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Identifying Crop Productivity Constraints using an Integrated Survey in the Nyiragongo Territory, North Kivu Province, Democratic Republic of Congo

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Abstract **– Overall, the Congolese agricultural sector is facing numerous technical, economic and institutional constraints, which hinder the country development and plunge populations into a situation of acute food and nutritional insecurity. This survey aims to identify the main constraints of agricultural production and propose possible solutions for the efficiency and sustainability of agricultural production for farmers in the Nyiragongo territory in the province of North Kivu in the Democratic Republic of Congo. One hundred and forty farmers constituting the studied population were selected from the seven agricultural associations in the territory and to whom a well-structured questionnaire was administered. The selection criteria for farmer to be interviewed was the farm size that should be greater or equal to 0.25 ha. The results obtained showed the existence of several constraints associated to socio-economic and technical factors. Major constraints were (1) lack of agroecology practices (100 % of respondents), (2) lack of financial means (87 % of respondents), (3) absence engines and agricultural machines ((85% of respondents), (4) high price for renting land to cultivate (78 % of respondents), (5) lack of state advisers (75 % of respondents), (6) the non availability of adequate fertilizers with high potential for restoring soil fertility (96 % of respondant). Farmers therefore practice primitive production systems which do not contribute to improving their food and their social well-being. These results identify priorities to be directed towards the need of the majority in the territory for the improvement of sustainable crop production for food and feeding.**

Keywords **– Agricultural Constraints, Socio-Economic Issues, Technical Factors, Social Well-Being.**

I. INTRODUCTION

Despite the country's enormous agricultural potential, the majority of the population in the Democratic Republic of Congo remains largely exposed to food insecurity, malnutrition and hunger. The country is one of the rarely African countries able of promoting sustainable agricultural development, given that it has millions of hectares of potential arable land, a diversity of climates, an important hydrographic network (Badibanga & Ulimwengu 2013). However, the Democratic Republic of Congo is classified as a low-income food deficit country (PFRDV) according to Badibanga and Ulimwengu (2013). The large surface area and its position on the equator offer the country a great diversity of climates and landscapes. The major pert of the country has a versatile hot and humid climate, high rainfall and generally two main seasons that are dry season and a rainy season (FAO, 2021).

Farmers therefore remain the most important target group in the fight against poverty in the Democratic Republic of Congo. Revitalizing the agricultural sector is seen as a clear response to rural exodus and the growing urbanization that it entails. Agriculture is then seen as a major strategic issue for the Democratic Republic of Congo (Badibanga and Ulimwengu 2013). Cash crop agriculture, whose production is largely

exported, suffers because of low productivity. Subsistence agriculture is neither profitable nor sufficiently productive to ensure food security for the entire population. The report of the Crop Assessment Mission during 2018-2019 campaign reveals that around 16 millions households are engaged in agricultural production activities, despite population displacements in areas of armed conflict and intercommunity areas. The cereal balance sheet for the campaign shows a net deficit estimated at 9 millions tonnes (OCHA, 2020). Indeed, food insecurity and household vulnerability have continued to increase over recent decades, particularly due to the structural lack of infrastructure and basic social services for the population. The permanent insecurity in the East parts of the country caused by clashes between armed groups and/or the armed forces of the Democratic Republic of Congo, and the persistence of endemic diseases such as cholera and especially Ebola virus disease (EVD), have contributed to maintaining the fragility of the country, mostly in trems of agricultural production. Armed conflicts and natural disasters are causing very significant population movements in the East of the country as well as numerous serious protection incidents (OCHA, 2020). Overall, the Congolese agricultural sector is faced with numerous technical, economic and institutional constraints, which hinder its development and plunge populations into a situation of acute food and nutritional insecurity. (FAO, 2021).

To be able to offer farmers innovations that correspond to their needs, we must first be able to analyze their potential in their environment, the evolution of their characteristics, the current production processes and their results, the techniques used, the corresponding tools, the effects on the environment, the corresponding technical and economic results (Altieri 2012). It is following this point of view that an exploratory survey among farmers in Nyiragongo was organized in view to collecting information relating to the constraints linked to agricultural production in this territory precisely in the chiefdom of Bakumu, groupement of Munigi. The information collected through a questionnaire will be used to propose some possible solutions that could contribute to the increase and improvement of agricultural production in this territory in the context of intelligent and/or agroecological agriculture and the fight against famine and poverty. This study then aims to identify the main constraints of agricultural production and propose possible solutions for the efficiency and sustainability of agricultural production for farmers in the territory of Nyiragongo in the province of North Kivu. Indeed, this territory, like other territories of the province, has an agricultural vocation but farmers are faced with numerous constraints that must be highlighted in order to seek everlasting solutions. To conduct this investigation, the following hypotheses were formulated: (1) the agricultural production in the Nyiragongo territory is faced with multiple constraints hindering the development of the territory, (2) these constraints are socio-economic (unavailability of land, manual labor, subsistence agriculture, etc.) and technical (poor unrestored soil, primitive cultivation techniques, use of unadapted seeds, lack of agro-ecological practices etc.), as well as institutional (lack of a good agricultural policy).

II. MATERIALS AND METHODS

The study area is located in Munigi groupement, chiefdom of Bakumu in the Territory of Nyiragongo in the Province of North Kivu. The topography of the North Kivu province presents a rugged relief ranging from less than 800 m to more than 2500 m above sea level. Temperatures vary from 23°C at low altitudes (less than 1000 m) to around 15°C at 2000 m, with rainfall varying from 1000 to 2000 mm per year. There are two types of climate in this region determining variations in temperatures and precipitations, in particular, the Afro-mountain tropical climate in the highlands and the Guinea-equatorial climate in the lowlands.

The plains, highland and mountain ranges give this area great complexity of agro-ecological conditions favoring the development of a diversity of crops. The soils are generally fertile and of several types including volcanic, soils of alluvial plains and soils of ancient rocks. However, the high demand for arable land, exacerbated by the prevalence of land insecurity and unsuitable and unsustainable agricultural practices, increasingly contributes to soil exhaustion (USAID, 2015).

Agriculture and animal husbandry are two major activities practiced in the study area producing income to the population. Animal husbandry is practiced at a small scale due to insufficient land space. Vegetables, beans, maize, potatoes, sorghum, sweet potatoes, bananas are the mainly cultivated plants according to the annual report on Nyiragongo territory of 2024. The territory has a soil with humus characteristics, with secondary forest and grass vegetation.

This study falls within the framework of socio-economic surveys. A well-structured questionnaire was administered to farmers in Bakumu chiefdom. The questionnaire designed in French then translated into Kiswahili was chosen to facilitate exchanges with respondents that mainly speak the national language. The major variables retained in the questionnaire were: (1) cultivated main crop, (2) how obtaining land, (3) soil fertility management, (4) cultivated area, (5) farmers' perception on soil fertility management, (6) types of fertilizer applied to fields, (7) main diseases and pests faced by farmers, as well as (8) challenges encountered by farmers in adopting agroecological practices. The questionnaire has closed questions to avoid too divergent answers. We also organized the interview to reinforce the collection of information. Regarding sampling, twenty farmers were selected from each of the seven agricultural associations in the Bakumu chiefdom. This gives a sample of one hundred and forty farmers constituting the population of our study. Each farmer had a farm size greater than or equal to 0.25 ha.

Microsoft Excel was used for data entry and arrangement. The statistical analysis of the qualitative and quantitative data from the survey was descriptive, using the frequencies and percentages of variables retained.

III. Results and Discussion

Main Cultivated Crops

The data relating to the respondents' responses on the main cultivated crops are presented in Table 1.

Table 1. Main cultivated crops in the territary.

Crops	Number of Respondents	Percentage (%)
Maize	95	67
Cassava	3	02
Beans	35	25
Soybeans	7	05
Total	140	100

Source: Our field surveys 2023.

The results in Table 1 shows that maize (67%), cassava (02%), beans (25%), and soybeans (05%) are the crop grown in the Bakumu chiefdom. Maize appears the most preponderant crop followed by beans.

Procurement of Land

Regarding on how to obtain land for cultivation, the data are presented in the Table 2 below.

Table 2. Acquirement of cultivated land in the territory.

Obtaining Land	Number of Respondents	Percentage (%)
Family inheritance	09	06
Leasing	00	00
Rental	126	90
Purchase	5	03.5
Total	140	100

Source: Our field surveys 2023.

The results in Table 2 indicate that the majority of farmers (90%) rent the land they cultivate, 6% through family inheritance and 3.5% buy. Furthermore, this situation constitutes a major obstacle to agriculture harmonious development and social well-being of farmers in Nyiragongo rural territory generally and in Bakumu chiefdom particullary.

Size of Cultivated Areas

The results on the size of cultivated fields in hectare are shown in Table 3.

Table 3. Size of cultivated land by farmers.

Dimension/ha	Number of Respondents	Percentage (%)
0.25 - 2.00	129	92.14
2.00 - 5.00	11	07.86
≥ 5	00	0.00
Total	140	100

Source: Our field surveys 2023.

The results shown in Table 3 shows that 92.14% of farmers have fields whose agrarian area is between 0.25 and 2 ha and 07.86% have agricultural fields between 2 to 5 ha. These results prove in sufficiently how much difficulties farmers encounter in obtaining arable land to cultivate crop or rearing their animal.

Techniques Used to Keep the Land Cultivable

The results relating to the techniques used by farmers to keep the land cultivable are shown in table 4.

Table 4. Techniques used to keep the land cultivable.

Techniques	Number of Respondents	Percentage (%)
Bench terraces	00	00
Progressive terraces	00	00
Anti- erosive ditch	00	00
Agroecology practices	00	00

Techniques	Number of Respondents	Percentage (%)
Fallow	00	00
Crop rotation	7	05
Crop residue	133	95
Total	140	100

Source: Our field surveys 2023.

The results recorded in Table 4 in relation with soil conservation measures shows that it is exploited each growing season, the majority of farmers (95%) resort to the application of crop residues (burying of crop residues) and crop rotation (05%) sometimes.

Farmers' Perception on Soil Fertility Management

The data concerning farmer's perception on soil fertility management are shown in Table 5.

Table 5. Perception of farmers on soil fertility management.

Perception of Farmers	Number of Respondents	Percentage (%)
Yes	140	100
No	00	00
Total	140	100

Source: Our field surveys 2023.

The results from Table 5 below in relation to soil fertility management shows, that farmers (100%) are really aware of the problem of soil fertility management that they cultivate each time and confirmed that the only way for them remains to use harvest residues because mineral fertilizer is too expensive. This is why we initiated a small project that could help farmers to reinforce plant seedlings of some agroforestry species like (Acasia sp, Calliandra calothyrsus, Leucaena diversifolia, Tephrosia vogelii, Vernonia amygdalina) and Tithonia diversifoli--a in the borders of their fields (Boundary tree planting), also alley cropping.

Types of Fertilizer Applied to Fields

Information on the types of fertilizer applied in farms is recorded in table 6.

Table 6. Types of fertilizers applied to the fields.

Types of Fertilizers	Number of Respondents	Percentage (%)
Biomass of agroforestry species	00	00
Chemicals fertilizers (NPK, DAP, Urea)	00	00
Mineral and organic fertilizers	00	00
Incorporation of crop residues in the soil	140	100
Total	140	100

Source: Our field surveys 2023.

The results recorded in Table 6 indicates that all farmers (100%) resort to burying crop residues as the only t-

-ype of fertilizer they apply and prefer, because mineral and organic manure are not available in the area.

Furthermore, with crop residues, determining the dose or quantity to spread becomes difficult.

Main Diseases or Pests

Data relating to the types of major diseases or pests are presented in Table 7.

Table 7. Main diseases or pests found in crops.

Crops	Diseases or Pests
Maize	Legionnaire caterpillar
Beans	Beans damping
Cassava	Mosaic visus
Soyabeans	Leaves yellowing

The results in Table 7 confirm the existence of certain diseases that attack crops such as: maize caterpillar, yellowing of maize and soybean leaves, damping off for beans, as well as cassava mosaic. Furthermore, in terms of incidence and severity of diseases, the percentage is negligible.

Solutions Adopted Concerning Diseases

The results on the solutions adopted in relation to the diseases are shown in table 8.

Table 8. Solutions adopted to fight diseases in crops.

Controls	Number of Respondents	Percentage (%)
Chemical control	00	00
Cultural control	00	00
Use of resistant varieties	00	00
Mechanical control	44	31.43
No solution	96	68.57
Total	140	100

Source: Our field surveys 2023.

The results in table 8 shows that some farmers use mechanical control (31.4%). Others on the other hand (68.5%) continue with the remains of plants which are not attacked. This situation automatically leads to a drop in crop yields with other repercussions from the socio-economic level of farmers.

The Harvest of the Growing Season A. (T/ha) in the Fields

The results on the harvest of the different crops in T/ha for growing season A are recorded in Table 9. Table 9 Harvest of growing season A.

Table 9. Harvest in cropping season.

Crops	Cultural Practices	Plant Density	Productivity. (T/ha)
Maize	pure	50cm×50cm	2.4

Crops	Cultural Practices	Plant Density	Productivity. (T/ha)
Cassava (chips)	Pure	1m×0.75m	2,2
Beans	Pure	40cm×20cm	0.7
Soyabean	Pure	40cm×15cm	0.5

Source: Our field surveys 2023.

The results in Table 9 shows that maize produced 2.4 T/ha, followed by cassava chips (2.2 T/ha), beans (0.7 T/ha) and soyabean (0.5 T/ha). Note that agricultural production seems to be weak because farmers are faced with several challenges such as lack of good farming practices, poor management of soil fertility, climate change and others issues.

The challenges encountered by farmers for the adoption of ecological Agro Practices and Proposals of some possible solutions by farmers.

Information related to the challenges encountered by farmers for the adoption of agroecological practices and proposals for some possible solutions by farmers themselves are consigned in table10 below.

Table 10. The challenges encountered by farmers in adopting agroecological practices and some proposed possible solutions by farmers.

Challenges	Propose Solutions
Lack of skills on agroecology practices	Training and Extension on agroecology practices
Competition to obtain cultivable land	Rational land use management

Source: Our field surveys 2023.

The results in Table 10 shows that agroecological practices do not exist in all Nyiragongo territory because farmers cannot even recognize the word agroecology and its importance. To this end, the need for training and popularization on agroecology practices is essential because agroecology seems to be the metal framework on which intelligent and/or sustainable agriculture rests. However, it would be desirable to do this with farmers who have their own land. The real gap that the survey was able to identify seems to be the non-existence of the application of agroecological practices in our study area.

Acquisition of Agricultural Inputs

The results on the acquisition of agricultural inputs are recorded in table 11.

Table 11. Acquisition of agricultural inputs.

Acquisition of Agricultural Inputs	Number of Respondents	Percentage (%)
Seeds purchases	100	100
Fertilizers purchases	00	00
Pesticides purchases	00	00
Granted by government	00	00
Granted by ONGs	00	00
Total	100	100

Source: Our field surveys 2023.

It appears from table 11 that farmers (100%) purchase agricultural inputs themselves, especially seeds. However, fertilizers, like pesticides, they do not use due to lack of knowledge and financial means.

Farmers' Grouping

The data relating grouping of farmers are shown in table 12.

Table 12. Grouping of farmers.

Grouping	Number of Respondents	Percentage (%)
Associations	140	100
Cooperative	00	00
Total	140	100

Source: Our field surveys 2023.

The results from Table 12 shows that all farmers (100%) work in associations. We encourage this trend, because it is the only way to make agricultural production profitable and also safeguard the rights of farmers in Congolese rural area. At the same time, we suggest that those associations be supervised by the administrative political authorities of the Nyiragongo territory.

Destination of Agricultural Production

The results on the use of agricultural production are shown in Table 13.

Table 13. Destination of agricultural production.

Destination	Number of Respondents	Percentage (%)
Self-Consomption	73	52.1
Sale	59	42.1
Storage	08	05.7
Transformation and Sale	00	00
Transformation and consumption	00	00
Total	140	100

Source: Our field surveys 2023.

The results recorded in Table 13 stipulate that the agricultural production of farmers is used in the following manner (52.1%) consumption, (42.3%) sale to support the schooling and medical assurance of childrens, (05.7%) reserved as seed for the next growing season.

Type of Market Operated

Informations on the type of market operated are reported in table 14 below.

Table 14. Type of Market.

Market	Number of Respondents	Percentage (%)
Local	140	100
National	00	00

Market	Number of Respondents	Percentage (%)
Regional	00	00
Total	140	100

Source: Our field surveys 2023.

The results in Table 14 shows that all farmers (100%) exploit the local market. These are explained by low agricultural productivity and also the lack of agricultural access roads.

Cultivation Systems Practiced

Data relating to practical cultivation systems in the study area are recorded in Table 15.

Table 15. Dominant farming systems.

Crop System	Number of Respondents	Percentage (%)
Monoculture	6	04.2
Crop Rotation	7	05
Mixte crop	115	82.1
Assolement	12	08.5
Total	140	100

Source: Our field surveys 2023.

The results in Table 15 indicate that (82.1%) of farmers practice mixed cropping, (08.5%) assolement, (05%) crop rotation and (04.2%) monoculture. These results also confirm the difficulty that farmers have in acquiring arable land, raison which majority of farmer's prefer mixed cultivation.

Challenges Linked to Agricultural Productivity

The results on the constraints linked to agricultural productivity are recorded in table 16 below.

Table 16. Challenges linked to agricultural productivity.

Challenges	Number of Respondents	Percentage (%)
1. Lack of agricultural machines	120	85
2. Very high price for renting land to cultivate	32	23
3. Lack of state agronomists	24	17
4. Lack of agricultural roads service	27	19
5. Lack of standard units of measure to sell agricultural products	35	25
6. Lack of agricultural credits	122	87
7. Insecurity/kidnapping of farmers	36	26
8. Lack of skill on agroecology practices	140	100
9. Competition to obtain agricultural land	110	78
10. Lack of shede to store agricultural products	37	26

Challenges	Number of Respondents	Percentage (%)
11. Drying agricultural product in the sun	28	20
12. Buyers impose purchase price	84	60
13. Virunga national park	72	51
14. Insufficient grazing	86	61
15. Seeds degeneration	31	22
16. High price of minerals Fertilizers	135	96

Source: Our field surveys 2023.

The results in table 16. Show that there are several constraints linked to agricultural productivity. However; the survey identified the following major challenges : Lack of skill on agroecology practices (100%); High price of minerals Fertilizers (96%); Lack of agricultural credits (87%); Lack of agricultural machines (85%); Competition to obtain agricultural land (78%); Insufficient grazing (61%); Buyers impose purchase price (60%) and Virunga national park (51%).

Challenges linked to agricultural productivity and solutions proposed by farmers.

The results on the constraints linked to agricultural productivity and solutions proposed by farmers are reported in table 17 below.

Table 17. Constraints linked to agricultural productivity and solutions proposed by farmers.

Challenges	Suggested Solutions
1. High price of minerals Fertilizers	Government can provide minerals fertilizers
2. Lack of agricultural machines	Government can mechanize agriculture
3. Very high price for renting land to cultivate	Government can review its land policy
4. Lack of state agronomisst	Government can provide agronomists
5. Lack of agricultural roads service	Government can improve agricultural roads service
6. Lack of standard units of measure to sell agricultural products	Sell by kilo
7. Land accessibility(cohabitation between farmers and breeders)	Establishment agroforestry practices
8. Lack of agricultural credits	Government create agricultural credit bank
9. Insecurity/kidnapping of farmers	Government secure agricultural spaces
10. Lack of skill on agroecology practices	Training and extension on agroecology practices
11. Competition to obtain agricultural land	Rational land management
12. Lack of shede to store agricultural products	Construction of shedes and depots
13. Drying agricultural product in the sun	Electric drying
14. Buyers impose purchase price	Find Equilibrium price between buyers and sellers
15. Virunga national park	annihilate the rebels living there
16. Insufficient grazing	Grant a part of reserved virunga national park area to agriculture and animal husbandry

Challenges	Suggested Solutions
17. Seeds degeneration	Use improved seed.

Source: Our field surveys 2023.

The results in Table 17 summarize the challenges linked to agricultural productivity and proposed solutions by farmers.

Agriculture in the Democratic Republic of Congo (DRC) is dominated by subsistence farming. House-holds grow food mainly for their own consumption and sell only when they have a surplus. The main crops are cassava, maize, yams, plantains, Beans and rice (FAO, 2020). Commercial farming of cash crops such as coffee, palm oil, rubber, and sugar is done on a smaller scale. With constant political instability, infrastructure deficiencies, and lack of investment in DRC, the expansion and productivity of commercial farming have been constrained (World Bank 2020). Livestock and fisheries are also important Agri-food subsectors and face constraints similar to the crop subsectors (Xinshen Diao et al, 2023).

In agricultural production, Mutibvu et al. (2012) report that several technical, social, political and even economic constraints limit this sector of production and whose amplitude of effects varies from one region to another.

In South Kivu on the other hand, following the absence of a characterization of agriculture-livestock integration practices, the constraints and opportunities have not yet been identified. However, several authors indicate that political insecurity, especially in post-conflict areas, is the major constraint to the development of the agricultural sector (Maass et al., 2012; Katunga and Muhigwa, 2014; Birthe et al. 2016).

This study aimed to identify the constraints linked to agricultural production and to propose some possible solutions that could contribute to the increase and improvement of agricultural production within the framework of intelligent or sustainable agriculture and the fight against famine. and poverty in the chiefdom of Bakumu, Munigi groupement, Nyiragongo rural territory, province of North Kivu, in the Democratic Republic of Congo-Kinshasa.

The results obtained showed that Maize, cassava, beans, and soybeans are grown in the Bakumu chiefdom. However, Maize remains the main crop (Table 1). These results are similar to the studies on Diagnostic of the current livelihood evolution, farming practices, production constraints, post-harvest processing, trading and value-chain systems of sweet potato in north-kivu province, eastern of Drcongo carried out by Theodore Munyuli et al (2022).

Regarding the way of obtaining land to cultivate, the results indicate that the majority of farmers rent the land they cultivate, a small number through family inheritance and a few also buy (Table 2). These results corroborate with those found by Balasha et al (2022) in the research on Challenges Faced by Congolese Women Farmers to Access Agricultural Productive Resources.

In fact, Congolese obtain land rights through inheritance, customary land allocations from chiefs or kings, or concessions from government officials (USAID, 2010; Cox, 2011; Balasha, 2022). In this country where the system of male inheritance prevails, women have been left landless (Cox, 2011, 2008; Balasha 2022). According to Deininger et al. (2017; Balasha; 2022), customary systems may be biased against women, in

particular by restricting their ability to inherit the land and thus their bargaining power within the households. The situation seems to be similar in sub-Saharan Africa. Many Organizations such as USAID (2010) and World Bank (2014) reported that land access and ownership for women remain severely unequal compared to men even though women are active participants in the agricultural sector and provide the majority of agricultural labor. For example, a recent gender analysis of customary land allocations in Ethiopia, Tanzania, and Zambia concluded that women not only receive less land in customary systems but also less productive land (USAID, 2010; World Bank, 2014; Balasha, 2022).

In Pakistan, Akram et al. (2019) found that landowners involved in agribusiness are more likely to invest in measures to improve soil and increase productivity than land tenants. While the customary system and traditional institution may come under stress and be no longer able to ensure equitable land access, because of land reform and increasing competition due to high demand in land, especially in per urban areas, as claimed by Deininger et al. (2017, Balasha 2022), this has introduced and prioritized purchase as another form of accessing land in DR Congo (Ansoms et al., 2012; Overbeek & Tamas, 2018; Balasha 2022). Although land markets are more active, attractive, and increasing because of the reforms that facilitate access to land in many African countries (Deininger et al., 2017, Balasha 2022), Furthermore, this situation constitutes a major obstacle to the harmonious development of agriculture and the social well-being of farmers in the rural territory of Nyiragongo in general and in the chiefdom of Bakumu in particular.

Furthermore, access to land in Democratic Republic of CONGO is one of the issues in the headlines. Indeed the problem arises in terms of management, that is to say ownership and responsibility in granting the power of enjoyment. Dualism is experienced in land tenure with customary responsibility one part and administrative responsibility another part (Usaid, 2010).

The customary management of the land in orality makes the framework very complex and promotes manipulation of the contractual parties and the greed of one or the other party who can sell the land without everyone agreeing and this generates conflicts between the land chiefs and the operator. (Usaid, 2010).

The complex legislative framework, the cadastral services and the very expensive courts and long registration procedures do not facilitate access to agricultural producers and landlords. (Usaid, 2010).

Demographic pressure and population movements aggravate the situation in the eastern part of the country following the successive wars experienced by the Great Lakes countries, the Democratic Republic of Congo being the country having presented possibilities for welcoming refugees and allowing them to decent living conditions, these are suffering the consequences which result in a war. In mining and timber exploitation areas, the interests of farmers are put at stake by the fact that these other operators are covered by the mining code, forestry code and exploitation licenses, titles which grant little or no benefit. Interests in the problems of farmers encountered in the mining or precious wood perimeter or square.

Conflicts have become permanent in localities bordering virunga national parks following demographic pressure and the low productivity of surrounding lakes. On the other side, there is no land use plan. This creates confusion in the skills of managers. (Usaid, 2010).

In view of the above, civil society tried to act within the limits of its skills and the human, material and financial means at its disposal but its efforts were not enough given that the very institutional problem also

requires solutions that involve the State. Reconciliation actions, raising awareness among the population on Congolese land law and customary land management in certain places. (Usaid; 2010).

In South Kivu, the use of land is mainly acquired by rental in the form of 'Bwassa' (IFDP, 2011) although some acquire it by inheritance. In Nigeria, Kassali et al. (2012) and Adamu (2014) found that the inheritance of agricultural land remains the most common mode of acquisition in rural areas. This difference in the method of land acquisition could be explained by the interest that each society has in land as well as cultural considerations.

Regarding the size of cultivated fields, the results shows that a large number of farmers have fields whose agrarian area is ≤ 0.25 ha and others have agricultural fields between 2 to 5 ha (Table 3). These results sufficiently prove the difficulties that farmers encounter in obtaining arable land. These results are similar to the research of Zamukulu et al, (2019) which looked at the constraints and opportunities of agriculture-livestock integration in Mushinga in eastern Democratic Republic of Congo.

The results recorded concerning the techniques used for the good conservation of the soil so that it can be exploited each growing season revealed that most farmers resort to burying harvest residues and sometimes rotating crops (Table 4). In addition, agroecological practices are not applied. And yet organic, not to say intelligent, agriculture considers agroecological techniques as an effective avenue of solutions for the conservation and improvement of soil fertility; with a view to increasing agricultural production in the tropics. (Altieri 2012).

Because of this major importance of agroecological techniques, our research suggests the implementation, the pure and simple popularization of agroecology in all agricultural lands in Nyiragongo rural territory. The Radical Terraces, the Progressive Terraces as well as the anti-erosion ditches contribute enormously to reducing the slope and erosion control in a mountainous landscape, Rwanda is an example in Africa or part of the relief of the province of North Kivu is similar to the Rwandan relief, as such, we ask the political-administrative authorities to see to what extent to initiate or support projects that could build Terraces in some mountainous area in Nyiragongo rural territory. Fallowing is not also possible because the majority of farmers rent land for cultivation and at the end of the growing season the land owners get their land back.

As for farmer's perception on soil fertility management, we found that one hundred percent of farmers are really aware of the problem of soil fertility management that they cultivate every time and confirmed that the only way to them remains the use of harvest crop residues (Table 5). These results corroborate with the research carried out by Gigalagamba et al, 2016 which looked on-farm testing of soil fertility management options for increased maize yield in Bugesera distric, Rwanda.

Ibrahim, 1995 in his book entitled principles of soil conservation supports this practice. Because mineral fertilizer is too expensive. This is why we encourage farmers to promote the biomass of *Tithonia diversifolia* which is very available and also strengthen the planting of some agroforestry species (*Acasia auriculiforms, Calliandra calothyrsus, Leucaena diversifolia, Tephrosia vogelli, Vernonia amygdalina)* in the borders of their fields (Boundary tree planting) and also alley cropping with maize or other crops.

The results on the types of fertilizers applied to fields by farmers confirm the burial of harvest crops residues as the only type of fertilizer. They apply it and prefer it, because minerals fertilizers and others organic

fertilizers are not known in the area (Table 6). Furthermore, with crop residues, determining the dose or quantity to spread becomes difficult.

The percentage of incidence and severity of diseases observed in crops is negligible (Table 7). For the Solutions adopted in relation to diseases, some farmers use mechanical control. Others continue with the remains of the plants, which are not attacked (Table 8). This situation automatically leads to a drop in crop yields with other repercussions from the socio-economic level of farmers. Zamukulu et al (2019), speaking about the constraints and opportunities of agriculture-livestock integration in Mushinga in eastern Democratic Republic of Congo, also recognized this weakness.

All the crops observed gave production at the end of growing season A in February 2024 (Table 9). Note that agricultural production appears to be low because farmers are faced with several constraints such as lack of good farming practices, poor management of soil fertility, climate change and others issues.

The challenges encountered by farmers for the adoption of Agroecological Practices and Proposals of some possible solutions by farmers (Table 10) shows that farmers cannot even recognize the word agroecological and its signification. To this end, the need for popularization on agro ecology is essential because agro ecology seems to be the metal framework on which intelligent and/or sustainable agriculture rests.

In addition, agroecology challenges agronomists on the interest of relying on the natural regulations of the agroecosystem, rather than on inputs, to ensure agricultural production without wasting natural resources, particularly those which are not renewable. Basing the construction of production methods on agroecology, underlines Altieri (1992), it means reducing negative environmental impacts by reducing, and if possible eliminating, chemical inputs; it means strengthening the health of agroecosystems by promoting techniques that strengthen the natural control of pests; it means optimizing the metabolism of agroecosystems by organizing the recycling of nutrients; Several influential authors (Altieri et al., 2012; Bommarco et al., 2013; Francis et al., 2003; Tilman et al., 2001; Tscharntke et al., 2012; Vandermeer, 2011a) are of the opinion that strategies resource management in agriculture require the use of agroecology principles and their application according to needs and circumstances at the local level.

Agroecological practices present varying opportunities to transform agroecosystems into sustainable, equitable, socially and culturally sensitive as well as economically viable systems. To assess whether agroecological practices have good potential for application in a given location, it is necessary to look at whether they offer the possibility of responding to the needs and constraints of the type of agricultural production concerned, the actors involved and the agroecological characteristics and environmental conditions of the operating site.

If these elements are not taken into account, agroecosystems will not be able to take maximum advantage of the advantages represented by the agroecological approach. The involvement of national and international authorities, as well as investments in the field of research and development, are essential to achieve greater adoption of agroecological practices in different environments, to the world (Andreane Gravel, 2016).

However, it would be desirable to do this with farmers who have their own land. Farmers buy agricultural inputs themselves, especially seeds. However, fertilizers, like pesticides, they do not use them due to a lack of knowledge and financial means to appropriate them (Table 11) .

Farmers work in associations (Table 12). We encourage this trend, because it is the only way to make agricultural production profitable and also safeguard the rights of farmers in rural Congolese area. At the same time, we ask that these associations be supervised by the Nyiragongo territory political-administrative authorities.

Farmers' agricultural production is used for self-consumption and for sale to support the education and medical assurance of childrens and a small quantity is reserved as seed for the next growing season (Table 13). Post-harvest activities, particularly the processing and processing of agricultural products, pose serious problems. The Type of Market operated by farmers (Table 14) shows that all farmers exploit the local market. These are explained by low agricultural productivity and also the lack of agricultural access roads.

The results on the dominant cropping system (Table 15) indicate that farmers practice more mixed cropping, less crop rotation, rotation and monoculture. These results also confirm the difficulty that farmers have in acquiring arable land, reason why the majority prefer mixed cultivation.

This practice of crop association is the consequence of low sown areas often linked to strong demographic pressure leading to the low availability of agricultural land (Civava et al., 2013). Farmers perceive that monoculture constitutes a loss and exposes them to the risks of climatic hazards, but also to the lack of diversification of the harvest.

Agricultural production in Nyiragongo faces enormous challenges both in terms of socio-economic factors and technical factors (Table 16). However; Major constraints were: (1) lack of agroecology practices (100 % of respondents), (2) lack of financial means (87 % of respondents), (3) absence engines and agricultural machines ((85% of respondents), (4) high price for renting land to cultivate (78 % of respondents), (5) lack of state advisers (75 % of respondents), (6) the non availability of adequate fertilizers with high potential for restoring soil fertility (96 % of respondant).

This resuts are similar to the research of Theodore Munyuli et al. (2022) on diagnostic of the current livelihood evolution, farming practices, production constraints, post-harvest processing, trading and value-chain systems of sweet potato in north-kivu province, eastern of Drc Congo.

Our results corroborated also to the research of Mulubrham et al. (2022) which looked on the impact of Agricultural productivity on welfare growth of farm household in Nigeria.

These same observations were made also in East Africa by Kindu et al. (2014) who report that low soil fertility, plant and animal diseases, plant pests, the high price of inputs and limited knowledge on fodder storage are the major constraints to crop production and animal.

Again in other African countries such as Ghana, Emmanuel et al (2016): conduct the research on an evaluation of challenges facing smallholders in Ghana: a case study for the Aowin suaman District several production constraint have been cited by farmers including: lack of access to financial credit (90 % of respondents), lack of access to government subsidies (81% of respondents), lack of access to farm machines(82% of respondents), low price of agricultural produce (84 % of respondents).

Low soil fertility on peasant farms has long been reported as one of the main constraints limiting the sustainable intensification of the agriculture-livestock integration system for both the production of food crops

and forage crops (Blanchard et al., 2012; Vall et al., 2012). This low soil fertility is mainly linked to overexploitation of agricultural land in mountainous regions like Mushinga.

IV. Conclusion

The aim of this investigation was to identify the constraints of agricultural production in the Munigi groupement, Bakumu chiefdom, Nyiragongo territory in the North Kivu province. The results obtained showed the existence of several constraints in terms of socio-economic and technical factors, particular lack of agroecological practices, lack of financial means, lack of engines and agricultural machines, very high price for renting land to cultivate, lack of states agronomists, the non-use of chemical and organic fertilizers with high potential for restoring soil fertility, hence the increasingly low yields. Farmers therefore practice primitive production systems which do not contribute in any way to improving their food and economic situation.

V. Significance Statement

This dissertation has brought to light the constraints faced by farmers in agricultural productivity in terms of technical, social, political and even economic and limit this sector of production and whose amplitude of effects varies from one region to another.

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