СИСТЕМА ВОЗДЕЛЫВАНИЯ КУКУРУЗЫ МАЛЫМИ ФЕРМЕРАМИ В АГРОЭКОЛОГИЧЕСКОЙ ЗОНЕ ЦЕНТРАЛЬНОГО БУРУНДИ И ЕЕ ПРЕИМУЩЕСТВА

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Кукуруза - одна из основных культур, играющих важную роль в обеспечении продовольственной безопасности и экономики домашних хозяйств в Бурунди. Среди проблем, которые мешают улучшить его производство, - заболеваемость и совки, а также небольшие размеры земли. Изучение агротехники, проведенное на основе опроса, показало, что кукуруза в 43% хозяйств ассоциируется с 3 ± 1 культурой. Расстояние между растениями кукурузы составляет 59 ± 12 см, а между рядами - 85 ± 14 см. Картофель и фасоль - самые распространенные культуры в системе ассоциаций с кукурузой. Эта система комбинирования сельскохозяйственных культур с кукурузой позволяет производить больше на небольших участках и диверсифицировать сельскохозяйственные спекуляции. Эта система возделывания также позволяет производить в течение всего сезона, потому что культуры имеют переменную продолжительность цикла созревания. Это позволяет домашним хозяйствам непрерывно производить и удовлетворять свои повседневные потребности в продуктах питания

Ключевые слова: КУКУРУЗА, СИСТЕМА ПРОМЕЖУТОЧНОГО ПОСЕВА, ПРЕИМУЩЕСТВА, МЕЛКИЕ ФЕРМЕРЫ, БУРУНДИ

MAIZE CROPPING SYSTEM AMONG SMALL FARMERS IN THE AGROECOLOGICAL ZONE IN CENTRAL BURUNDI AND ITS ADVANTAGES

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Maize is one of the main crops that plays a major role in food security and household economy in Burundi. Among the challenges that prevent the improvement of its production is the incidence of diseases and armyworm and the small size of land. The study of agricultural practices carried out on the basis of a survey showed that maize in 43% of farms is associated with 3 ± 1 crop. The spacing between maize plants is 59 ± 12 cm and that between the rows 85 ± 14 cm. The potato and the bean are the most common crops in the system of associations with maize. This system of combining crops with corn makes it possible to produce more on small plots and to diversify agricultural speculations. This cropping system also makes it possible to produce throughout the season because the crops have a variable maturity cycle length. This allows households to continuously produce and meet their daily food needs

Keywords: MAIZE, INTERCROPPING SYSTEM, ADVANTAGES, SMALL FARMERS, BURUNDI

Introduction

Maize is among the main crops grown in Burundi. It is cultivated in all agro-ecological zones of the country from the hills to the marshes. However, maize yield remains low and most of the production is consumed within households. Sometimes, part of it is sold to meet other needs, such as buying food or paying the costs of care or schooling for the children.

Maize is a crop that is easy to grow because it is less demanding in terms of agricultural inputs and means of maintenance. In the intercropping system(ICS), maize is grown together with two or more plants on the same field [2,3]. It is cultivated in three seasons during the year namely seasons A, B and C. Season A is from September to January, season B from February to May and season C from June to September. Cropping season A is the season where a large maize production is observed (67% of the total production for the three seasons) [1]. However, diseases such as band and caterpillar diseases negatively influence yield. Sowing on different dates is one of the strategies that limits competition between crops for soil nutrients and increases maize yield [4].

In this context, a survey to acquire data on maize cropping system(CS) and its benefits for small farmers was carried out in central Burundi.

MATERIAL AND METHODS

The Giheta commune of the province which constitutes the study area is one of the eleven communes of the Gitega province where we find today the political capital of Burundi.

Figure 1. Geographical location of Giheta commune

This study area is located in the central plateaus, an agro-ecological zone in the center of the country. In this municipality, the altitude varies from 1600 to 2000 m and the average monthly rainfall(P) is 94 mm. The annual average temperature(T) is 20^0C with a variation of about 3^0C.

Figure 2. Ombrothermal diagram (P = 2T)

The drought lasts from June to September. Optimal precipitation is found during the month of October. This is the ideal time for sowing maize during growing season A. The hydrographic configuration is an asset for agriculture. Indeed, the lands bordering the rivers are made of alluvium offering an opportunity for irrigation even in the dry season. According to projection data, the municipality is populated by approximately 116,200 inhabitants with an annual growth rate of 2.4%. Agriculture occupies more than 95% of the population of this commune. The agricultural system remains traditional despite efforts to improve agricultural practices, including agricultural techniques that respect the environment, the use of selected seeds and agricultural inputs. The average cultivable area per household in this municipality is 0.3 ha.

The study was conducted during Season A from September to January. This season is recognized as very favorable for maize. Information related to the cropping system was obtained from measurements, observations and study of the density of crops in fields of the farmers. Thus, data relating to the spacing and the number of crops associated with maize were collected using Kobotoolbox and analyzed using Microsoft Excel and Munitab version 20 software. This made it possible to obtain a relationship between different variables taken into account in the study.

Results and discussions

The fields that have been used for measurement and observation are on the hill and for the most part not far from the houses. The crops in these fields were sown on the same date. Banana is the crop that dominates the landscape and considered a soil-fixing crop. It plays a very preponderant role in the socioeconomic life of households. maize is mostly found in places outside banana plantations although there are also maize fields where bananas are found.

The agricultural system in the studied area is characterized by an association of crops. Indeed, the small size of the land does not allow a monoculture in the conditions where farmers want to diversify crops. Thus, the crops in intercropping system(ICS) with maize are mainly beans, potatoes, bananas, sweet potatoes and cassava. The potato intervenes during the lean periods and is eaten with the beans before the corn is harvested. The importance of these crops in corn fields is shown in the following figure
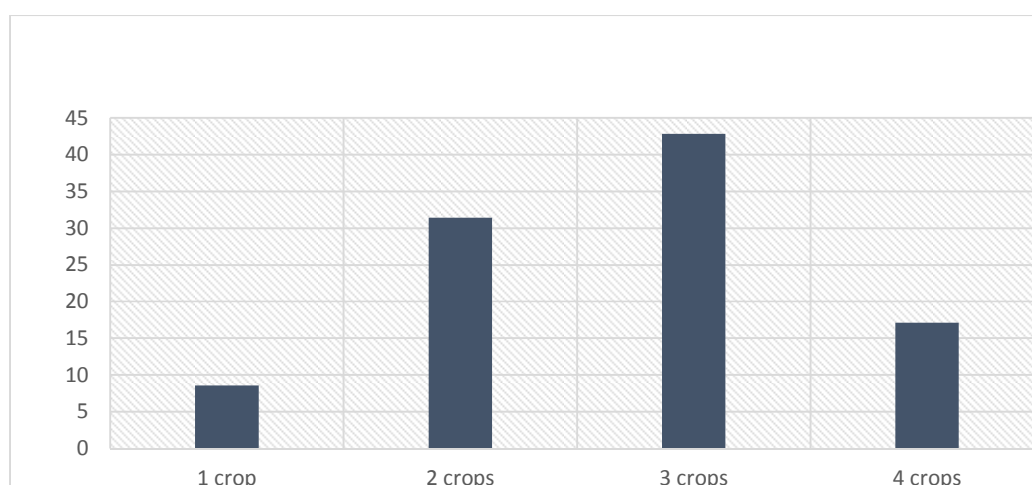

Figure 3. Number of crops associated with maize in the fields in percentage

Maize in the fields visited is generally associated with 3 crops. These crops vary from 1 to 4 but also, it is clear that there are fields of maize in monoculture although very rare. In fields visited, 43% are those where maize is associated with three crops, 31% with two crops, 17% with 4 crops and finally, 9% with a single crop.

In more than 52% fields, crops in association with maize are dominated by potatoes followed by beans, bananas, cassava and finally sweet potatoes. The density of these crops are very high and this promotes competition for nutrients in the soil and light, which has a negative impact on photosynthesis and hence on the yield of crops in CS.
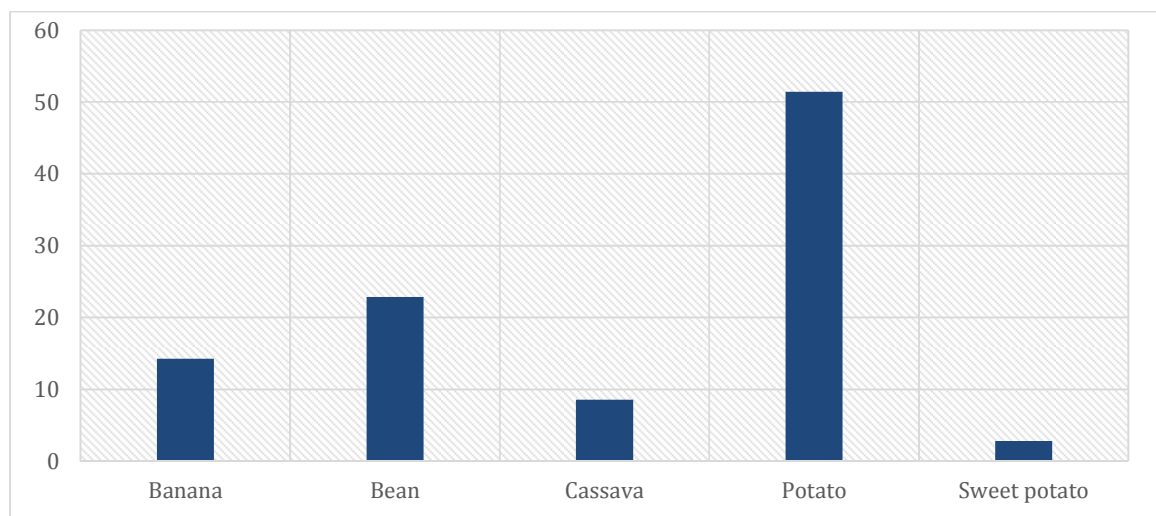
Figure 3. Dominant crops in the ICS with maize

The potato although in abundance in the fields, it is important to precise that this one grows mostly on its own and from the tubers that remain in the soil after the previous harvest. Beans, cassava and sweet potatoes are crops that are grown in this season. Banana is a perennial crop whose density conditions that of maize because in some cases it presents a shade that does not promote lighting and hinders photosynthesis in maize. That is the reason why maize is mostly found in places with low density in banana plants.

Efforts related to the modernization of maize cropping include the use of selected seeds and the adoption of row sowing. The seeds come from NGOs which support households and provide practical cultural advice to farmers.

Particular attention was paid to the spacing between rows and plants in this study. Indeed, it determines the density of the plants and hence the yield of maize. The results of this study show that small farmers(SF) do not use the same spacing between rows and plants.

The spacing between rows is on average 85 ± 14 cm and that between plants 59 ± 12 cm. Maize in the fields of SF is associated with 3 ± 1 cultures among those mentioned above.
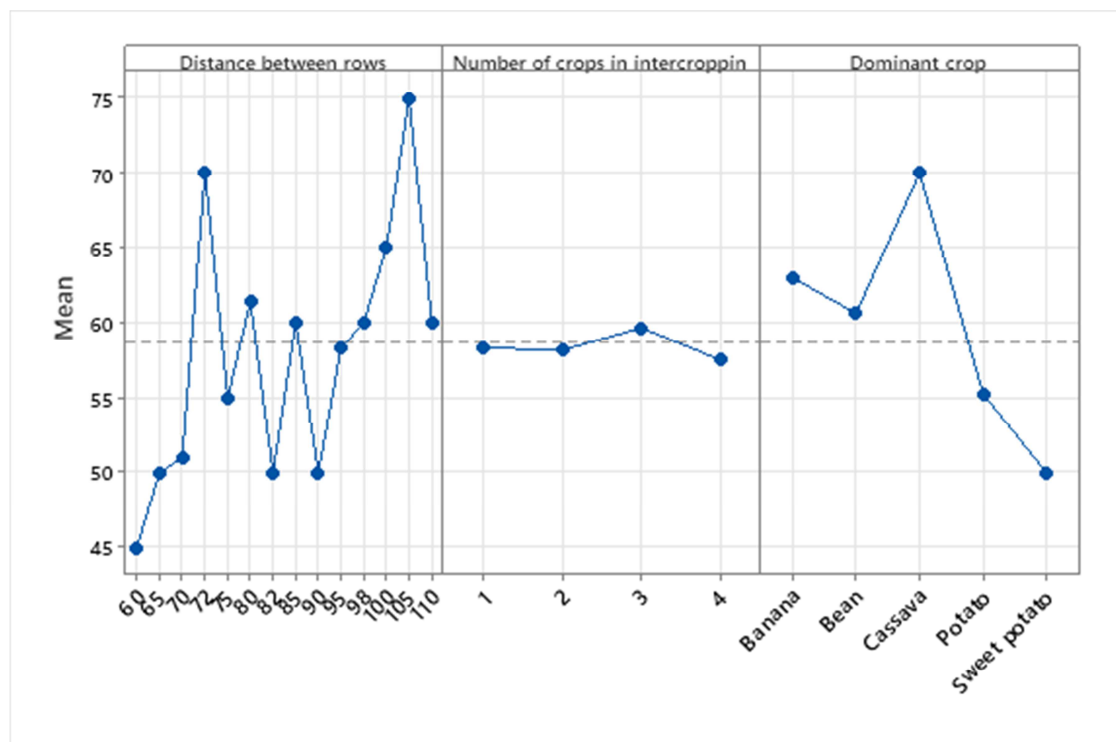

Figure 4. Main effects plot for distance between plants

The results show that the spacing between the plants do not depend on either the spacing between the rows or the number of crops associated with corn in the fields of SF (for n = 65 fields, the correlation between the number of crops in ICS and the spacing between maize rows on the one hand and between the spacing between plants on the other hand is weak (R < 0.5). The spacing between plants in the fields where maize is associated with the maximum of crops is lower than that observed in the case where it is in ICS with a single crop. We observe a large gap in the case of an association with three crops. From these results, we find difficult to explain the differences observed on the basis of the number of crops taken in the CS and the practices of SF.
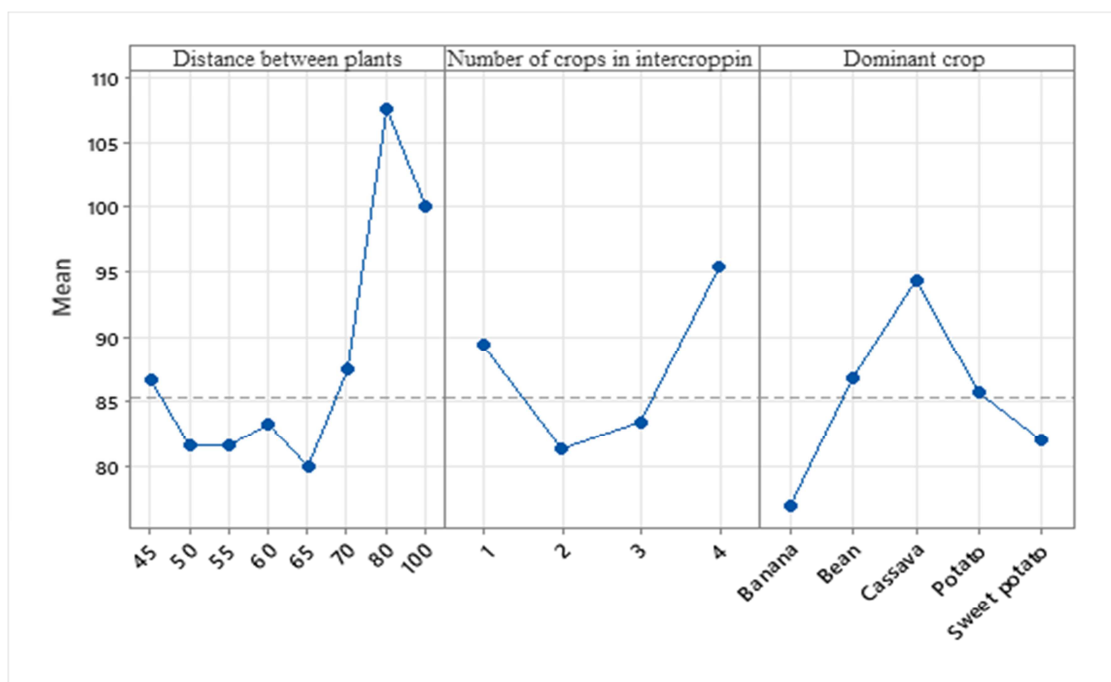
Figure 5. Main effects plot for distance between rows

Like the spacing between plants, the spacing between rows does not take into account the number of crops in CS. The greatest spacing between the rows is found in our case when the case of ICS with 4 crops. This tendency is not observed, however, in the case of a single crop. Because, the spacing is greater than that in the case of two crops. This suggests that, as in the case of plant spacing, the row spacing in the case of the maize ICS does not follow any pattern.

In such a CS, it is important to understand that the density in the field must be controlled in order to optimize the yield. In fact, ICS is an important recourse in developing countries where the land is cramped and agricultural techniques still rudimentary and do not allow more production on small plots of land.

CS increases the chances of production today, because if production is bad for one crop, it can be good for another which contributes to the survival of families. Crops in the ICS have different maturity cycles, so families always have to consume.

The tender bean leaves help meet the vegetable needs of families. The harvest period of the potato in CS comes before that of the bean and makes it possible to meet ends of the growing season. At the moment, the potato meal is accompanied by the green bean harvested from the same field. As for the dry beans harvested, part of it is eaten and another part is kept for the most part to serve as seeds for the following season. Maize is eaten in grilled, cooked, porridge or paste form.

Conclusion

The ICS with maize during the season A makes it possible to diversify crops and produce a lot on small plots, which allows households to meet their food needs. Indeed, it makes it possible to have harvests throughout the growing season. The diversification of crops also allows the diversification of foods which contributes to cope with the problems of malnutrition. They are sources of protein, carbohydrates, lipids and mineral salts. However, crop spacing follows an unclear pattern and improved modern techniques could help increase crop yields.

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