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Identification of Constraints in Cassava (*Manihot esculenta* Crantz) Production in the Irumu Territory

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Abstract

Cassava (Manihot esculenta Crantz) is a key staple crop in the Democratic Republic of Congo (DRC), providing essential calories for millions of people. Despite its importance, cassava production in the Irumu territory has declined due to a complex interaction of technical, socio-economic, biotic, and abiotic constraints. Farmers face limited training, poor adoption of improved techniques, and reliance on rudimentary tools (75.8%), while restricted access to credit (100%), inputs, and insecurity (98.8%) exacerbate production challenges. Climatic variability, including droughts (63.3%) and excessive rainfall (36.7%), along with high prevalence of diseases such as cassava mosaic and pervasive weeds (100%), further reduce yields.These findings highlight the urgent need for integrated interventions combining farmer training, adoption of resistant cassava varieties, improved access to inputs and credit, climate adaptation strategies, and strengthened farmer organizations. Implementation of such measures is expected to enhance productivity, resilience, and food security in Irumu.

Keywords : Cassava ; Constraints ; Productivity ; Irumu.

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Résumé

Le manioc (Manihot esculenta Crantz) est une culture vivrière stratégique en République Démocratique du Congo, fournissant l'essentiel des calories pour une large partie de la population. Dans le territoire d'Irumu, la production de manioc est limitée par un ensemble de contraintes techniques, socioéconomiques, climatiques et biotiques. Les producteurs souffrent d'un déficit de formation, d'une faible adoption des itinéraires techniques modernes et d'un recours aux outils rudimentaires (75,8 %). L'accès restreint au crédit (100 %), aux intrants et l'insécurité (98,8 %) aggravent les difficultés. La variabilité climatique, incluant les sécheresses (63,3 %) et les pluies excessives (36,7 %), ainsi que la prévalence de maladies comme la mosaïque africaine et des mauvaises herbes omniprésentes (100 %) réduisent encore les rendements.

Ces résultats soulignent l'urgence d'interventions intégrées incluant la formation des producteurs, la promotion de variétés résistantes, l'accès aux intrants et au crédit, le renforcement des organisations paysannes et l'adoption de stratégies d'adaptation au climat. De telles mesures pourraient améliorer durablement la productivité, la résilience et la sécurité alimentaire dans le territoire d'Irumu.

Mots-clés : Manioc, Contraintes, Productivité, Irumu,

1. Introduction

Cassava (*Manihot esculenta* Crantz) is a strategic staple crop in many developing countries, particularly in the Democratic Republic of the Congo (DRC), where it constitutes the main food source for nearly 70% of the population and provides approximately 60% of caloric needs (Janssens, 2001; Anonymous, 2011). Despite its resilience to unfavorable edaphoclimatic conditions (IITA, 1990), cassava production has experienced a significant decline over the past decade, due to factors such as viral diseases—particularly cassava mosaic disease—soil nutrient depletion, inappropriate cultivation practices, pest infestations, and climatic variability (Vandenput, 1981; Silvestre & Arraudeau, 1983; Kabeya, 2004). Farmers' yields remain low, averaging 7–8 t/ha, far below the genetic potential estimated at 11–65 t/ha under research station conditions (Janssens, 2001).

The Irumu Territory (Ituri Province) illustrates this context of vulnerability, combining food insecurity, security instability, and dependence on cassava as the primary crop. Technical, socioeconomic, biotic, and abiotic constraints remain poorly documented. The aim of this study is to identify the main limiting factors affecting cassava production in this area and to propose tailored solutions to sustainably improve yields and food security.

2. Materials and Methods

2.1. Study area

The study was conducted in Irumu Territory, located in the north-eastern part of the DRC (8,183 km², average altitude 935 m, coordinates 1°26′46″ N, 29°52′31″ E). The area is characterized by a humid tropical climate, with a rainy season extending from March to November and a dry season from December to February. The average annual rainfall is 1,200 mm, and the mean annual temperature ranges between 20 and 25 °C. Soils are predominantly ferralitic (sandy-clay, slightly acidic, prone to nutrient depletion) and alluvial (fertile, located in lowland areas). Vegetation consists of tropical forests, wooded and grassy savannas, often invaded by competitive

weeds, requiring regular field maintenance.

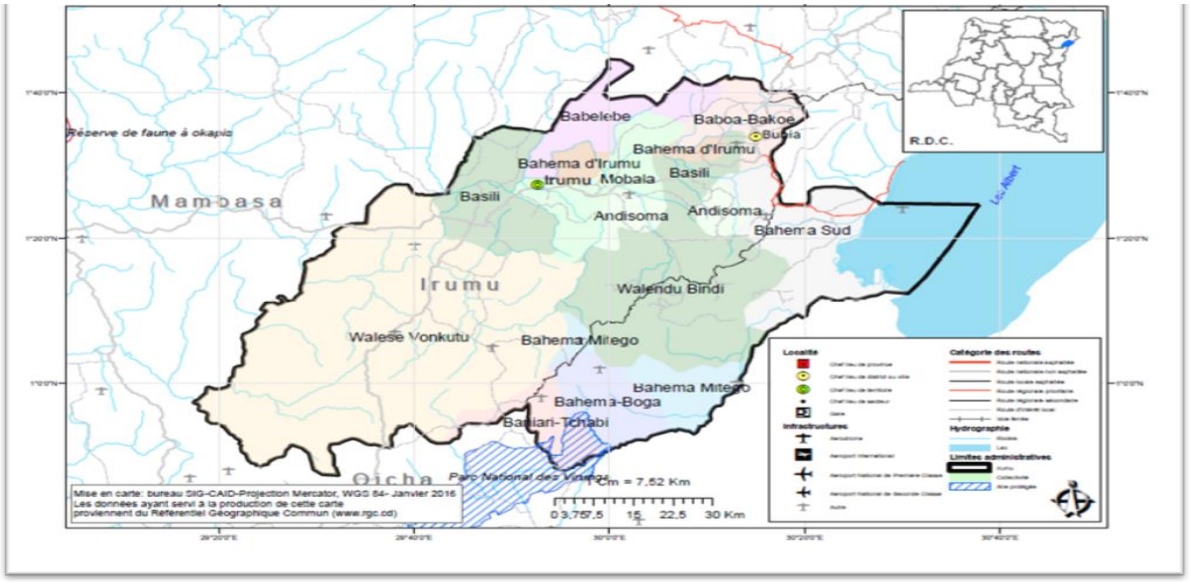

Figure 1: Geographical location of Irumu Territory in Ituri Province, DRC (Source: CAID)

2.2. Methodology

The study adopted a cross-sectional descriptive approach. A stratified random sampling method was used to select 240 cassava farmers, representing the different agroecological zones of the territory. Data were collected through semi-structured questionnaires, direct field observations of cassava plots, and consultation of local meteorological station records. The analysis combined quantitative methods (frequency and percentage of constraints) and qualitative approaches (farming practices and farmers' perceptions) in order to comprehensively characterize the limiting factors.

3. Results and Interpretation

Table 1 : Technical Constraints

Technical Constraint	**Number of Cases Observed**	**Percentage (%)**
Lack of improved planting material	182	75.83
Absence of training on technical itineraries	240	100.00
Lack of knowledge of integrated pest management techniques	240	100.00
Use of rudimentary agricultural tools	240	100.00
Lack of agricultural extension officers	178	74.16
Poor condition of feeder roads	185	77.08

Analysis of this table reveals that all surveyed farmers lack access to training and modern cassava cultivation

techniques. This results in the use of rudimentary tools and inadequate phytosanitary management. Furthermore, the shortage of extension officers worsens this situation, making farmer supervision difficult. Degraded road infrastructure also limits access to markets and technical support.

Table 2 : Socioeconomic Constraints

Socioeconomic Constraint	Number of Cases Observed	Percentage (%)
Lack of access to agricultural inputs	223	92.91
Low purchasing power of farmers	232	96.66
Difficulty accessing agricultural credit	240	100.00
Unstable cassava market prices	158	65.83
Lack of functional farmers' organizations	161	67.08
Limited market opportunities	208	86.66
Insecurity in the region	237	98.75

This table shows that cassava producers operate in a highly precarious economic environment. The lack of access to credit and agricultural inputs severely hinders production improvement. Insecurity further restricts mobility and product marketing. The absence of functional farmer organizations leaves producers vulnerable to market fluctuations and logistical challenges.

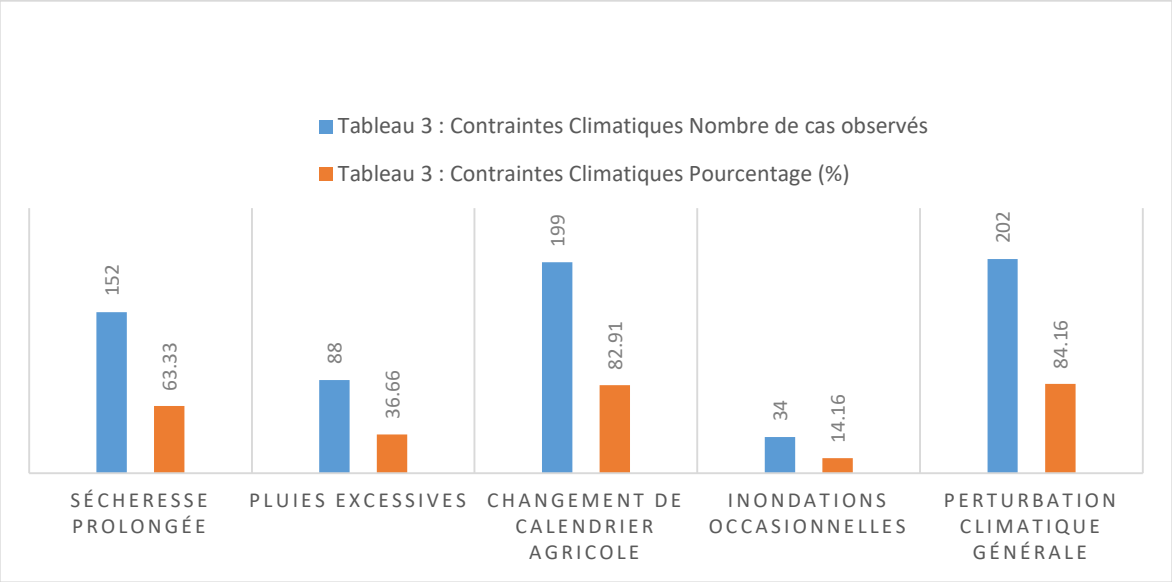

Figure 2: Climatic Constraints

Analysis of this figure indicates that farmers face significant climatic hazards that disrupt agricultural planning and productivity. Climate variability, including droughts and excessive rainfall, directly affects cassava yields.

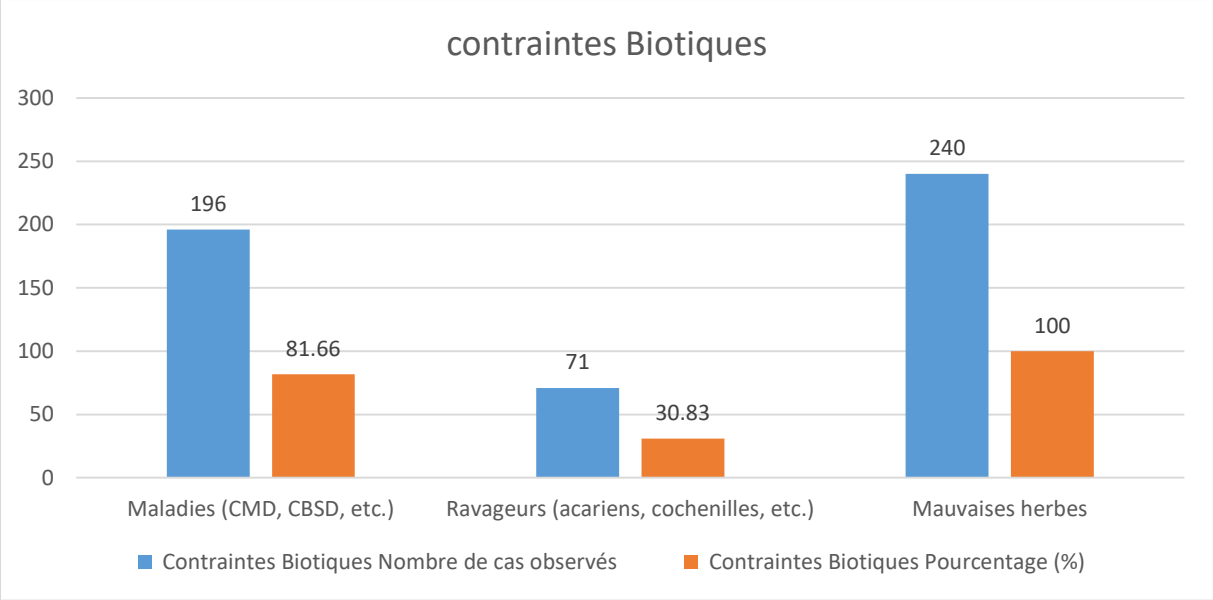

Figure 3: Biotic Constraints

This figure shows that weeds are a widespread problem, with crop diseases also common. Additionally, the presence of pests reported by some respondents was noted. The absence of appropriate control measures exacerbates the impact of these threats.

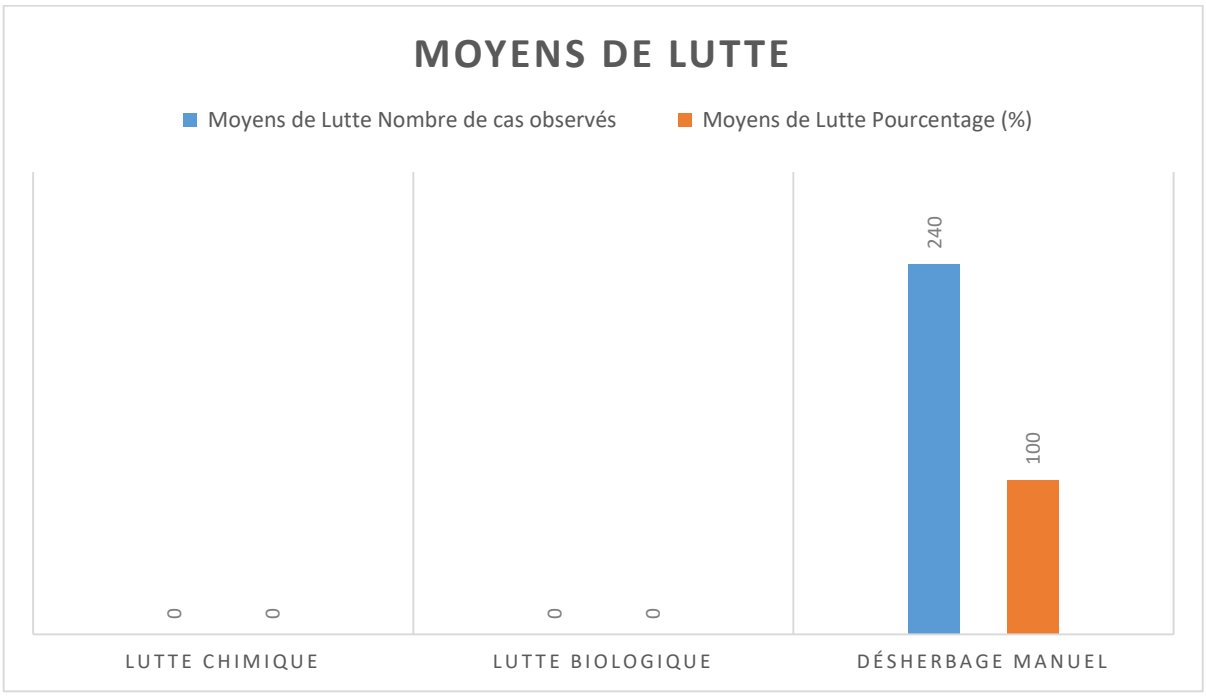

Figure 4: Control Methods

No modern pest or disease control methods are implemented. Manual weeding remains the only available option, which is highly time-consuming and ineffective against diseases or pests.

Table 3 : Technical Practices

Cultural Practice	Number of Cases Observed	Percentage (%)
Crop rotation	0	0.00
Land selection	10	4.16
Land preparation (burning, clearing)	220	91.66
Tillage	240	100.00
Selection of quality cuttings	26	10.83
Respect of plant spacing	48	20.00
Fertilization	0	0.00
Irrigation	0	0.00
Weeding/Maintenance	240	100.00
Other care practices	32	13.33
Excessive leaf harvesting	209	87.00

The analysis of farming practices (Table 3) highlights a heterogeneous application of cassava technical itineraries in Irumu Territory. While some basic operations such as tillage (100%) and weeding/maintenance (100%) are systematically applied, other essential steps are completely neglected, including crop rotation (0%), fertilization (0%), and irrigation (0%).

Furthermore, inappropriate practices such as excessive leaf harvesting (87%) compromise photosynthesis and increase the risk of viral contamination, thereby negatively affecting yields. Very low rates are observed for land selection (4.16%), selection of quality cuttings (10.83%), and respect of plant spacing (20%).

These results indicate a significant technical gap and underscore the need to strengthen farmer training and awareness in order to optimize yields and ensure sustainable production.

4. Discussion

4.1 Technical Constraints

All surveyed farmers (100%) showed a lack of training and a lack of knowledge of modern integrated pest management techniques, confirming the urgent need for capacity-building programs. The use of rudimentary tools (75.83%) and the degradation of road infrastructure (77.08%) limit access to inputs, markets, and technical support services, significantly reducing the competitiveness of the cassava sector.

4.2 Socioeconomic Constraints

The lack of access to agricultural credit (100%) is a major barrier to productive investment. Low purchasing power (96.66%), limited availability of inputs (92.91%), and persistent insecurity (98.75%) further increase the economic and logistical vulnerability of farms. The weak structuring of farmers' organizations (67.08%) limits their ability to negotiate collectively and pool resources.

4.3 Climatic Constraints

Climate variability strongly affects crop management, causing shifts in the agricultural calendar (82.91%), prolonged droughts (63.33%), and excessive rainfall (36.66%). In this purely rainfed context, the introduction of drought-tolerant varieties, strict adherence to the cropping calendar, and the establishment of early warning systems are priority measures to secure yields.

4.4 Biotic Constraints

Cassava Mosaic Disease (CMD) remains the main disease observed, followed by sooty mold, causing estimated losses ranging from 5 to 45% (Guthrie, 1999; PRONAM, 1989). Its prevalence is exacerbated by the use of infected planting material and the presence of insect vectors. Weeds, present in 100% of farms, are mainly controlled through manual weeding, a method that is labor-intensive and ineffective on a large scale.

4.5 Regional Comparison

Unlike the Dikodougou area in Côte d'Ivoire, where constraints are mainly socioeconomic (N'Zué & Coulibaly, 1997), the results of this study reveal a pronounced combination of biotic, climatic, and economic constraints. This situation is consistent with the conclusions of Ikotun & Osiru (1990) on the multifactorial nature of cassava yield limitations in sub-Saharan Africa.

4.6 Improvement Strategies

The exclusive reliance on manual weeding reflects limited access to alternatives such as integrated pest management, chemical weeding, or biological control. The partial adherence to technical itineraries, restricted to basic operations (tillage, weeding), reflects insufficient technical supervision. Slow ground cover (Caburet and his colleagues, 2009) and low fertilization exacerbate weed pressure and soil fertility degradation. The adoption of crop rotations with legumes and cereals, combined with optimal planting density (Arraudeau & Silvestre, 1983), is a strategic pathway to sustainably optimize yields.

5. Conclusion and Recommendations

This study provided a detailed diagnosis of the main constraints limiting cassava (*Manihot esculenta* Crantz) production in the Irumu territory. The results highlight the interaction of technical, socio-economic, biotic, and abiotic factors, which collectively reduce yields and compromise the sustainability of farming systems.

Technically, the near-universal lack of training, limited knowledge of improved cropping practices, and reliance on rudimentary tools reflect structural deficiencies in agricultural extension. Socio-economic constraints, including limited access to credit, inputs, and weak farmers' organizations, exacerbate production vulnerability. Biotic (weeds, diseases, pests) and abiotic (climatic variability, soil degradation) factors further threaten yield stability and production resilience.

To improve cassava productivity and enhance food security, the following recommendations are proposed:

- Develop and implement context-specific training programs focusing on integrated crop management, improved technical itineraries, and agroecological practices.
- Conduct targeted varietal research to promote cassava genotypes tolerant to abiotic stress and resistant to major endemic diseases, including cassava mosaic.
- Assess existing financing mechanisms and establish alternative models (revolving funds, microfinance, specialized rural banks) to facilitate farmers' access to credit and quality inputs.
- Undertake interdisciplinary research on climate change impacts and develop localized adaptation strategies, including early warning systems, water management, and crop diversification.
- Strengthen farmers' organizations through capacity building in management, marketing, and advocacy to enhance competitiveness and resilience.
- Develop integrated simulation models to anticipate the combined effects of limiting factors (climate, soil, and cropping practices) on cassava productivity and guide evidence-based agricultural policies.

The implementation of these measures is expected to sustainably increase cassava yields, strengthen farmers' resilience, and promote stable food security in the Irumu territory.

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