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# Analysis of Common Bean Production Constraints in Burundi's Acid Soils

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## Abstract

Farming is a main job occupying a large part of the Burundian population. Farming products are a main source of food system. While the soil is known for the acidity and suffering from many issues, this article targets to analyze the way by which common bean farmers achieve their production and if not, the problems they meet as obstacles to achieving their targets. We used a questionnaire administrated to a sample of 283 respondents in which we used KoboCollect tools in data collection. Data analysis was helped by IBM SPPS 25 tools and Microsoft Office Excel. Besides problems related to financial means to buy fertilizers, farming common beans is getting hard. Issues like climate variability, constraints linked to the lack of new improved seeds' varieties, high seed prices and lack of investment capital in the domain of beans farming.

## Keywords

Beans, Farmer, Fertilizer, Acid Soil, Agricultural Production

## 1. Introduction

A maxim from ancient wisdom tells the world of all generations that people may eat to live and not live to eat (Kinasz et al., 2017; Nyabenda & Sindayigaya, 2023; Sindayigaya, 2020; Sindayigaya & Nyabenda, 2022; Weisburger, 2000; Yang et al., 2014). This then attracts people to the perception of food and eating by using qualitative marketing tools to select what is useful to life or not, and finally maps photographs representing thoughts and feelings about food and eating (Yang et al., 2014). Management of food and eating helps strengthen to fight against

chronic diseases in the world related to nutritional components known as capable of resisting specific diseases, enhancing the risk through phenomena of promotion, exerting a beneficial effect in decreasing risk, or preventing the disease (Weisburger, 2000).

Farming or agricultural development systems became a science that always is mapping technology searching means to provide food to humanity. Land tenure, labor arrangements, and classificatory systems employed by different farming methods modifying local farming traditions that are perceived as not favorite to providing food and beans occupy a big portion in African quality feeding (González, 2010; Jonya et al., 2023; Sindayigaya & Toyi, 2023a). Targeting to optimize the production in developmental strategies' systems, people are then imagining their will on food supply chains with several quality parameters of eating and food needs (Saltini et al., 2013; Sindayigaya, 2023a, 2023b).

Burundi pertains to the central Africa and should think about the implementation plans to enhance the nutrient-rich bean acknowledged by their storage roots to improve food quality and availability and sustainability of farming systems which are applied in the most part of Central and West Africa (Gruneberg, 2016). Beans supply answers to consumers' preferences for plant proteins as alternatives to substitute animal sources not genuine to human long lives, alternatives that increased for years due to improved nutritional and environmental sustainability benefits. Beans are known as bean as a sustainable source of high quality protein for food, through optimized genetics, farming and processing (Ndayisenga & Sindayigaya, 2024; Nduwimana & Sindayigaya, 2023b; Tsolakis et al., 2019). It has therefore been very important in the expansion of bean production trying many categories but also applying many systems till the solution is found just by benefiting from all opportunities and strategies for further increasing the productivity and use (Muehlbauer & Kaiser, 2012; Sabiraguha et al., 2023; Sindayigaya et al., 2016).

Among other solutions, increasing beans production may also depend on the capacity to transform the soil acidity. Such response that Burundi should imitate has been applied in South Ameriac where they used Rhizobium phaseoli to acid pH, aluminium (Al) and manganese (Mn) in nutrient medium under field conditions to help the low soil pH to raise bean production when the land acquires tolerance of these stresses related to the survival and nodulating ability of strains of R. phaseoli in acid soils (Graham et al., 1982). For instance, Brazil used and is using fertilizers as a successful means by which it improves and increases annual crops production despite the Brazilian farming soils contain acid components but grow productive beans (Fageria & Baligar, 2001; Ndayisenga & Sindayigaya, 2024; Nduwimana & Sindayigaya, 2023a; Sindayigaya & Toyi, 2023a).

In Burundi as in the most part of the Sub-Saharan Africa, drought is the most important production risk that affects a major part of the beans' production (Beebe et al., 2014). It is a such case that is observed in reduce soil acidity with associated low nutrient availability Ethiopian highlands where they integrate the

use of organic and inorganic amendments to improve crop production (Ciza et Sindayigaya, 2023; Fekadu et al., 2018; Mpabansi, 2023). Fighting against this issue requires financial resources and probably the governmental assistance and help to the population who are maximally under extreme poverty (Beebe et al., 2012; Jonya et al., 2023; Sindayigaya & Toyi, 2023b). Such response has long ago been applied in Kenya where farmers required financial return from the government (Ndung'u et al., 2006; Sindayigaya, 2020, 2023b).

This article targets to analyze the way farmers of common beans achieve their production in Burundi facing the acidity of the soil but also having to produce beans which is useful to feed their families.

## 2. Methods and Methodology

This article is a result of a survey conducted by 4 interviewers with 283 respondents (chosen randomly) on the following date: 2023-04-24, 2023-04-26, 2023-05-16, 2023-05-17, 2023-05-182023-05-31, 2023-06-01, 2023-06-13, 2023-06-14, 2023-06-15, 2023-06-29, and 2023-07-04.

The survey was conducted in 15 sub-hills of 4 hills (**Figure 1**):

- 70 from Kizingoma hill in Makamba commune and province;
- 71 respondents from Mitakataka hill in Bubanza commune and province;
- 72 respondents from Mukonko hill in Nyabiraba commune and Bujumbura province;
- 70 respondents from Shanga hill in Buhiga commune and Karusi province.

The target population of this article is women (147 respondents) and men (137 respondents) (**Figure 2**).

240 respondents are from households whose chiefs are of male, 41 respondents from families whose chiefs are females, and 2 from orphan children (**Figure 3**).

173 of our respondents were chiefs of their households and 113 were only members of their households (**Figure 4**).

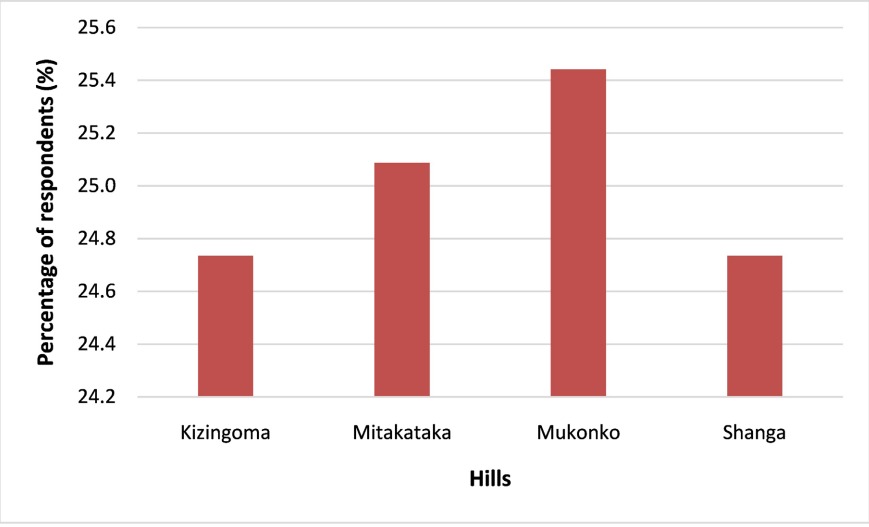


**Figure 1.** Hills origin of respondents.

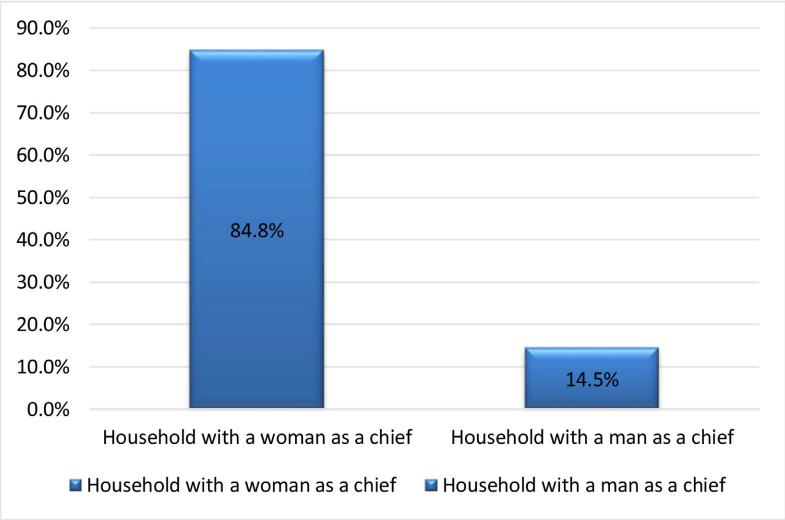


**Figure 2.** Gender consideration of our respondents.

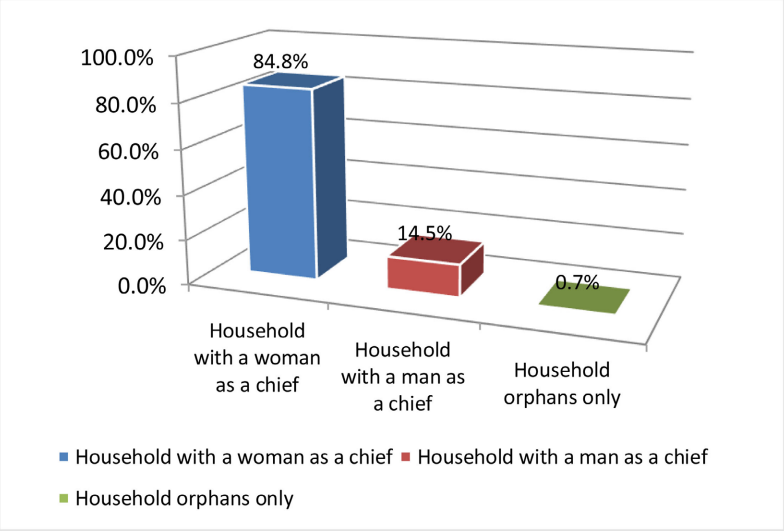


**Figure 3.** Category of household.

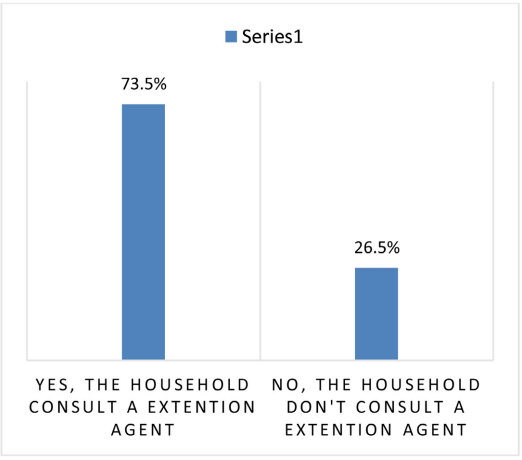


**Figure 4.** Distribution of households according to respondent status.

Data collection was used with Kobokollect tool. IBM SPSS 25 software (Statistical Package for Social Sciences IBM 25) and Microsoft Office Excel were used to enter data on a model beforehand. Zotero software was used for references and biography throughout the text.

## 3. Main Results Analysis

In this part, we present the results in tables or figures.

During the season 2022 A, Table 1 shows that among 283 respondents to our questionnaire, 240 representing 49.5% answered that they produced zero kilos. 17 households (6%) produced 20 kg each, 14 households (4.9) produced 30 kilos each, and 20 produced 50 kilos. Other quantities were produced by less than 10 households.

Table 1. Estimated household production of bean variety one for 2022A (kg) on their farm.

| Production in kilos | Frequency | Percentage | Valid percentage |
|---|---|---|---|
| 0 | 140 | 49.5 | 49.5 |
| 4 | 1 | 0.4 | 0.4 |
| 5 | 3 | 1.1 | 1.1 |
| 6 | 1 | 0.4 | 0.4 |
| 8 | 1 | 0.4 | 0.4 |
| 10 | 8 | 2.8 | 2.8 |
| 11 | 1 | 0.4 | 0.4 |
| 12 | 2 | 0.7 | 0.7 |
| 14 | 1 | 0.4 | 0.4 |
| 15 | 5 | 1.8 | 1.8 |
| 18 | 1 | 0.4 | 0.4 |
| 20 | 17 | 6.0 | 6.0 |
| 23 | 1 | 0.4 | 0.4 |
| 25 | 6 | 2.1 | 2.1 |
| 27 | 1 | 0.4 | 0.4 |
| 28 | 1 | 0.4 | 0.4 |
| 29 | 1 | 0.4 | 0.4 |
| 30 | 14 | 4.9 | 4.9 |
| 32 | 2 | 0.7 | 0.7 |
| 35 | 1 | 0.4 | 0.4 |
| 36 | 1 | 0.4 | 0.4 |
| 38 | 2 | 0.7 | 0.7 |
| 40 | 9 | 3.2 | 3.2 |
| 45 | 1 | 0.4 | 0.4 |

Continued

| | | | |
|---|---|---|---|
| 48 | 1 | 0.4 | 0.4 |
| 50 | 20 | 7.1 | 7.1 |
| 58 | 1 | 0.4 | 0.4 |
| 60 | 4 | 1.4 | 1.4 |
| 70 | 4 | 1.4 | 1.4 |
| 80 | 4 | 1.4 | 1.4 |
| 90 | 1 | 0.4 | 0.4 |
| 100 | 9 | 3.2 | 3.2 |
| 105 | 1 | 0.4 | 0.4 |
| 115 | 1 | 0.4 | 0.4 |
| 120 | 1 | 0.4 | 0.4 |
| 150 | 8 | 2.8 | 2.8 |
| 155 | 1 | 0.4 | 0.4 |
| 170 | 1 | 0.4 | 0.4 |
| 200 | 2 | 0.7 | 0.7 |
| 272 | 1 | 0.4 | 0.4 |
| 300 | 1 | 0.4 | 0.4 |
| 750 | 1 | 0.4 | 0.4 |
| Total | 283 | 100.0 | 100.0 |

During the season 2022 B, Table 2 emphasizes the situation showing that the 1st category is occupied households that produced less than 1 kilo. 36 respondents representing 12.7%; 18 respondents (6.4%) produced 50 kilos another group of 18 respondents produced 100 kilos; 14 (4.9%) said they produced 15 kilos; 13 (4.6%) produced 10 kilos; a category made of 11 households (3.9%) produced 10 kilos and another category of the same number of households produced 200 kilos; and a category of 10 households produced 20 kilos.

Table 2. Estimated household production of bean variety one for 2022 B (kg) on their farm.

| Production in kilos | Frequency | Percentage | Valid percentage | Cumulated percentage |
|---|---|---|---|---|
| 0 | 36 | 12.7 | 12.7 | 12.7 |
| 2.5 | 1 | 0.4 | 0.4 | 13.1 |
| 5.0 | 7 | 2.5 | 2.5 | 15.5 |
| 6 | 4 | 1.4 | 1.4 | 17.0 |
| 8 | 1 | 0.4 | 0.4 | 17.3 |
| 10 | 13 | 4.6 | 4.6 | 21.9 |
| 12 | 4 | 1.4 | 1.4 | 23.3 |
| 15 | 14 | 4.9 | 4.9 | 28.3 |

Continued

| | | | | |
|---|---|---|---|---|
| 16 | 2 | 0.7 | 0.7 | 29.0 |
| 17 | 1 | 0.4 | 0.4 | 29.3 |
| 20 | 10 | 3.5 | 3.5 | 32.9 |
| 21 | 1 | 0.4 | 0.4 | 33.2 |
| 23 | 1 | 0.4 | 0.4 | 33.6 |
| 25 | 9 | 3.2 | 3.2 | 36.7 |
| 28 | 1 | 0.4 | 0.4 | 37.1 |
| 29 | 1 | 0.4 | 0.4 | 37.5 |
| 30 | 11 | 3.9 | 3.9 | 41.3 |
| 35 | 9 | 32 | 3.2 | 44.5 |
| 37 | 1 | 0.4 | 0.4 | 44.9 |
| 40 | 5 | 1.8 | 1.8 | 46.6 |
| 45 | 7 | 2.5 | 2.5 | 49.1 |
| 50 | 18 | 6.4 | 6.4 | 55.5 |
| 53 | 1 | 0.4 | 0.4 | 55.8 |
| 56 | 2 | 0.7 | 0.7 | 56.5 |
| 57 | 1 | 0.4 | 0.4 | 56.9 |
| 58 | 1 | 0.4 | 0.4 | 57.2 |
| 60 | 5 | 1.8 | 1.8 | 59.0 |
| 62 | 1 | 0.4 | 0.4 | 59.4 |
| 65 | 1 | 0.4 | 0.4 | 59.7 |
| 67 | 1 | 0.4 | 0.4 | 60.1 |
| 68 | 1 | 0.4 | 0.4 | 60.4 |
| 70 | 9 | 3.2 | 3.2 | 63.6 |
| 75 | 1 | 0.4 | 0.4 | 64.0 |
| 76 | 1 | 0.4 | 0.4 | 64.3 |
| 80 | 8 | 2.8 | 2.8 | 67.1 |
| 85 | 1 | 0.4 | 0.4 | 67.5 |
| 90 | 4 | 1.4 | 1.4 | 68.9 |
| 100 | 18 | 6.4 | 6.4 | 75.3 |
| 105 | 2 | 0.7 | 0.7 | 76.0 |
| 110 | 3 | 1.1 | 1.1 | 77.0 |
| 115 | 1 | 0.4 | 0.4 | 77.4 |
| 120 | 5 | 1.8 | 1.8 | 79.2 |
| 130 | 2 | 0.7 | 0.7 | 79.9 |
| 150 | 9 | 3.2 | 3.2 | 83.0 |
| 170 | 1 | 0.4 | 0.4 | 83.4 |
| 180 | 1 | 0.4 | 0.4 | 83.7 |
| 200 | 11 | 3.9 | 3.9 | 87.6 |

**Continued**

| | | | | |
|---|---|---|---|---|
| 215 | 1 | 0.4 | 0.4 | 88.0 |
| 220 | 1 | 0.4 | 0.4 | 88.3 |
| 250 | 7 | 2.5 | 2.5 | 90.8 |
| 270 | 1 | 0.4 | 0.4 | 91.2 |
| 275 | 1 | 0.4 | 0.4 | 91.5 |
| 300 | 7 | 2.5 | 2.5 | 94.0 |
| 350 | 2 | 0.7 | 0.7 | 94.7 |
| 380 | 2 | 0.7 | 0.7 | 95.4 |
| 400 | 2 | 0.7 | 0.7 | 96.1 |
| 450 | 2 | 0.7 | 0.7 | 96.8 |
| 500 | 2 | 0.7 | 0.7 | 97.5 |
| 520 | 1 | 0.4 | 0.4 | 97.9 |
| 550 | 1 | 0.4 | 0.4 | 98.2 |
| 560 | 1 | 0.4 | 0.4 | 98.6 |
| 600 | 1 | 0.4 | 0.4 | 98.9 |
| 760 | 1 | 0.4 | 0.4 | 99.3 |
| 850 | 1 | 0.4 | 0.4 | 99.6 |
| 1000 | 1 | 0.4 | 0.4 | 100.0 |
| Total | 283 | 100 | 100 | |

During the season 2022 C, Figure 5 shows that out of 283 respondents, 264 corresponding to 93.3% did not produce any kilo of beans.

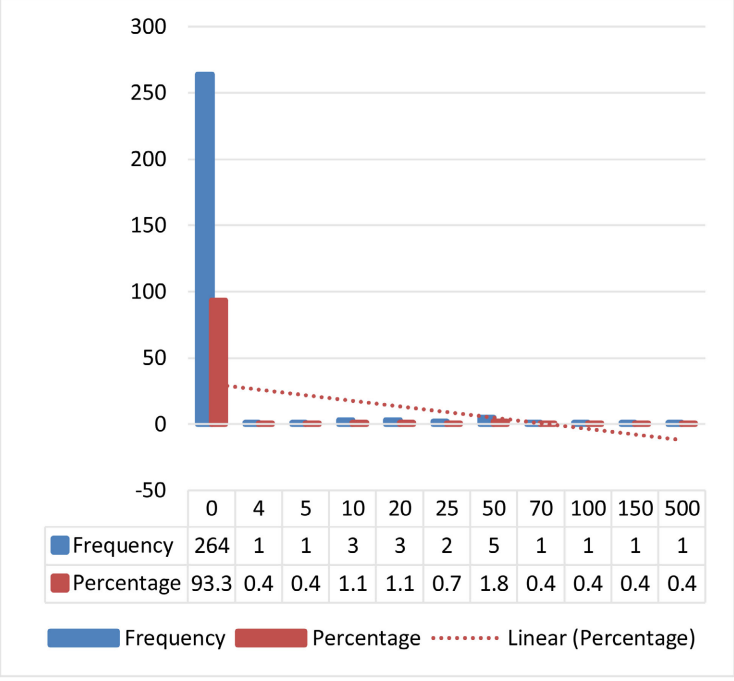


Figure 5. Estimated production of bean variety one for 2022 C (kg) on your farm.

During season 2023 A, Table 3 shows 103 respondents (corresponding to 36.4%) did not produce even a single kilo of beans. In number, this followed by 25 respondents (8.8%) confirming that they produced 50 kilos; 17 (6%) produced 30 kilos; 14 (4.9%) produced 20kilos; and 10 produced only 15 kilos and another category of 10 produced 150 kilos.

Table 3. Estimated household production of bean variety one for 2023A (in kg) on their farm.

| | Production in kilos | Frequency | Percentage | Valid percentage |
|---|---|---|---|---|
| Valid | 0 | 103 | 36.4 | 36.4 |
| | 3 | 1 | 0.4 | 0.4 |
| | 5 | 3 | 1.1 | 1.1 |
| | 6 | 1 | 0.4 | 0.4 |
| | 10 | 9 | 3.2 | 3.2 |
| | 11 | 1 | 0.4 | 0.4 |
| | 12 | 3 | 1.1 | 1.1 |
| | 15 | 10 | 3.5 | 3.5 |
| | 16 | 1 | 0.4 | 0.4 |
| | 18 | 1 | 0.4 | 0.4 |
| | 20 | 14 | 4.9 | 4.9 |
| | 25 | 8 | 2.8 | 2.8 |
| | 26 | 2 | 0.7 | 0.7 |
| | 27 | 1 | 0.4 | 0.4 |
| | 28 | 1 | 0.4 | 0.4 |
| | 30 | 17 | 6.0 | 6.0 |
| | 35 | 5 | 1.8 | 1.8 |
| | 37 | 2 | 0.7 | 0.7 |
| | 38 | 2 | 0.7 | 0.7 |
| | 40 | 12 | 4.2 | 4.2 |
| | 42 | 2 | 0.7 | 0.7 |
| | 45 | 2 | 0.7 | 0.7 |
| | 46 | 1 | 0.4 | 0.4 |
| | 48 | 2 | 0.7 | 0.7 |
| | 50 | 25 | 8.8 | 8.8 |
| | 54 | 1 | 0.4 | 0.4 |
| | 58 | 1 | 0.4 | 0.4 |
| | 60 | 7 | 2.5 | 2.5 |
| | 65 | 1 | 0.4 | 0.4 |
| | 70 | 4 | 1.4 | 1.4 |
| | 75 | 2 | 0.7 | 0.7 |

**Continued**

| | | | |
|---|---|---|---|
| 80 | 4 | 1.4 | 1.4 |
| 89 | 1 | 0.4 | 0.4 |
| 90 | 1 | 0.4 | 0.4 |
| 100 | 9 | 3.2 | 3.2 |
| 110 | 2 | 0.7 | 0.7 |
| 120 | 2 | 0.7 | 0.7 |
| 140 | 1 | 0.4 | 0.4 |
| 150 | 10 | 3.5 | 3.5 |
| 170 | 1 | 0.4 | 0.4 |
| 200 | 4 | 1.4 | 1.4 |
| 250 | 1 | 0.4 | 0.4 |
| 450 | 1 | 0.4 | 0.4 |
| 1050 | 1 | 0.4 | 0.4 |
| Total | 283 | 100.0 | 100.0 |

Justifying the low production in former results, Figure 6 shows that respondents (145 out of 283 corresponding to 51.2%) esteem that whether climate conditions are the main cause while 99 corresponding to 35% justify it by the problems related to soil infertility.

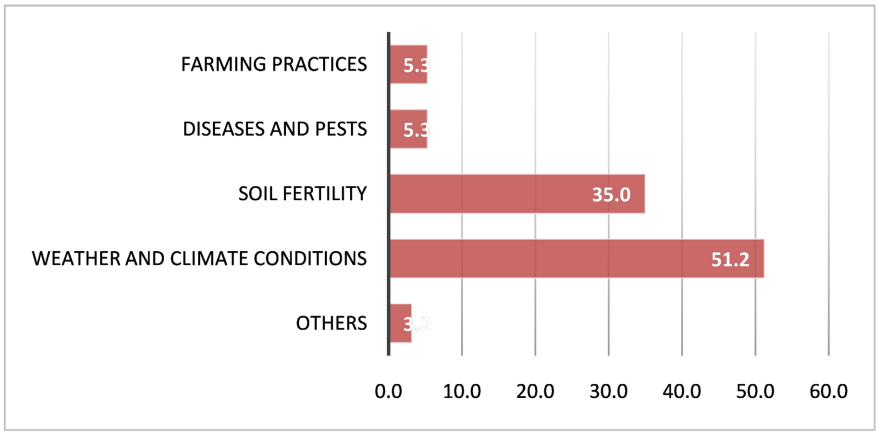


Figure 6. Main reason for the upward/downward trend in bean production.

Based on Figure 7, during the difficult situation, 208 respondents corresponding to 73.5% consulted vulgarization agents while 75 i.e. 26/5% did not do it.

Figure 8 illustrates that respondents' views that disease and pest-related constraints represent a very big issue for farmers among others that farmers encounter, and alone occupy 61.5% according to answers on our questionnaire.

Figure 9 illustrates that constraints linked to the lack of new improved varieties are frequently observed as a very big issue for farmers. 180 out of 283 meaning 63.6% esteemed it as a very big problem. Only 15 out of 283 respondents (5.3%) do not consider it a problem.

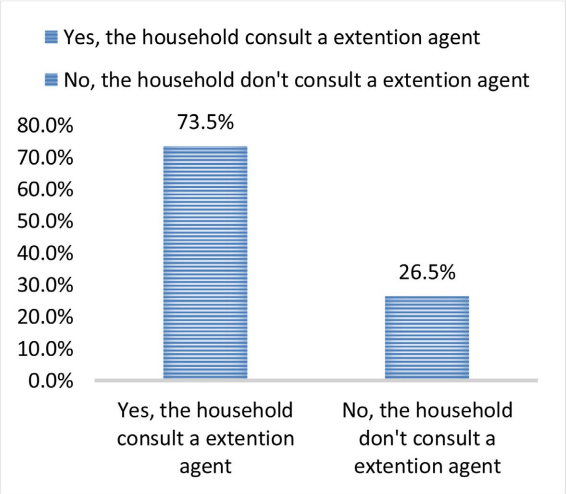


Figure 7. Distribution of households according to their request for help from the extension agent.

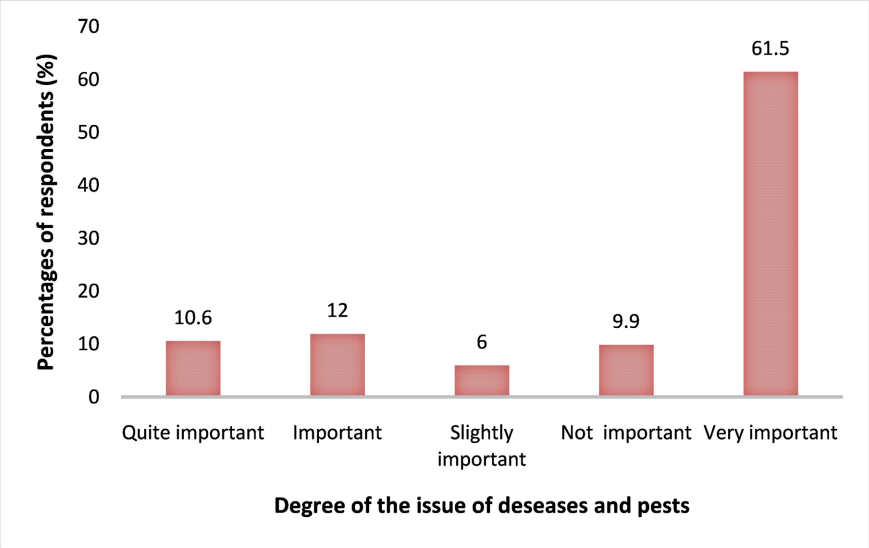


Figure 8. Frequent disease and pest-related constraints.

Figure 10 remarks the constraints in the fact that seeds cost so much and farmers (152 respondents corresponding to 53.7%) pointed out that the high price of seeds is a big issue and obstacle to wished beans production.

Fertilizers' price is also viewed as a big issue for farmers in Burundi (See Figure 11). 129 respondents (45.6%) explained their views considering that the fact of having fertilizers costing so much money is an obstacle to achieving their dream of high production.

Figure 12 confirms that climate variability is a big problem with 241 respondents (85.2%) esteem it as a very important constraint. One and only respondent did not see it as an issue for farmers.

Results from Figure 9 show that the poor quality of seeds is considered by our respondents as a big issue with 171 out 283 respondents (60.4%) confirming this

option. Only 9 respondents (3.2%) deny this position.

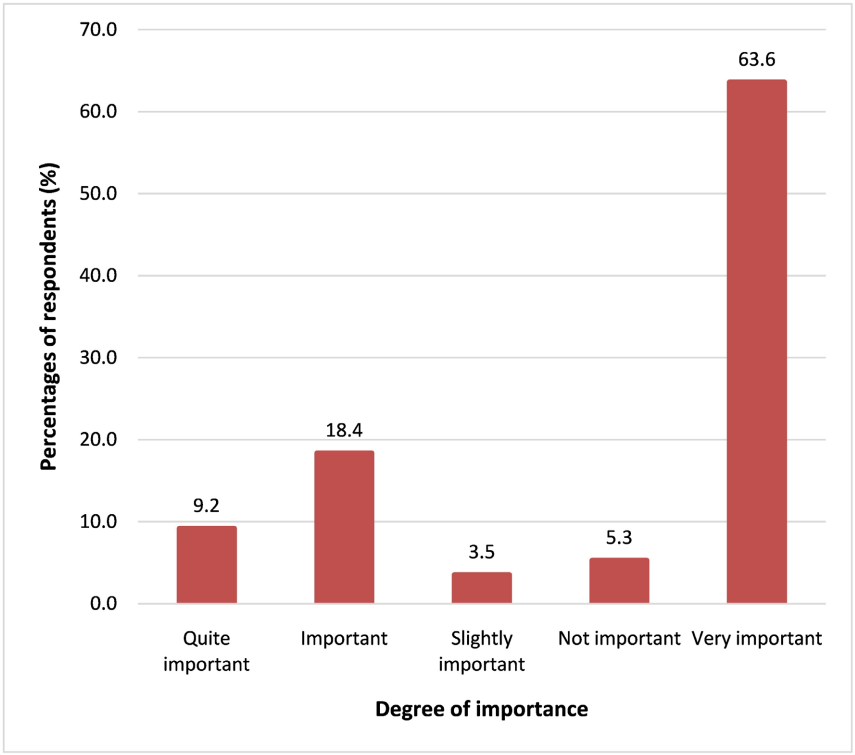


Figure 9. Degree of importance of the lack of improved varieties as a problem in bean cultivation.

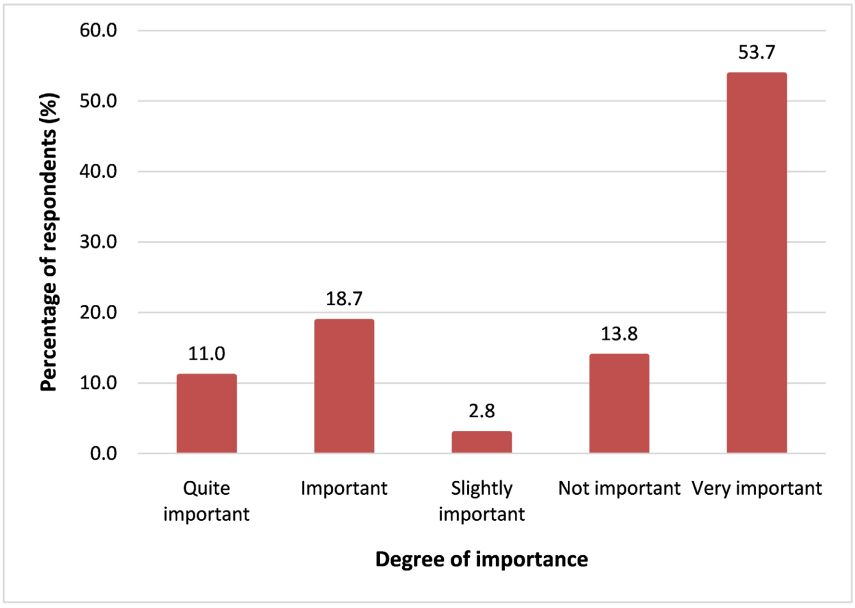


Figure 10. Degree of importance of the high seed prices as a problem in bean cultivation.

Among other issues, poverty or lack of investment capital in farming is a big issue (See Figure 14). 149 out of 283 respondents i.e. 52.7% see it as a very important issue while only 15 (5.3%) do not consider it as an issue.

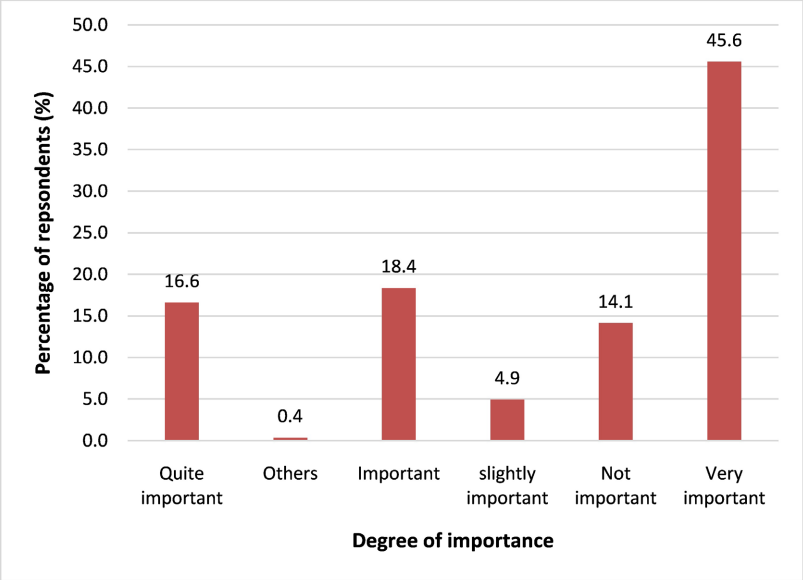


Figure 11. Degree of importance of the high chemical fertilizer prices as a problem in bean cultivation.

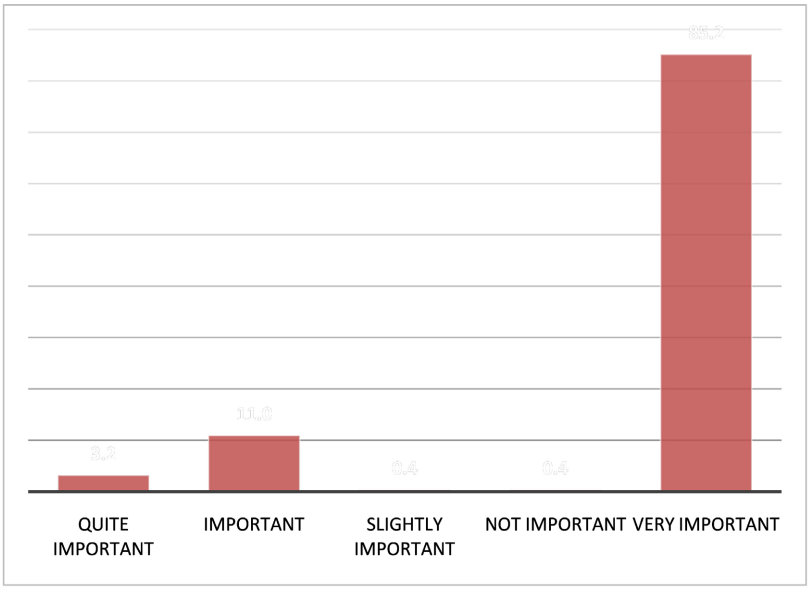


Figure 12. Degree of importance of unpredictable climate constraint or climatic variability as a problem in bean cultivation.

## 4. Discussion and Conclusion

In Burundi, the production of beans has been worse for all the seasons considered as the object of our research (See Tables 1-3 and Figure 5). This joins the idea that farmers employ mixed cropping systems in an attempt to provide food for their families in an environment with high risks, few safety nets, and limited storage options (Niragira et al., 2022). Farmers live in a situation where they lack seeds of the best quality which they consider a big issue (See Figure 13) and do not even get capital to invest in the best production (See Figure 14). However, it has been

admitted that in Burundi and Zimbabwe, multi-stakeholder partnerships are a favorite opportunity to access to quality bean seed and variety turnover (Aseete et Katungi, 2023; Buhendwa et al., 2023; Nduwimana & Sindayigaya, 2023a). Solving this issue requires bio-fortified bean seeds and this has been applied in Burundi in Muyinga and Gasorwe communes which has been successful in ending malnutrition issues among rural households (Nchanji et al., 2023).

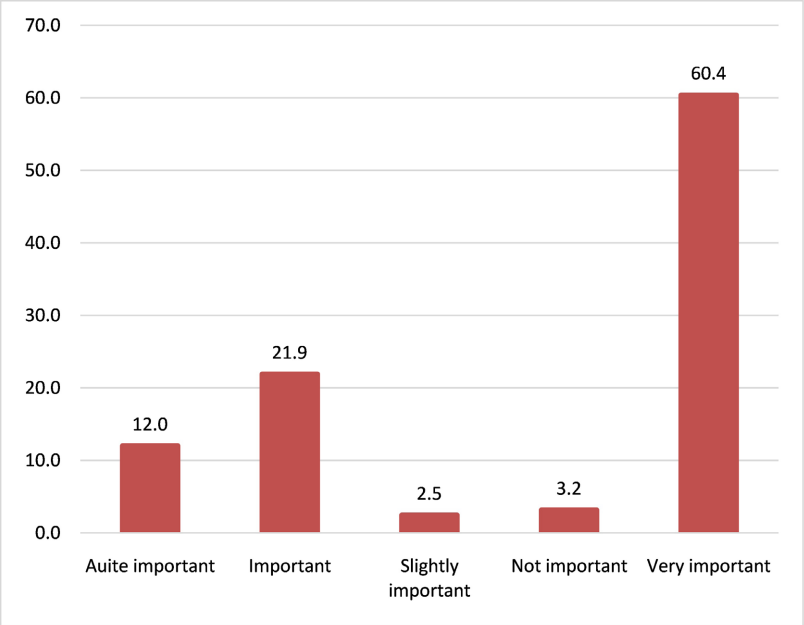


**Figure 13.** Degree of importance of unpredictable climate constraint or climatic variability as a problem in bean cultivation.

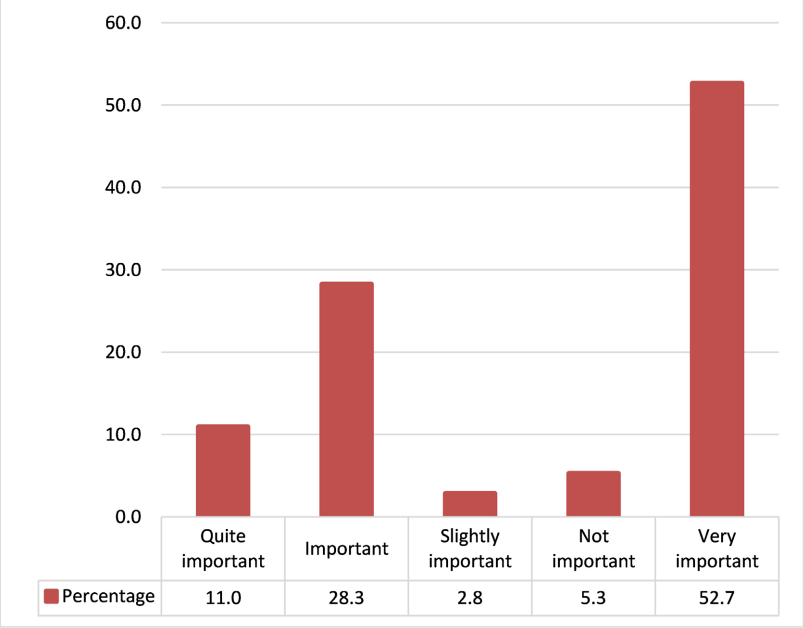


**Figure 14.** Degree of importance of to lack of investment capital as a constraint to the bean cultivation.

Climate change or variability is perceived by farmers as a big problem in Burundi (See **Figure 12**). Hence, it would also help to achieve the required specialization in specific activities or seeds to grow and lead to economies of scale and improved efficiency at the household scale leading to a decrease in stand for the climate change, health, and market shocks (Musumba et al., 2022). Anyway, a solution must be found inasmuch as Burundi, is ranked among the world's poorest countries, yet, a large majority of its population depends on agriculture and problems cause that they do not produce enough food among which beans to feed families (Niragira et al., 2015). Climate change and variability is a big obstacle to growing beans and others seeds not only in Burundi but in the whole East Africa (Otieno et al., 2021).

Disease and pest-related constraints represent a very big issue for farmers in Burundi (See **Figure 8**). This is a common thing for human beings that devastating bacterial disease in crops threatens farmers that especially have small farms as in Burundi for it originates problems in production and livelihoods (Iradukunda et al., 2019). As long as access to improved varieties of seeds is a big issue (See **Figure 10**) aggravated by poverty diminishing farmers' capacity to buy fertilizers (See **Figure 11**) things become very hard and obliges decision-makers to implement free distribution of seeds and tools the standard approach to agricultural recovery (Remington et al., 2002) to supply a market. This is remarked in Burundi where Common bean (*Phaseolus vulgaris* L.) is a major staple food in Burundi which influences the market situation as its production increases or diminishes (Birachi et al., 2011). The solution must imply resisting against climate conditions, improved varieties, healthier seeds, and fertilization that d improves their quality (Bararyenya et al., 2018). Preferences for specific traits of improved climbing bean varieties and agricultural technology adoption are solution the problems that farmer are facing in Burundi (Lambrecht et al., 2015).

Climate variability is perceived as a worst issue as reported by results to our questionnaire respondents (See **Figure 12**). This calls for an obligation to implement new seeds that resist so much for it. There has been proved that variety as moth bean is a drought-tolerant food legume of the tropics for its seeds and leaves serving as abundant food protein source besides carbohydrate, fatty acids, minerals and vitamins (Bhadkaria et al., 2022). Climate variability obliges farmers to also vary time after time the variety of seeds responding favorably to it and the soil quality. This joins the study of comparing productivity and physiological traits of faba bean varieties under conditions of boreal climatic zone (Janusauskaite & Razbadauskiene, 2021; Nyabenda & Sindayigaya, 2023; Sindayigaya, 2023b; Sindayigaya & Nyabenda, 2022).

Results proved the importance farmers attach to the vulgarization services (See **Figure 11**). The phase of communication plays a very great importance as it has been proved in Ethiopia. There, pre-extension popularization was taken as a useful or indispensable technique to popularize improved variety of beans to increase to increase production and productivity of the crop with its full packages at

farmer's fields but also used to assess the perception about the acceptance of the new technology to be applied by the smallholder farmers (Abraha & Wolday, 2020). Popularization or vulgarization in Ethiopia played an important role where irrigation of beans crops was found as a means leading to the production increase (Kidane et al., 2019) but also as an implication for a sustainable seed supply (Kassa et al., 2022). The same idea to be observed as a sample of technology vulgarization in beans varieties' production is applied in Ghana (Tsiboe et al., 2021). By no means, it cannot be understood that new technology in farming would ignore integrate communication services agents who are in touch with farmers (Sung et Jeon, 2020).

## 5. Conclusion

This article is a result of interviews conducted with a sample maid by a team of four agents that mobilized the Kobokollect tool by applying a questionnaire to which 283 respondents gave their points of view on issue about farming beans in acid land of Burundi. The selected zone of the study is four hills chosen in different communes and four different provinces in Burundi. Analyzing data with IBM SPSS 25 and Microsoft Office excel, results show that beans farmers fight against many constraints like frequent diseases and pests on crops, lack of new improved seeds' varieties, constraints due to high seed prices, high chemical fertilizer prices, unpredictable climate constraint or climatic variability issues, poor quality seeds, and lack of investment capital in beans farming.

## Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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