

Impact of Potato Production (*Solanum tuberosum* L.) on the Family Income of Producers in Lomanda Village, Ecunha Municipality, Angola

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Publication Date: 2026/07/29

Abstract: Potato (*Solanum tuberosum* L.) cultivation plays a significant role in the socioeconomic development of rural households, constituting an important source of income, employment, and food security in many developing countries. This study aimed to evaluate the impact of potato production on the family income of farmers in Lomanda village, Ecunha Municipality, Huambo Province, Angola between September 2025 to April 2026. The study adopted a mixed-method approach combining quantitative and qualitative techniques. The research had a descriptive and exploratory nature and involved the application of structured questionnaires to 97 family farmers engaged in potato production. Data were organized and analyzed using descriptive statistics, including frequencies and percentages. The findings revealed that most producers were over 40 years old, belonged to large households, and had considerable experience in agricultural activities. Potato cultivation was identified as the primary source of income for 81% of the surveyed households, contributing significantly to food consumption, healthcare, education, and reinvestment in agricultural production. The study also found that potato production positively influenced local employment opportunities, food security, and commercial activities within the community. However, farmers continue to face important constraints, particularly limited access to agricultural inputs, credit facilities, technical assistance, transportation, and stable markets. Additionally, concerns regarding soil degradation associated with continuous cultivation practices were reported. The study concludes that potato production is a strategic activity for improving rural livelihoods and promoting local economic development in Lomanda, highlighting the need for policies and support programs aimed at strengthening the potato value chain and enhancing farmers' profitability and resilience.

Keywords: Potato Production; Family Farming; Household Income; Food Security; Rural Development; Socioeconomic Impact.

How to Cite: Artur Domingos Catito; Pascoal Jeremias Chiambo; Bonifácio Visseteca; Imaculada Matias Da Conceição; Alexandre Gombiwa Alfredo; Romilson Gouveia Madruga (2026) Impact of Potato Production (*Solanum tuberosum* L.) on the Family Income of Producers in Lomanda Village, Ecunha Municipality, Angola. *International Journal of Innovative Science and Research Technology*, 11(7), 1678-1685. <https://doi.org/10.38124/ijisrt/26jul984>

I. INTRODUCTION

Family farming is the main productive base of Angolan rural areas, playing a decisive role in food security, job creation and poverty reduction. In Angola, this sector is

responsible for most of the national food production, being fundamental for the economic sustainability of households and for the development of local economies. It is estimated that family farming is responsible for about 80% of national food production and involves millions of peasant families

distributed across different regions of the country (Delphy, 2022) (Governo de Angola, 2024)(FAO, 2024). Among the various crops exploited by family farmers, potatoes (*Solanum tuberosum* L.) stands out for its high economic, nutritional and commercial value, assuming a growing importance in the Central Plateau, particularly in the province of Huambo (Delphy, 2022).

The province of Huambo has favorable soil and climatic conditions for potato production, namely high altitude, moderate temperatures and adequate rainfall, factors that have contributed to the consolidation of the region as one of the main producing centers in the country (Delphy, 2022). In recent years, there has been a continuous growth in cultivated area, production and crop productivity, reflecting the expansion of agricultural activity and the gradual adoption of better production practices. Available estimates indicate that the cultivated area increased from approximately 29,500 ha in 2020 to about 36,800 ha in 2024, while production evolved from 250,800 tons to 386,400 tons in the same period, accompanied by an increase in average productivity from 8.5 to 10.5 t/ha (MINAGRIF, 2024).(MINAGRIF, 2024)

When compared to other strategic crops of family farming, such as corn and beans, potatoes have a significantly higher productivity. Although it occupies a substantially smaller area than corn, the crop produces about 3.5 times more per hectare and almost nine times more than beans, evidencing its high production efficiency and its potential for income generation. While maize mainly plays the role of ensuring food security for households and beans contribute to food and nutritional diversification, potatoes are the main commercial crop of family farms in the Central Plateau, constituting an important source of liquidity to cover

expenses with food, education, health and agricultural reinvestment (Delphy, 2022; FAO, 2024).(IFAD, 2018)(RAFA/CPLP, 2018)

In the municipality of Ecuinha, and particularly in the village of Lomanda, potato production represents one of the most relevant economic activities for family farmers. However, despite the socioeconomic importance of the crop, several constraints persist related to access to agricultural inputs, credit, technical assistance, storage and marketing infrastructures, factors that limit the productive potential and profitability of producers (IFAD, 2018; MINAGRIF, 2024).

In this context, the present study aimed to evaluate the impact of potato (*Solanum tuberosum* L.) production on the family income of producers in the village of Lomanda, municipality of Ecuinha, Huambo province, analyzing simultaneously the socioeconomic profile of farmers, the economic performance of the activity and the main constraints that condition the sustainable development of the potato production chain in the region.

II. MATERIAL AND METHODS

The present study was carried out in the village of Lomanda, commune of Ecuinha, municipality of Ecuinha, province of Huambo, in the period between September 2025 and April 2026. The study area is located about 42 km from the city of Huambo and presents agroecological conditions favorable to potato cultivation, characterized by high altitudes, annual rainfall between 1100 and 1400 mm and moderate temperatures, factors that favor the development of the crop.

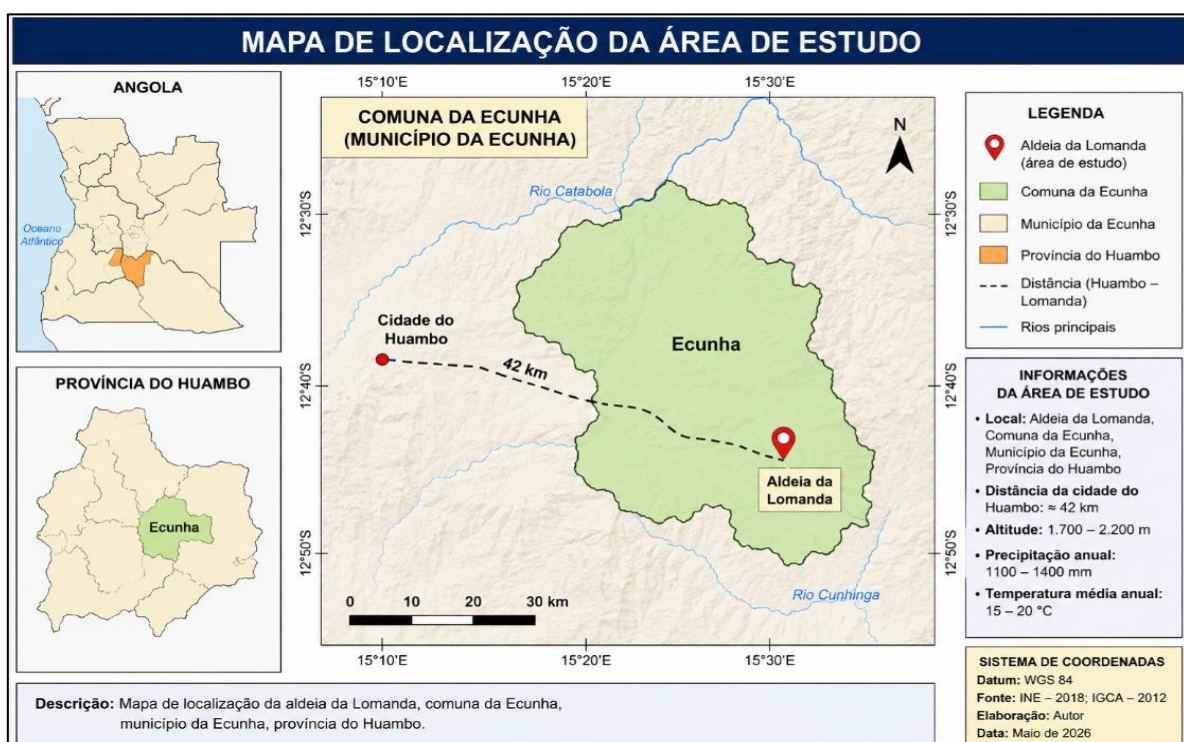


Fig 1 Location Map of the Study Area.

Source: Authors

The research was characterized as a descriptive and exploratory research, The descriptive character allowed to identify and describe the socioeconomic characteristics of the producers and the relationships between potato production and family income, while the exploratory component allowed to understand the main constraints and opportunities associated with the local agricultural activity.

The target population of the study consisted of 117 family farmers who produce potatoes in the village of Lomanda, according to information provided by the Institute of Agrarian Development (IDA). The minimum sample size was determined using the Yamane (1967) formula for finite populations, considering a confidence level of 95% and a sampling error of 5%, resulting in a minimum sample of 91 producers:

$$n = \frac{N}{1 + N(e)^2}$$

Where represents the sample size, the total population (117 producers) and the allowable sampling error (0.05). nNe

During the fieldwork, 97 family farmers who produce potatoes were surveyed, corresponding to approximately

82.9% of the total population, a value higher than the minimum statistically recommended, thus ensuring high representativeness and reliability of the results obtained.

The instrument used for data collection was the questionnaire by survey, structured in three main sections: (i) characterization of the socioeconomic and productive profile of family farmers; (ii) evaluation of the economic performance of potato production in households compared to other cash crops; and (iii) identification of the main productive constraints, as well as analysis of the socioeconomic impacts of potato cultivation in the community under study.

After collection, the data were initially organized, coded and systematized in the Microsoft Excel program, and later processed in the *statistical* software *InfoStat*, version 2020. This *software* was used to prepare tables and graphs, as well as to perform descriptive statistical analyses and correlation between the variables studied. The descriptive analyses included the determination of absolute and relative frequencies, percentages, means and standard deviations, allowing a better understanding of the socioeconomic and productive characteristics of the farmers and the dynamics of potato production in the study area.

III. RESULTS AND DISCUSSION

➤ Socio-Economic and Productive Profile of Family Farmers

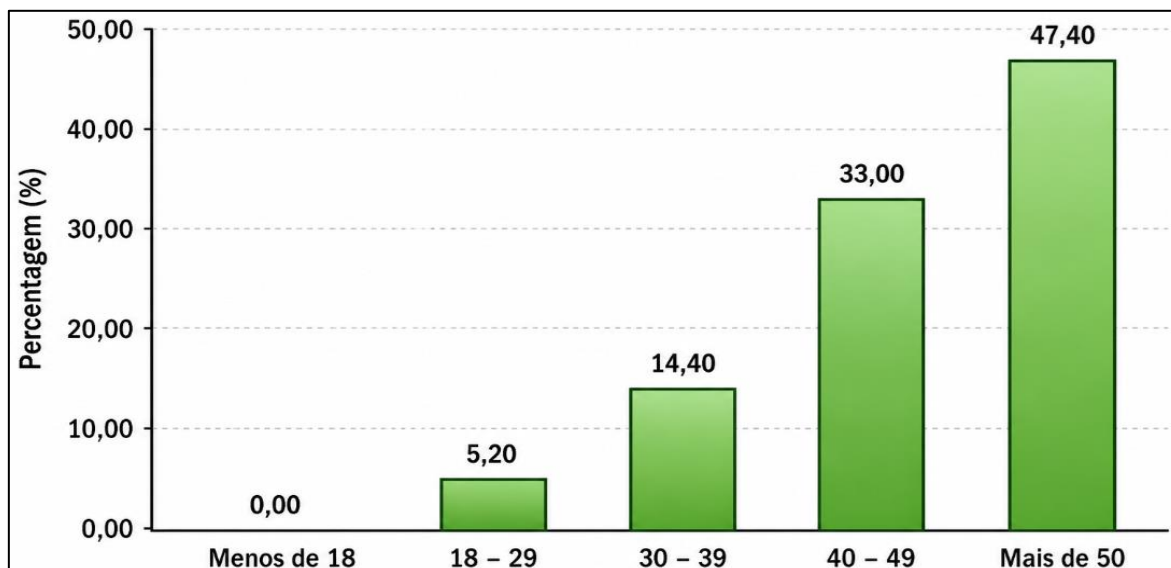


Fig 2 Distribution of Farmers by Age Group.
Source: Author

Figure (2) shows the ectal distribution of potato-producing family farmers in the community under study. There is a predominance of producers over 50 years of age, representing 47.4% of the total number of respondents, followed by the age group of 40 to 49 years, with 33.0%. Farmers aged between 30 and 39 years account for 14.4%, while producers aged between 18 and 29 years represent only 5.2% of the sample. No farmers under the age of 18 were registered.

These results show a clear aging of the agricultural population dedicated to potato production in the study area, reflecting the reduced participation of young people in agricultural activity. Such a situation can compromise generational renewal and the future sustainability of production, since the permanence of the activity depends on the integration of new producers and the adoption of more innovative and technologically advanced production practices.

It is verified that potato production is predominantly developed by farmers over 40 years of age, especially in the age group over 50 years (47.4%). On the other hand, the participation of young people is low, with only 5.2% of producers between 18 and 29 years of age and no producers

under 18 years of age were registered. The results suggest an aging process of the agricultural population and highlight the need for policies and incentives that promote the participation of young people in productive activity.

Table 1 Average Productive and Economic Indicators of the Main Cash Crops of Ecnha Households.

Culture	Average area. family-1 (ha)	Average production (t. family-1)	Productivity (t/ha)	Sales (1000 kz)	Production cost (1000 Kz. ha-1)	Net profit (1000 kz. family-1)
Reindeer Potato	0,75	10,5	14,0	3 360	1450	1910
Corn	1,50	1,8	1,2	540	250	290
Beans	0,80	0,96	1,2	864	320	608
Vegetables	0,35	5,25	15,0	1575	650	925

Source: Field Data Collection

The analysis of the productive and economic indicators of the main crops exploited by the Ecnha households shows significant differences in land use, productivity and profitability. Maize has the largest average area under cultivation per household (1.50 ha), reflecting its importance for the food security of households; however, it has low productivity (1.2 t.ha⁻¹) and the lowest net profit (290 Kz/family). Beans occupy an intermediate average area (0.80 ha), with productivity similar to that of corn (1.2 t.ha⁻¹), providing a moderate net profit of 608 Kz per family.

In turn, vegetables have the highest productivity among the crops analyzed (15.0 t.ha⁻¹), despite the reduced

cultivated area (0.35 ha), generating a net profit of 925 Kz/family. The reindeer potato crop, although cultivated in only 0.75 ha per family, stands out for its high production volume (10.5 t/family), high productivity (14.0 t.ha⁻¹) and highest economic return, presenting the highest sales (3 360 Kz/family) and the highest net profit (1 910 Kz/family), despite the production costs being higher (1 450 Kz.ha⁻¹).

These results demonstrate that potatoes are the main income crop of family farmers in Ecnha, playing a strategic role in generating income and strengthening the economic security of households, while maize and beans predominantly assume subsistence and food security functions.

Table 2 Evolution of the Economic Performance of Potatoes in Ecnha (2015–2024)

Year	Cultivated area (ha)	Output (t)	Productivity (t/ha)	Estimated revenues (million kz)	Costs (million kz)	Profit (million kz)
2015	1050	13650	13,0	2048	1103	945
2016	1120	14896	13,3	2309	1210	1099
2017	1180	15930	13,5	2548	1322	1226
2018	1230	16974	13,8	2801	1426	1375
2019	1280	17920	14,0	3046	1536	1510
2020	1320	18744	14,2	3281	1663	1618
2021	1360	19584	14,4	3525	1795	1730
2022	1390	20155	14,5	3729	1904	1825
2023	1410	20868	14,8	4174	2045	2129
2024	1430	21450	15,0	4612	2160	2452

Source: FAOSTAT (2024)

The evolution of the economic performance of potato cultivation in the municipality of Ecnha, in the period from 2015 to 2024, shows a continuous and sustainable growth of all the productive and economic indicators analyzed. The cultivated area increased from 1,050 ha in 2015 to 1,430 ha in 2024, corresponding to an increase of approximately 36.2%, while production evolved from 13,650 to 21,450 tons, representing a growth of about 57.1%. At the same time, there was a gradual improvement in productivity, which went from 13.0 to 15.0 t/ha, reflecting the adoption of better agronomic practices and greater production efficiency. The increase in production was accompanied by a significant expansion in revenues, which grew from 2,048 to 4,612 million Kz, despite the simultaneous increase in production costs, which went

from 1,103 to 2,160 million Kz. As a result, profit from the activity increased from 945 million Kz in 2015 to 2,452 million Kz in 2024, confirming the growing economic importance of potatoes as the main cash crop of family farmers in Ecnha and its contribution to the improvement of living conditions and local economic development.

The results observed in Ecnha, characterized by the simultaneous increase in cultivated area, productivity, revenues and profit over the period from 2015 to 2024, corroborate the findings of Devaux et al. (2021), who highlight potato cultivation as one of the food crops with the greatest potential to promote income generation, food security and economic development in rural areas. Similarly,

Bajracharya et al. (2017) found that increased investments in improved seeds, fertilisation and appropriate agronomic practices contribute significantly to increasing the productivity and profitability of potato production among smallholder farmers. The results are also in line with FAO (2024), which considers potatoes a strategic crop for family farming systems due to their high productivity per unit area

and their ability to generate higher yields than traditional subsistence crops.

➤ Pearson's Correlation Analysis Between Economic Indicators

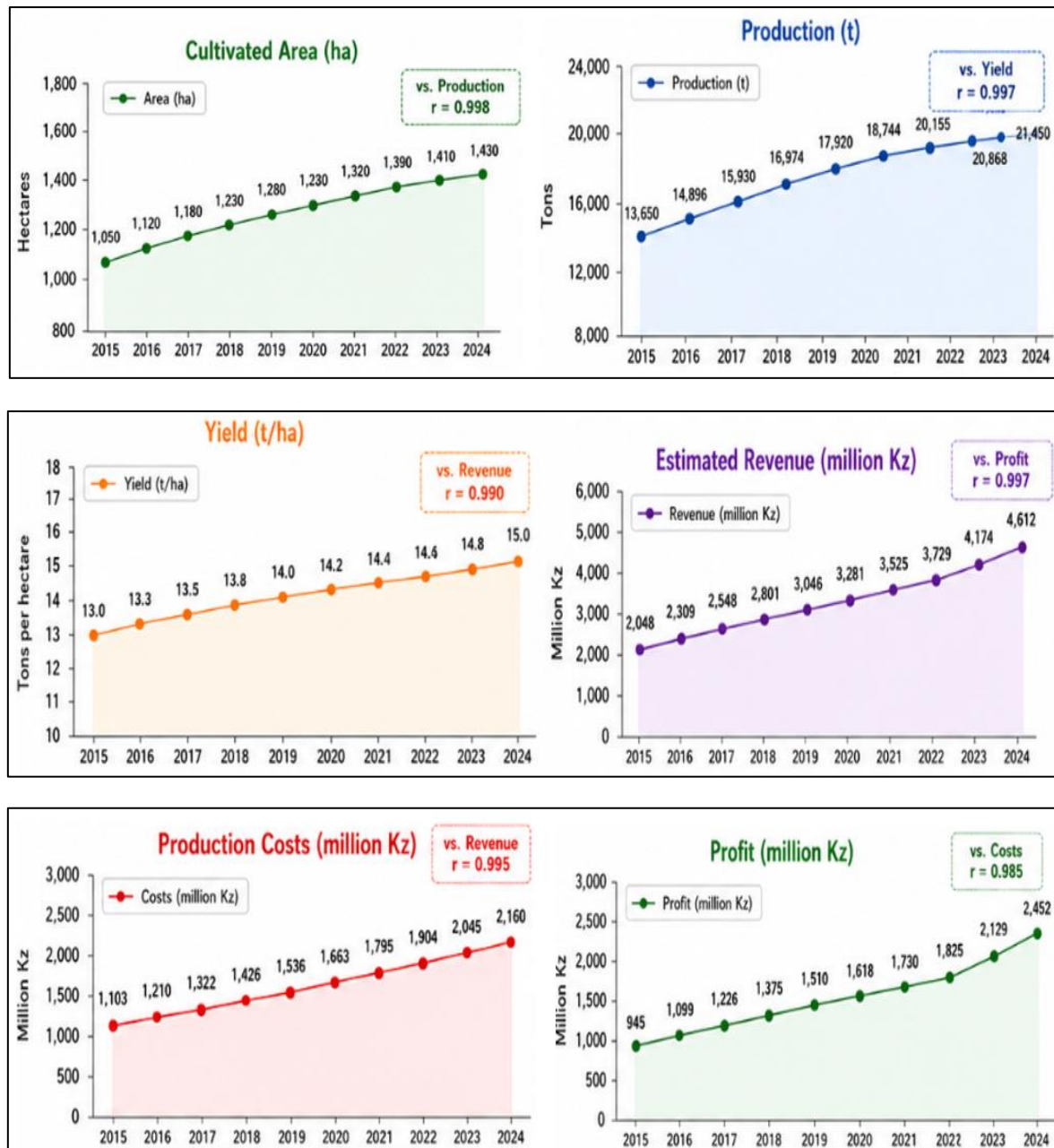


Fig 3 Correlation Analysis.

Source: Authors

Pearson's *correlation analysis* revealed very strong positive associations between the productive and economic indicators of potato cultivation in the municipality of Ecunha, in the period from 2015 to 2024, suggesting that the increase in cultivated area, productivity and productive investments was directly associated with the growth of production, revenues and household profit.

The almost perfect correlation observed between cultivated area and production ($r = 0.998$) indicates that the expansion of the area under potato cultivation was one of the main factors responsible for the increase in production over the period analyzed. This result is consistent with studies carried out in family farming systems, which show that the increase in the cultivated area is positively associated with the growth of agricultural production and producers' income.

Likewise, the high correlation between productivity and production ($r = 0.997$) shows that the growth in production resulted not only from the expansion of the cultivated area, but also from the improvement of production efficiency and the adoption of better agronomic practices. According to FAO (2024), the use of quality seeds, adequate fertilization and good management practices contribute significantly to increasing potato productivity, especially on family farms.

The results obtained also corroborate the findings of Bajracharya *et al.*, (2017) who found that greater investments in production factors, such as labor, seeds and fertilizers, lead to significant increases in productivity and profitability of the potato crop. In this study, the increase in production costs was accompanied by increases in economic income, a situation similar to that observed in Ecunha.

The strong correlation observed between costs and revenues ($r = 0.995$) and between costs and profit ($r = 0.985$) demonstrates that the investments made by farmers in inputs and production technologies were offset by increases in production and sales. Similar results were reported by Mdoda & Maziya (2023) *et al.*, who concluded that farms that are more efficient in the use of productive resources obtain higher levels of productivity and economic return.

The almost perfect correlation between revenues and profit ($r = 0.997$) shows that the increase in potato sales was the main determinant of the improvement in the profitability of agricultural activity in Ecunha. This result is in line with several studies conducted in developing countries, which show that potatoes represent an important cash crop, capable of significantly increasing the income and food security of rural households (Mijena, 2022; Manirinho & Nkikabahizi, 2025). In addition, the high association between productivity, revenues and profit reinforces the importance of technological innovation, access to improved seeds and technical assistance for the sustainable development of the potato production chain. Recent studies such as Devaux (2021) and FAO (2025) indicate that improvements in agronomic management and the efficient use of production factors simultaneously increase crop productivity and profitability.

Taken together, the results confirm the strategic role of potatoes as the main income crop of Ecunha households, contributing to income generation, rural poverty reduction and improved food security, as described by the international literature on family farming systems based on potato production.

➤ Constraints and Improvement Strategies

Despite the economic relevance of potato cultivation for the households of the village of Lomanda, the results of this study showed the existence of several constraints that limit the sustainable development of the activity and the maximization of producers' incomes. Among the main problems identified are limited access to quality agricultural inputs, such as certified seeds, fertilisers and plant protection products, difficulties in accessing agricultural credit, insufficient technical assistance, deficiencies in storage and

marketing infrastructure, high transport costs and gradual soil degradation resulting from continuous potato cultivation. These results corroborate the studies by Bajracharya *et al.* (2017), which demonstrated that the unavailability of improved seeds and agricultural inputs is one of the main factors responsible for the low levels of productivity and profitability of potato cultivation among small producers.

The limitation in access to agricultural financing is another important obstacle to the development of the potato production chain in Ecunha. Many farmers rely solely on their own resources to finance production, restricting their ability to invest in technologies, mechanization and expansion of cultivated areas. A similar situation was reported by IFAD (2018), which identified insufficient access to credit as one of the main obstacles to the growth of family farming in Angola. Similarly, Mdoda and Maziya (2023) found that producers who have greater access to financial services have higher levels of production efficiency and economic profitability.

The low coverage of rural extension services and technical assistance is also a limiting factor for the adoption of more efficient agronomic practices. According to Devaux (2021), technology transfer, farmer training, and the dissemination of good agricultural practices are fundamental elements for simultaneously increasing productivity, sustainability, and competitiveness of potato crops. It is therefore necessary to strengthen technical assistance services through continuous training of producers, the implementation of demonstration camps and the promotion of field schools for farmers.

Another important constraint identified in the study refers to the existing limitations in the storage and marketing infrastructures. The absence of adequate conservation conditions forces many producers to sell immediately after harvest, a period in which market prices tend to be lower, significantly reducing profit margins. According to FAO (2025), post-harvest potato losses can exceed 25% in many developing countries due to insufficient storage, transport and marketing infrastructure.

High transport costs and difficulties in accessing the main consumer markets, namely Huambo, Benguela and Luanda, also compromise the profitability of agricultural activity. Similar results were found by Manirinho and Nkikabahizi (2025), who concluded that market limitations and logistical costs significantly reduce the competitiveness of potato production among Rwandan smallholder farmers.

In addition, the continuous practice of potato monoculture has contributed to the gradual degradation of soil fertility, increasing the incidence of pests and diseases and reducing the productive potential of farms. FAO (2025) and Devaux (2021) highlight that the adoption of crop rotation systems, the use of organic fertilizers, and the implementation of conservation agriculture practices are key to ensuring the sustainability of potato production systems.

On the other hand, the results of the study revealed a marked ageing of the agricultural population, since most

producers are over 40 years old, showing a low participation of young people in agricultural activity. FAO (2024) considers that the ageing of farmers is one of the biggest challenges to the sustainability of African agriculture, advocating the need for public policies that promote rural youth entrepreneurship, facilitate young people's access to land, credit and agricultural technologies.

In view of the constraints identified, it is recommended the implementation of integrated policies to support the potato production chain in E Cunha, including the strengthening of production and distribution systems for certified seeds, the creation of specific credit lines for family farmers, the reinforcement of rural extension services, investment in storage and marketing infrastructures, improving market access routes and promoting sustainable farming practices. The adoption of these measures could contribute significantly to increasing the productivity, profitability and resilience of potato producers, strengthening the role of this crop in generating income, reducing rural poverty and promoting food security.

IV. CONCLUSION

This study demonstrates that potato production is the principal economic activity supporting the livelihoods of family farmers in Lomanda Village, E Cunha Municipality. The results show that potato cultivation is the main source of household income for most producers, providing greater economic returns than other major crops such as maize, beans, and vegetables. Beyond income generation, potato production contributes substantially to household food security, employment creation, access to education and healthcare, and the reinvestment of financial resources into agricultural activities, thereby strengthening the socioeconomic resilience of rural households.

The economic analysis confirms the strategic importance of potatoes within the local farming system. Despite requiring higher production costs than other crops, potato cultivation generates the highest productivity, sales, and net profit, demonstrating that well-managed investments in agricultural inputs and improved production practices can significantly enhance farmers' profitability. Furthermore, the long-term analysis (2015–2024) revealed sustained increases in cultivated area, production, productivity, revenues, and profits, while the Pearson correlation analysis showed strong positive relationships between productive investment, output, and household income, highlighting the economic viability of potato production in the study area.

Nevertheless, the study identified several structural constraints that continue to limit the full potential of the potato value chain, including restricted access to certified seeds, fertilizers, agricultural credit, extension services, storage facilities, reliable markets, and transportation infrastructure. The ageing farming population and the environmental impacts associated with continuous potato monoculture also represent important challenges to the long-term sustainability of the production system.

Overall, the findings indicate that strengthening the potato sector should be considered a priority for rural development policies in Angola. Investments in quality inputs, rural credit, extension services, post-harvest infrastructure, market access, and sustainable land management practices would substantially improve productivity, profitability, and resilience among smallholder farmers. In addition, initiatives that encourage youth participation in agriculture and promote climate-smart and environmentally sustainable production systems are essential to ensure the long-term competitiveness of the potato value chain. Future research should evaluate the economic impacts of these interventions over time and explore value-addition opportunities, post-harvest technologies, and market integration strategies that can further increase household income and rural development in potato-producing regions of Angola.

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