vuazi et Kiyaka (26,96 %) et certains sont distribués par la FAO (11,46%). Ces résultats montrent que l'agriculture de la RD Congo est encore à la traîne en ce qui concerne l'utilisation des engrais et des pesticides. L'effort doit être fait pour rendre les intrants agricoles disponibles aux agriculteurs et faciliter l'acquisition par les femmes des terres agricoles afin qu'elles aussi puissent être plus impliquées dans le secteur agricole en RD Congo.

Mots clés : Evaluation, intrants, utilisation, exploitations agricoles, taille, sexe

INTRODUCTION

Much of the sustained agricultural growth necessary for economic transformation comes from expanded input use, especially of modern inputs like improved seeds, fertilizers and other agro-chemicals, machinery, and irrigation that embody improved technologies (SHEAHAN and BARRET, 2017).

The efficient use of the agricultural inputs in combination with the good cultural practices such as the intercropping and crop rotations contribute in stopping soil degradation, restoration of soil fertility and in the improvement of agricultural production. In DR Congo however, as in most of the sub-Saharan countries, the non availability of agricultural inputs of good quality at the right time and place is one of the factors of their poor use (FAO, 2009).

Also because of poor financial resources, peasant farmers use small quantities of the agricultural inputs (SHEAHAN and BARRET, op.cit). In addition, the lack of the organization and the coordination of the farmers limit their availability (KASONGO, 2008).

FONTAINE and SINDZINGRE (1991) stressed earlier that to answer the demand of agricultural inputs requires the knowledge of their functions by the users, which is not common among the majority of the African peasant farmers.

In addition, the low level of the knowledge of the African farmers in handling the agricultural inputs and the poor research in this area also limit their use at large scale (KASONGO, op.cit).

The unavailability of improved seeds and agricultural inputs; the inadequate cultural practices; the high incidence of diseases; pests and insects; resulting in poor crop yields, have pushed the country to import the rice, the maize flower, the oil palm, etc (CHAUSSE et al., 2012).

The agricultural activities in the plateaux of Batéké in Kinshasa province also encounter the difficulties of accessing to the agricultural inputs and in most cases, the farmers are not assisted by the extension workers.

In the present study, we evaluate the level of the use of the agricultural inputs, mainly the fertilizers, the pesticides and the improved seeds by the farmers of BU administrative organization in the plateaux of Batéké, Kinshasa town Province in DR Congo and also determine the sizes of the farms and the sex of these farmers.

The study will therefore give information about the trend of the modernisation of the agriculture in the area.

STUDY AREA AND METHOD

Study area

The Bu administrative organization, situated in the commune of Maluku in the Batéké plateaux, Kinshasa province, was selected as the study area because of its rural characteristic and agricultural activities.

Maluku is an urban-rural commune covering about 80 percent of the total area of Kinshasa province. The majority of its population are peasant farmers living mainly on agriculture, fishing and livestock farming. The hunting is no longer practiced because of the destruction of the forest by the charcoal makers (ANONYME, 2016).

The commune of Maluku has the border with the Republic of Congo and is limited in the East by the territories of Kwamouth and Kenge, in the West by the commune of N'sele, in the North by the river Nkao up to the river Maindombe and in the South by the territories of Kimvula and Kasangulu in the province of Kongo-Central (BILOSO, 2008).

The plateaux of Batéké have large and deep valleys with the altitude between 600 and 700 m and sandy soils. These soils are marginal and have a limited agronomic value because of the poor water holding capacity and soil fertility (MALELE, 2003). Farmers grow on these soils mainly the maize (*Zea mays* L.), the cassava (*Manihot esculenta* Crantz), the groundnut (*Arachis hypogeae* L.) and the soya bean (*Glycine max* L. Merr).

The map of the experimental site is shown in figure 1.

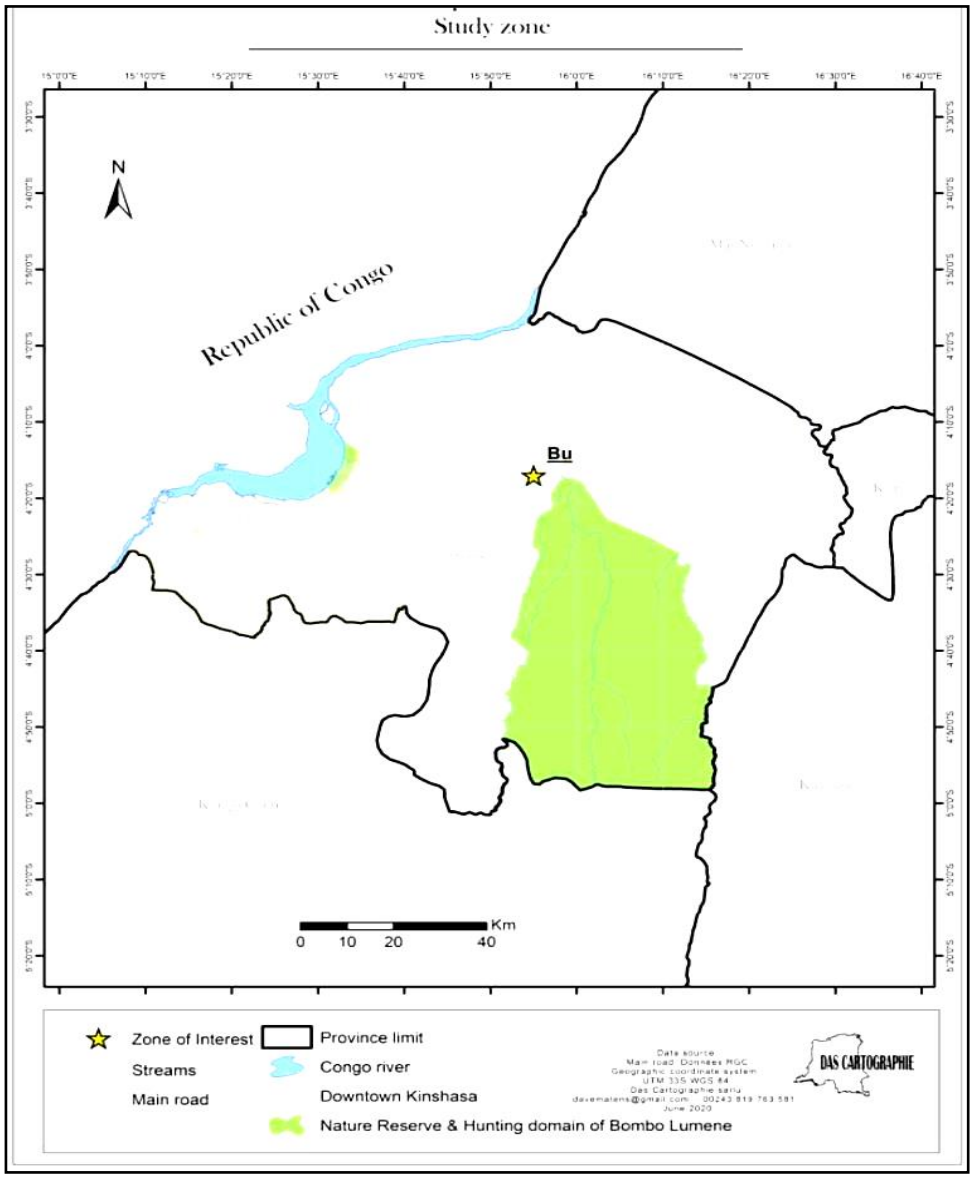

Figure 1. Map of the study area

The climate is the type of AW_4 of the Köppen classification (COMPERE, 1970) with the alternate of two seasons: a dry season from June to the middle of September and a rainy season from the middle of September to the end of May. February, March and April are the hottest months

(25. 5 °C) while July the coolest (22. 1°C). The mean air relative humidity is high with the highest value of 88. 1 % in December and the lowest of 76.4% in September.

The annual rainfalls are abundant varying from 1300 to 1600 mm with a bimodal and irregular distribution (COMPERE, op.cit).

Two types of the vegetation are predominant in the plateaux of Batéké: the woody vegetation and the large savannahs (PAUWELS et NZAYILU, 1993).

Materials

Sheets of the questionnaire were used to record the answers of the interviewed farmers of the BU administrative organization.

Methods

The descriptive and documentary methods as well as the direct observation, the interview and the questionnaire techniques were used for the description of the study area and for the data collection.

The local workers of the ministry of agriculture and the farmers themselves participated in the determination of the size of farms. A preliminary survey was carried out to test the suitability of the questionnaire.

A sample of sixty farms was selected from six villages on the basis of a reasonable choice taking into account the villages where the agriculture represents the main activity.

The farmers of the BU administrative organization, while recording their sex, have to answer the following questions:

1. What are the sizes of your farms?
2. What are the types of agricultural inputs (insecticides, fungicides, inorganic fertilizers, manures, improved or local seeds) commonly used?
3. Where do you get these inputs?

Data analysis

The data of the different studied parameters were transformed in percentages on standard basis equal to 100 and used to drawn the graphs for the interpretation of the results (VALETTE, 2007).

RESULTS AND DISCUSSION

Results

Sex of the interviewed farmers

The results of this parameter are presented in figure 2.

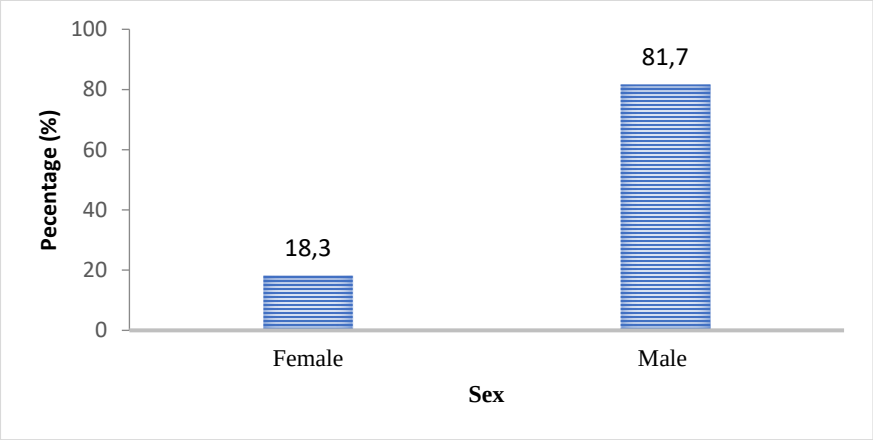

Figure 2. Sex of the farmers

The figure indicates that the majority (81.7%) of the interviewed farmers are men with a low percentage (18.3%) of women. Therefore, the farming activities in the area are carried out by men. It was observed that most of these men are politicians and businessmen who have financial means to acquire the agricultural land.

Sizes of the farms in the surveyed area

The sizes of the cultivated farms in BU administrative organization are shown in figure 3.

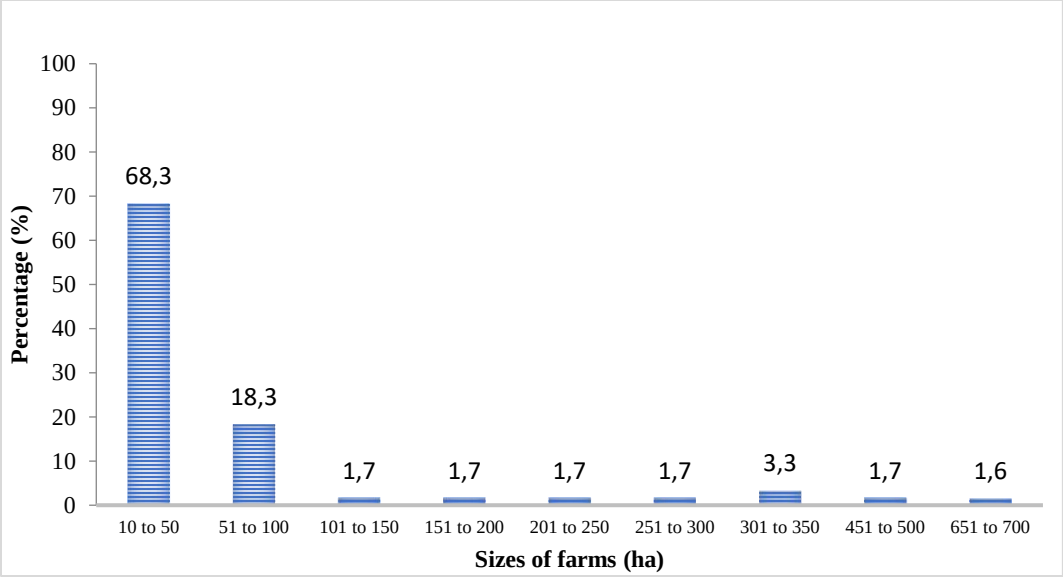

Figure 3. Sizes of the farms in the surveyed area

The results of the figure 3 indicate that 68.3% of the farmers own 10 to 50 ha of cultivated land followed by those having 51 to 100 ha (18.3%). But very few of them (1.6 % to 3.3%) have 101 ha to 700 ha.

Use of the fertilizers by the farmers

The results of the surveyed farmers on the use of the fertilizers are shown in figure 4.

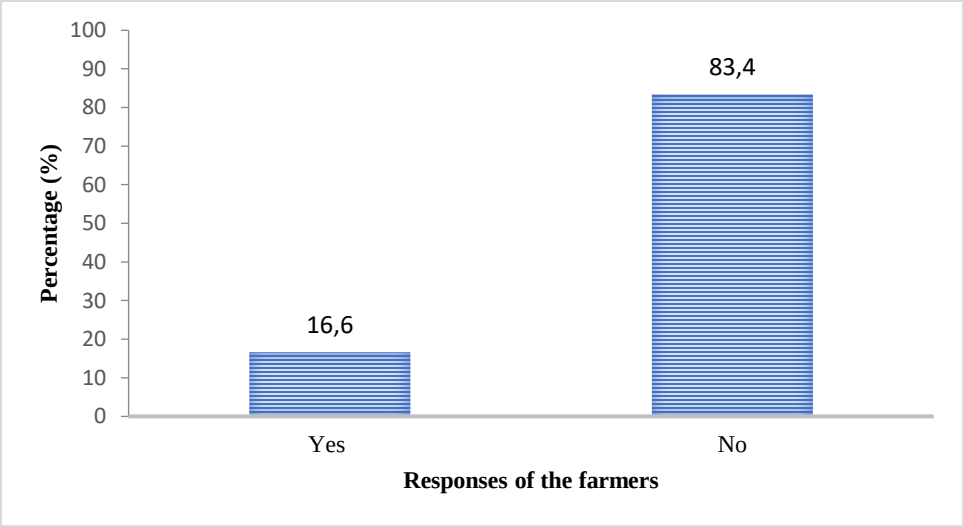

Figure 4. Responses of the farmers

Most of the surveyed farmers (83. 4%), as shown in figure 4, do not apply the inorganic fertilizers in their farms, except 16. 6% of them. The no use of inorganic fertilizers is due to their unavailability and high cost on the local market and probably because of the weak level of the knowledge of the farmers on the importance and the use of fertilizers.

Types of organic materials used as manure

The types of the organic materials used as manure by the farmers of Bu administrative organization are presented in figure 5.

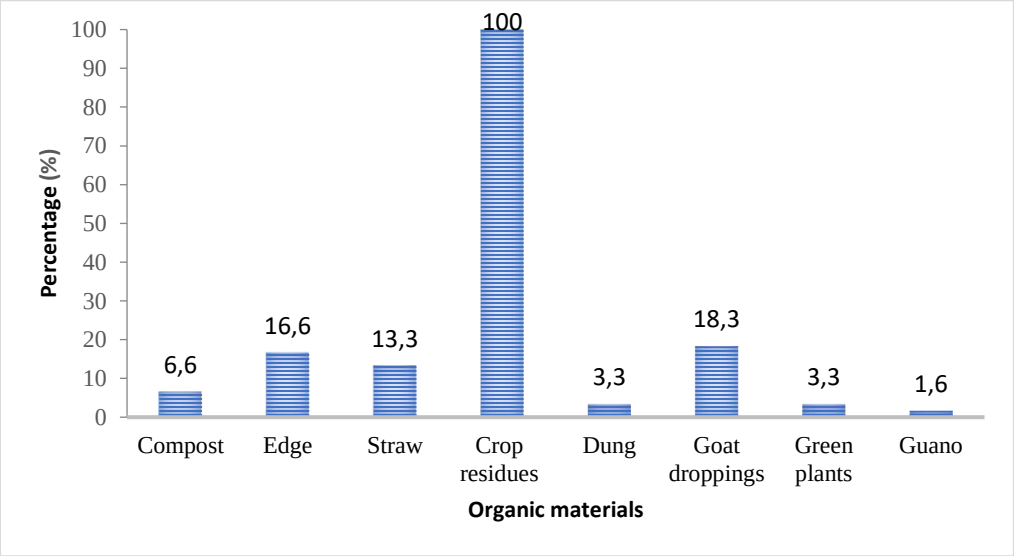

Figure 5. Percentage of the use of the organic materials as manure

Figure 5 indicates that the crops residues are used by all the interviewed farmers (100%) as manure. In addition to the crop residues, 18.3% of them use the goat droppings, followed by the edge (mixture of animal excrements and urine) (16.6%), the straws (13.3%), the compost (6. 6%) while the cow dung, the green plants and the guano (bat waste) were least used (1.6 % - 3. 3%). The straws are mainly obtained from the natural grasses in the farms which are cut and buried before planting.

Use of the pesticides

Figure 6 presents the results of the survey on the use of the pesticides in the study area.

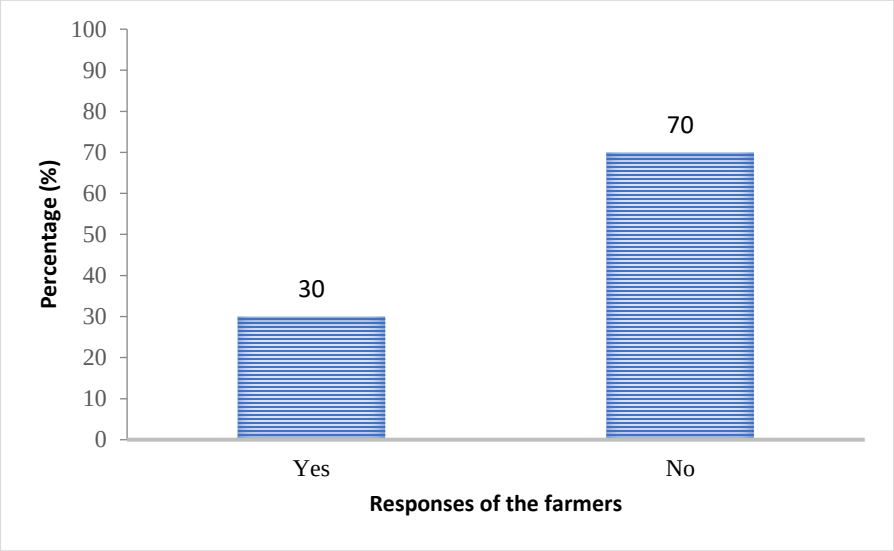

Figure 6. Percentage of the use of the pesticides

The results mentioned in figure 6 indicate that 70% of the interviewed farmers do not use the pesticides while 30% of them do use them. The major constraints for the small-scale farmers to use the pesticides are probably the difficulty to get the government grant to purchase the agricultural inputs.

Types of the pesticides used

Figure 7 presents the types of the pesticides used in the study area.

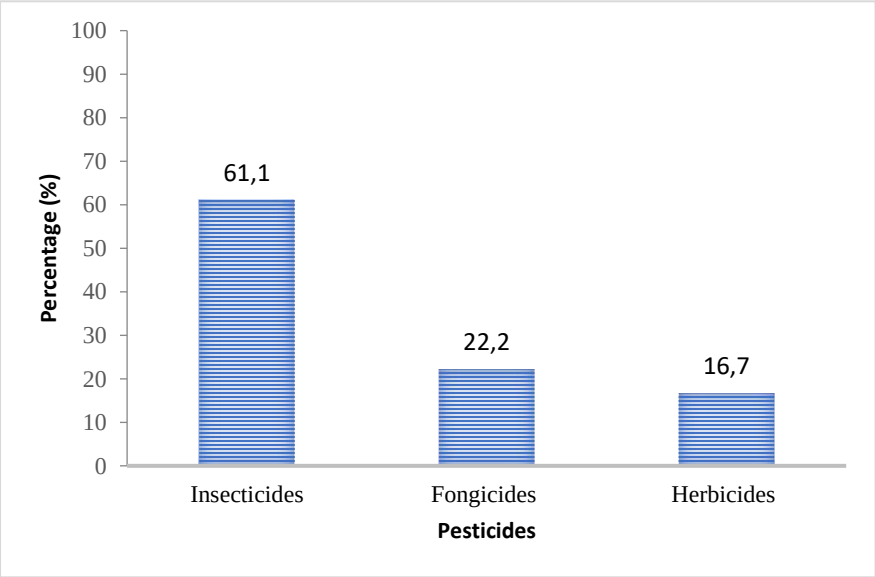

Figure 7. Pesticides used in the area of study

We observe from the figure 7 that the insecticides are the most used by the surveyed farmers (61. 1%) followed by the fungicides (22.2%) and the herbicides (16. 7%). The presence of the insects and other pests in farms oblige some farmers to use the insecticides as a mean to combat them.

Sources of supply of the pesticides

They are indicated in figure 8.

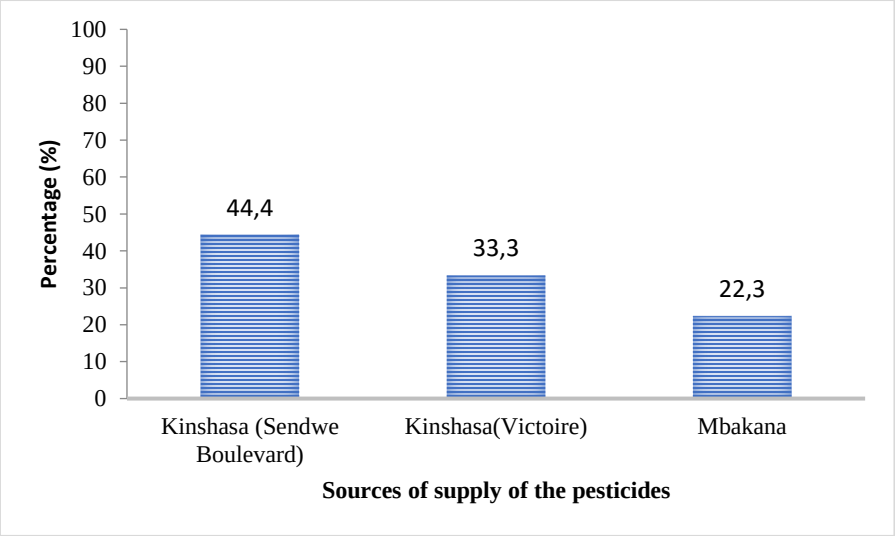

Figure 8. Sources of supply of the pesticides

The pesticides used in Bu administrative organization (figure 8) are all locally purchased in three shops situated in Kinshasa as follows: Sendwe boulevard (44. 4%), Victoire avenue (33.3%) and at Mbakana market (22.3%).

Sources of supply of improved seeds

The different sources of the seeds used in the surveyed area are mentioned in figure 9.

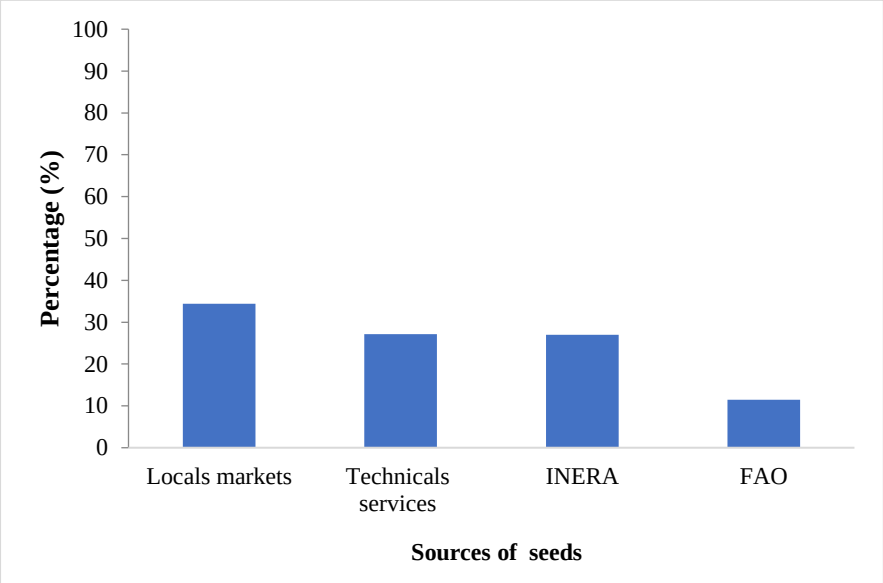

Figure 9. Sources of supply of improved seeds

Figure 9 indicates that farmers obtain the crop seeds mainly from the local markets (Mbakana. Victoire and Sendwe), followed by technical services (SENASEM et TECHNISEM), the INERA (M'vuazi et Kiyaka) and the FAO. Apart from INERA and FAO, the other sources may not provide the improved seeds.

Discussion

The survey conducted in Bu administrative organization has shown that 81, 7% of men against 18, 3% of women own agricultural farms in the area (figure 2).

The men had more agricultural farms than the women. This is because that these men are politicians or businessmen and hence they have more financial resources to buy the agricultural land than the women.

HERBST (2002) has indicated that traditional authorities, historically the custodians of customary land, are selling it to those with money and influence, transferring an unknown but certainly large amount of land from future generations of rural-born people to investors, speculators, and state-led projects.

NJOBE and KAARIA (2015) have reported that the African women play a central role in the continent's agriculture sector where they represent 52% of the total population and are

responsible for approximately 50% of the agricultural labour on farms in Sub-Saharan Africa (SSA). They also produce 60% to 80% of the continent's food.

However they made an observation that women described as farmers, livestock owners, workers and entrepreneurs within the sector, consistently experience limited access to productive resources, compared to their male counter parts.

According to OCDE/FAO (2016)**,** if the women farmers could have the same access to the productive resources as men, they could have increased the crop yields and free millions of people from hunger. Therefore, women can be encouraged and assisted to also acquire agricultural lands to effectively contribute to DR Congo agriculture production.

The results of the study have indicated that the majority of the surveyed farmers (68.3%) have 10 to 50 ha of cultivated land (Figure 3) which is in the range of small and moderately sized farms (MOYO, 2016).

The Alliance for a Green Revolution in Africa (2014) has reported that in sub-Saharan Africa, the small sized farms represent 80 % of agricultural farms and utilise about 175 millions of people.

MOYO *(2016) adds* that 80 % of agricultural lands in Sub-Saharan Africa and Asia are exploited by small-scale farmers, cultivating at maximum 10 hectares. LOWDER *et al*. (2016) have observed that the agricultural land size in SSA is less than 1 hectare. It is these small and moderately sized farms that end up providing more food for people to eat than do the large farms.

The study has shown that most of the surveyed farmers (83.4%) (figure 4) do not apply the inorganic fertilizers in their farms, except 16.6% of them. The no use of inorganic fertilizers may be due to their unavailability and high cost on the local market and probably because of the weak levels of the knowledge of the farmers on the importance and the use of fertilizers.

This has a negative impact on agriculture production resulting in poor crop yields. In addition, soil degradation as a result of demographic evolution and excessive land use which shortens the fallow period and not allowing soil natural fertility restoration, have a negative impact on crop yields. In fact, the mean yields of cassava and maize in the surveyed area were estimated at 2,798 and 1,116 kg/ha, respectively.

However, the yields of cassava were estimated at 10.9 t/ha under peasant farmers conditions to 25 à 55 t/ha in big farms or research stations for cassava and that of maize from 800 – 1,000 kg ha-1 in traditional farmers fields to 3,000 – 8,000 kg ha-1 in the big farms as in Katanga or research stations as at INERA Mvuazi (FAO, 2011) (NYEMBO et al., 2014) (ANONYME, 2018).

The study also showed that the crops residues are used as source of nutrients by all the surveyed farmers (100%) (figure 5). But a very low percentage (1.6 – 16.6%) of these farmers combine the crop residues with the goat droppings, the edge, the straws, the compost, the cow dung, the green plants and the guano.

This is the line with FAO, IFA et IMPHOS (2003) who advised that, before using the inorganic fertilizers, to use all sources of nutrients available such as cow dung, pig dung, crop residues, chicken droppings and all other organic materials.

But KELLY and NASEEM (2009) made an observation that even though organic and inorganic fertilizers are used in Sub-Saharan Africa (SSA), theirs quantities are extremely small. The evaluation of their quantities is recommended to know if they respond to crops demands.

They also add that historically, in the African agriculture, crop residues and animal manure were used to maintain soil quality. But most farmers relied on shifting cultivation rather than on soil amendments to maintain soil fertility and hence the crop yields. When yields declined, farmers cleared new land, allowing the previously cultivated land to lie fallow for ten to fifteen years.

However during the last few decades, SSA has experienced some of the highest population growth rates in the world (3 to 4% per annum). Rapid population growth has placed heavy demands on arable land in these countries where 50 to 90% of the population rely on agriculture for their livelihood.

Nowadays, the current fallows rarely exceed 2 to 3 years - a period that is too short to rebuild soil quality. Unfortunately, the decline in fallows has not been accompanied by the necessary increase in use of fertilizers (both organic and inorganic) to maintain soil quality and yields.

While many parts of the world are currently concerned by the negative environmental impacts of excessive fertilizer use such as eutrophication, salinization, aluminum toxicity, etc, most of Sub-Saharan African countries are suffering the negative environmental consequences of too little fertilizer use (rapid loss of soil nutrients, inadequate production of biomass for recycling nutrients and soil organic matter, etc.).

KASONGO (2008) agrees that the low level of crop productivity is a result of numerous endogenic factors which the main ones are the extensive characteristic and the poor technical level of the traditional agriculture. To these factors, there are also the unavailability of the agricultural inputs and the lack of agricultural funding.

The results of the study have indicated that the majority of the farmers of the study area (70%) do not use the pesticides, But few (30%) do use them (Figure 6); mainly the insecticides (61, 1%) followed by the fungicides (22. 2%) and the herbicides (16, 7%) to combat insects, pests and weeds (Figure 7). As for the fertilizers, the question still remains about the use of appropriate pesticides, with adequate quantity and at proper time.

As mentioned by FAO (2014), the constraints of not using the pesticides at large scale are the weak levels of the knowledge of the farmers to combat the crop pests and also the weak research capacity in plant pathology. Also in the surveyed area, the pesticides are obtained from the small shops and local markets (figure 8).

CONCLUSION

The aim of the present study was to evaluate the level of the use of the inorganic and organic fertilizers, the pesticides (insecticides, fungicides and herbicides), of improved seeds by the farmers of Bu administrative organization in the plateaux of Batéké, commune of Maluku, Kinshasa province in DR Congo. The sex of the farmers and the sizes of theirs farms where also determined as well as the source of the agricultural inputs. It was expected that the study will give an indication about the state of the modernisation of the agriculture in the area.

A sample of sixty farms was selected and the descriptive and documentary methods in combination with the direct observation, the interview and the questionnaire techniques were used to describe the study area and to collect the data on the use of agricultural inputs.

The results of the survey showed that most of the farmers are men with a low percentage of women. Some authors made an observation that if the women farmers could have the same access to the productive resources as the agricultural land, as observed for men, they could have increased the crop yields and free many of people from hunger.

Also, the surveyed farmers use more the organic materials as source of nutrients for their crops, mainly cassava and maize, than the inorganic fertilizers**.** The traditional practices of using the manure and the availability of organic materials can justify the interest of their use in the study area.

The inorganic fertilizers as well as the fungicides and the herbicides are used at a very low level by these farmers probably because of their unavailability and high cost on the local market. This can also due to the weak levels of the knowledge of the farmers on the importance and the use of fertilizer.

But farmers seem to give more preference to the insecticides than to the herbicides and fungicides because of the attacks of their crops by insects. They also give more preference to the organic fertilizers due to their availability and the traditional practices of the farmers to use them.

It was observed that the farmers buy these pesticides, which may be the same for the inorganic fertilizers, in small local shops in Kinshasa streets.

Concerning planting material and seeds, mainly of cassava and maize, farmers do purchase them in local markets, but they also obtain them from the technical services (SENASEM and TECHNISEM), the INERA Mv'uazi and Kiyaka or donated by the FAO.

But for the fertilizers as well as for the pesticides, the question about the use of appropriate products and adequate quantity and at proper time must be answered. Due to their high cost, the government should assist the farmers with the grants to allow them buy these inputs.

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