

Postharvest Preservation and Marketing Practices of Potato (*Solanum tuberosum*) in the Bagga Valley in the Tahoua Region, Niger

Mahamane Moctar Rabe¹, Ibrahim B. Baoua², Soumailla A. Almoustapha¹ & Dieudonne Baributsa³

¹ Department of Rural Sociology and Economics, Faculty of Agronomic Sciences, Djibo Hamani University of Tahoua, Tahoua, Niger

² Department of Plant Production Sciences and Technologies, Dan Dicko Dankoulodo University of Maradi, Maradi, Niger

³ Department of Entomology, Purdue University, West Lafayette, IN, USA

Correspondence: Mahamane Moctar Rabe, Department of Rural Sociology and Economics, Faculty of Agronomic Sciences, Djibo Hamani University of Tahoua, P.O. Box 255, Tahoua, Niger. E-mail: mocnad1@gmail.com

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Abstract

This study examines postharvest preservation and marketing practices of potato (*Solanum tuberosum*) producers in the Bagga Valley, Tahoua region of Niger. Based on survey data collected from approximately 200 farmers across selected municipalities, the study combines descriptive statistics with a binary logistic regression model to identify the determinants of storage adoption and examine prevailing market practices. Results reveal that only a limited proportion of producers practice storage, mainly due to inadequate storage infrastructure and limited access to improved storage technologies, resulting in a relatively short storage duration averaging about 30 days. The econometric analysis shows that cultivated area, farming experience, access to agricultural inputs, and membership in producers' organizations significantly increase the likelihood of storage adoption. Despite a high level of cooperative membership, marketing channels remain dominated by intermediaries, limiting farmers' bargaining power and income opportunities. These constraints contribute to market saturation at harvest and price volatility. The findings suggest that investments in decentralized storage facilities, farmer training, and rural infrastructure are essential to improve potato value chain efficiency, enhance producers' incomes, and support sustainable agricultural development in the Sahelian context.

Keywords: postharvest storage, value chain, market access, smallholder farmers, Niger

1. Introduction

Agriculture remains the cornerstone of Niger's economy, accounting for nearly 40% of national GDP and employing over 80% of the workforce, despite the country's very limited share of arable land, estimated at only 13% of the national territory (FAO, 2021; INS, 2023). As in most Sahelian countries, agricultural production in Niger is predominantly rainfed and highly vulnerable to climatic shocks. Recurrent droughts, short rainy seasons, erratic rainfall, and periodic floods are major sources of production instability and chronic food insecurity (Adamou, 2024). These climatic pressures have intensified the need to rethink agricultural development pathways that are resilient to environmental shocks. In response to these challenges, diversification of production to irrigated systems has become an essential component of resilience strategies in arid and semi-arid regions. Theoretical and empirical literature on agricultural resilience emphasizes the importance of diversification, both of crops and income sources, as a means to reduce vulnerability to climate risks, stabilize household incomes, and enhance adaptive capacity (Walker et al., 2004).

In Niger, this transition toward more diversified and climate-resilient production systems has largely been driven by the expansion of irrigated agriculture. The Nigerien government and development partners have invested significantly in irrigation infrastructure, small-scale water management, and the promotion of high-value horticultural chains. Among these, potato (*Solanum tuberosum*) has emerged as a particularly strategic crop due to its high productivity, short growth cycle, nutritional value, and strong domestic and regional market demand (Moëne, 2008).

The Tahoua region is central to this transformation. With nearly 3 million hectares of arable land and an irrigable potential estimated at 70,000 hectares, less than half of which is currently utilized (PDC, 2021), the region offers favorable agroecological conditions for horticultural development. The Bagga Valley and other lowland systems benefit from shallow groundwater, fertile alluvial soils, and cool-season climatic conditions conducive to potato cultivation. Consequently, Tahoua has become the leading production zone in Niger, contributing approximately 30,000 tons annually and representing 33% of the national potato cultivation area (MAE, 2023).

At the same time, demand for potatoes in Niger is growing rapidly due to urbanization, dietary diversification, increased consumption in hotels and restaurants, and integration into regional markets (FAO, 2021). Potatoes have thus become an important cash crop, providing significant income opportunities for smallholder farmers during the dry season and contributing to broader goals of food security and rural economic development. However, the potential of the potato value chain remains largely understudied. Research on horticultural crops in West Africa showed that post-harvest challenges, including inadequate storage facilities, lack of sorting and grading, poor transport conditions, and limited access to structured markets, significantly reduce the profitability and competitiveness of perishable crops (James & Zikankuba, 2017).

In Niger, potato producers experience post-harvest losses that can exceed 20-30% during peak production periods, highlighting the urgent need for improved storage and marketing systems (Degebasa, 2020). These losses affect not only producer incomes but also national food availability, price stability, and the long-term sustainability of irrigated production systems. Several studies emphasize that improving post-harvest management and strengthening market linkages are essential for agricultural transformation, especially in contexts where production gains can be quickly offset by inefficient value chains (Alawode, 2025). Strengthening the potato value chain in regions like Tahoua therefore represents a strategic opportunity to consolidate the gains from agricultural diversification initiatives.

In this context, the present study aims to provide a comprehensive analysis of potato storage and marketing practices among producers in the Bagga Valley, the main production area in the Tahoua region. The objectives are to (i) identify current potato preservation practices and constraints among producers in the Tahoua region, and (ii) analyze the potato marketing systems and constraints in the targeted municipalities. By focusing on a key irrigated crop such as potato, this study contributes to ongoing efforts to transform Niger's agricultural sector and strengthen the resilience of Sahelian farming systems. Improving potato storage and marketing in the Tahoua region could therefore significantly enhance food security, stimulate rural economic growth, and consolidate the transition toward more resilient and diversified agricultural systems in Niger.

2. Methods

2.1 Survey Location and Sampling Strategy

The study was conducted between 25 and 30 October 2024 in three municipalities of the Tahoua region in Niger: Tahoua Urban I, Bambèye, and Kalfou, located along the Bagga Valley (Figure 1). The valley is one of the main potato-producing areas in the region, where farmers cultivate irrigated plots individually on sites distributed along the valley.

Agriculture and livestock constitute the main economic activities of the local population. The region has a Sahelian climate characterized by three main seasons: a cool dry season from October to January, a hot dry season from February to mid-June, and a rainy season from mid-June to September. Because potatoes are mainly cultivated during the cool dry season, irrigation is necessary to sustain production.

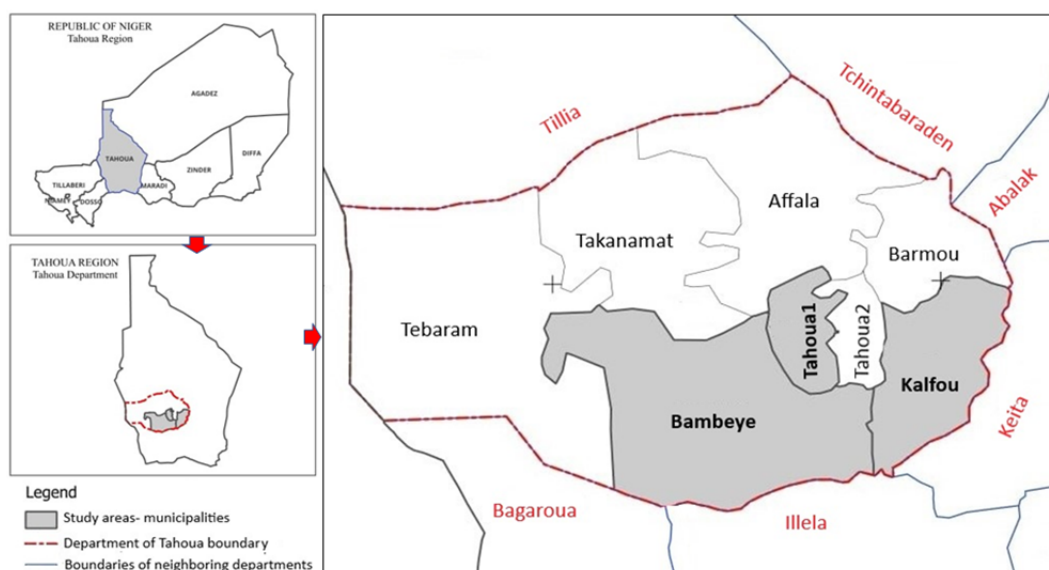


Figure 1. Municipalities in the Tahoua department where the study was implemented

2.2 Sampling of Producers

Sampling was conducted in collaboration with regional agricultural services, using criteria such as quantity of potato produced and village accessibility in the Bagga Valley. The three municipalities of the Tahoua department were selected because they play an important role in potato production, with a significant output of 13,208.25 tons (MAE, 2018). Two villages were selected in the municipality of Bambeye, while one village was selected in each of the other two municipalities. In each village, farmers were randomly selected from official lists of potato-producing households, established by extension services and village chiefs. Priority was given to households actively involved in potato production, storage, and marketing. In each village, about fifty respondents were selected, totaling 200 farmers, representing approximately 30% of the estimated 600 potato producers in the study area. This ensured that the sample was both robust and representative of local practices.

2.3 Data Collection

Field surveys were implemented using Kobo Collect, a digital tool that enabled direct field data entry and ensured rapid integration into a centralized database. Data were obtained from individual farmers engaged in potato production and storage for the 2024 season (the latest marketing season in the Bagga Valley). The survey questionnaires included both closed- and open-ended questions covering socio-demographic (*e.g.*, age, education, farm size), storage (methods, duration, and postharvest loss), marketing (channel and methods), sales (methods, volume, price, destination—local, regional, or export), and constraints in storage and marketing, and adaptation strategies. In addition, direct field observations and interviews with key stakeholders (Regional Directorate of Agriculture (01), FCMN Niya (01), traders (02 wholesalers), local representatives (village chief and neighborhood leaders) were conducted. This triangulation enriched and validated the collected data.

2.4 Data Analysis

Data from Kobo Collect were downloaded as an Excel file, cleaned, and organized for further analysis. Descriptive analysis (proportions, means, standard deviations) included the demographic data, storage practices, and marketing methods. Inferential analysis examined associations between qualitative variables (*e.g.*, storage methods, constraints). Analysis of variance (ANOVA) was used to test differences between groups on quantitative variables (*e.g.*, cultivated areas, yields, storage duration, prices, etc.). All analyses were conducted with SPSS software (version 22).

To identify the determinants of storage adoption among producers, a binary logistic regression model was estimated. The dependent variable was coded as 1 if the farmer practiced storage and 0 otherwise.

The model is defined as:

$$\text{Logit}(P_i) = \beta_0 + \beta_1 \cdot \text{Age} + \beta_2 \cdot \text{Household size} + \beta_3 \cdot \text{Area} + \beta_4 \cdot \text{Experience} + \beta_5 \cdot \text{Inputs} + \beta_6 \cdot \text{PO} + \epsilon_i \quad (1)$$

where,

P_i : Probability of adopting storage; Age: Age of the producer (years); Household size: total number of people in the house; Area: Cultivated area (ha); Experience: Farming experience (years); Inputs: Access to agricultural inputs (1 = yes, 0 = no); PO: Membership in producers' organizations (1 = yes, 0 = no).

2.5 Limitations and Generalizability

The use of self-reported data may introduce recall and reporting biases. Although the sample size is adequate, its concentration in selected municipalities of the Tahoua region may limit representativeness and introduce selection bias. In addition, potential omitted variables such as access to credit, market distance, and infrastructure may affect the robustness of the estimates. Therefore, the generalizability of the findings beyond the study area remains limited. Future studies should use larger, more diverse samples and longitudinal data to strengthen external validity.

3. Results

3.1 Socio-economic and Demographic Characteristics of Potato Producers

Table 1 shows no differences among potato producers across the three municipalities in terms of average age, household size, and years of experience in farming. Farm labor was significantly higher in Bambèye and Kalfou municipalities compared to Tahoua I. Kalfou municipality had a significantly higher number of farms per potato producer compared to Bambèye, which was also higher than Tahoua I. In addition, potato producers in Kalfou had larger farmland areas compared to those of the two other municipalities.

Table 1. Socio-economic and demographic characteristics of respondents to the survey conducted among potato producers in three municipalities in the Tahoua department in Niger during the 2024 harvest season

Municipality	Age	Household size	Farm labor	Years of experience	Number of farms	Farmed size (ha)
Bambèye	45.38±10.02a*	9.21±6.37a	3.21±1.87a	16.8±17.7 a	2.0±0.82 b	1.42±0.61 b
Kalfou	45.12±12.75a	8.48±3.92a	3.42±2.35 a	15.1±9.3 a	3.0±1.72 a	2.48±2.03 a
Tahoua I	42.92±15.46a	8.63±4.17a	2.06±1.33 b	13.3±11.1 a	1.4±0.77 c	1.64±0.94 b
Mean	44.09±13.57	8.74±4.76	2.69±1.76	15.1±17.5	1.9±1.28	1.79±1.30
ANOVA	F = 0.96; df = 2/199; p ≤ 0.39	F = 0.46; df = 2/199; p ≤ 0.63	F = 12.29; df = 2/199; p < 0.000	F = 1.78; df = 2/199; p ≤ 0.17	F = 37.76; df = 2/199; p < 0.000	F = 10.56; df = 2/199; p < 0.000

Note. *All data are means ± Standard Error of means (SEM). Means followed by the same letter are not significantly different at $p \leq 0.05$.

3.2 Production and Storage Duration

Across all municipalities, on average, a potato farmer produced about 8,185.00 kg (Table 2). The duration of storage was significantly lower in Kalfou compared to the other two municipalities. On average, farmers stored potatoes for a month before they were sold. Gross revenue was higher in Bambèye compared to the other two municipalities.

Table 2. Average potato production, storage duration, and gross revenues by a farmer interviewed during the survey conducted in three municipalities in the Tahoua department in Niger during the 2024 harvest season

Municipality	Total production (kg)/producer	Storage duration (days)	Gross Revenues (FCFA)
Bambèye	3,906±1,221a	27.11±24.87a	266,625±99,033a
Kalfou	6,388±2,306ab	18.00±14.77b	213,606±18,887b
Tahoua	11,327±1,786c	34.18±31.01a	207,434±1,336b
Mean	8,185±1,117	30.27±28.58	224,912±14,258
ANOVA	F = 4.10 df = 2/199 p ≤ 0.018	F = 3.67 df = 2/131 p ≤ 0.028	F = 3.16 df = 2/196 p ≤ 0.044

Note. *All data are means ± Standard Error of means (SEM). Means followed by the same letter are not significantly different at $p \leq 0.05$.

3.3 Storage Practices

Most producers (67.2%) preferred to sell their potatoes right away at harvest, with only 32.8% storing (Table 3). The difference in storage among the three municipalities is statistically significant, with more farmers in Kalfou (55.1%) storing potatoes than those in the other two municipalities. The storage location varied significantly among the three municipalities (Table 3). On average, storage remained rudimentary, with 62.2% of producers keeping potatoes outside under sheds and 50.3% storing in warehouses.

Table 3. Potato producers who store and storage methods used in the three municipalities surveyed in the Tahoua department of Niger during the 2024 harvest season

Variables	Parameters	Municipality			Mean	χ^2	Significance
		Bambèye	Kalfou	Tahoua I			
Stored	Yes	13.5	55.1	32.0	32.8	19.89	***
	Outside under a shed	40.0	8.8	82.7	62.2	61.36	***
Storage location	Warehouse	90.0	91.2	33.7	50.3	53.12	***
	In a pit	0.0	0.0	11.2	7.7	5.47	Ns

Note. Values are expressed as a percentage (%). The total percentage for storage locations may exceed 100% because producers could report using more than one storage method. χ^2 : chi-square test. Sign: ns = not significant; *** = very highly significant ($p < 0.001$).

3.4 Potato Marketing

Most producers (98.8%) in the three municipalities are members of a potato marketing cooperative. Although sales are made by individual producers, the prices are set by the cooperative. Overall, a little over two-fifths (44.0 %) of producers sell their potatoes in rural markets, while a little less than a third (29%) sell outside the region of Tahoua. Potato producers in Kalfou and Bambèye mainly favor sales in rural markets, with a little more than four-fifths of the respondents each. Most producers sell their potatoes to various customers, but the main buyers are wholesalers and middlemen. Key challenges encountered during potato marketing included a lack of customers (44.6%), low prices during harvest (26.7%), and high transportation costs (24.1%).

Table 4. Membership in organizations, sale location, main buyers, and marketing challenges of potato producers surveyed in three municipalities in the Tahoua department during the 2024 harvest season

Variables	Parameters	Municipality			Mean	χ^2	Significance
		Bambèye	Kalfou	Tahoua I			
Cooperative membership	Yes	100.0	100.0	96.8	98.5	3.2	Ns
	In the village	5.8	16.3	3.0	17.0	9.2	***
Sale location	Rural market	86.5	85.7	2.0	44.0	144.2	***
	Export	19.2	14.3	94.0	29.0	16.2	***
Main buyers	Wholesalers	100.0	100.0	94.0	97.0	6.3	**
	Middleman	98.1	76.0	99.0	93.1	30.1	***
	Consumers	7.7	16.0	7.0	9.4	3.41	Ns
	Processors	17.3	0.0	0.0	4.5	27.2	***
Marketing challenges	Lack of customers	50.0	44.7	41.7	44.6	0.94	Ns
	Low price	46.2	44.7	7.3	26.7	36.3	***
	Transportation	0.0	0.0	49.0	24.1	63.9	***
	Deterioration	3.8	10.6	2.1	4.6	5.34	*

Note. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$; NS: Non-significant difference.

3.5 Analysis of Prices and Gross Revenues by Municipality

At harvest, the average price of a 50-kg bag of potatoes is estimated to be 10,733 CFA francs throughout the study area. This price does not show a significant difference between the three municipalities. The ceiling price, corresponding to the maximum sale price observed in favorable periods, reaches an average of 24,665 CFA francs,

more than double the floor price. The ceiling prices remain homogeneous between municipalities: 25,192 CFA francs in Bambèye, 24,430 CFA francs in Tahoua I, and 24,580 CFA francs in Kalfou.

Table 5. Prices of potatoes and gross income of farmers in the three municipalities surveyed in the Tahoua department of Niger during the 2024 harvest season

Municipality	Floor price (FCFA)	Price ceilings (FCFA)
Bambèye	11,000±1,010a	25,192±1,704a
Kalfou	10,580±1,247a	24,580±2,540a
Tahoua I	10,680±1,034a	24,430±2,548a
Mean	10,734±1,089	24,665±2,362
	F = 2.19	F = 1.82
ANOVA	df = 2/199	df = 2/199
	$p \leq 0.114$	$p \leq 0.163$

3.6 Logistic Regression

The results of the logistic regression analysis provide insights into the determinants of potato storage practices among producers in the study area. Overall, the model is statistically significant, as indicated by the Wald statistics of the key explanatory variables, suggesting that the selected factors meaningfully explain the likelihood of storage adoption. The intercept is negative and statistically significant ($\beta = -3.214$; $p = 0.004$), indicating a low baseline probability of storage in the absence of explanatory variables. This reflects the generally limited adoption of storage practices among producers. Among the explanatory variables, farm size has a positive and highly significant effect ($\beta = 0.623$; $p = 0.002$). The odds ratio ($\text{Exp}(\beta) = 1.865$) indicates that a one-hectare increase in cultivated area nearly doubles the likelihood of storage. This suggests that larger-scale producers have greater financial and logistical capacity to invest in postharvest storage facilities. Similarly, farming experience significantly influences storage behavior ($\beta = 0.057$; $p = 0.007$). The odds ratio (1.059) implies that each additional year of experience increases the probability of storage adoption by about 5.9%. This highlights the role of accumulated knowledge and learning effects in improving postharvest management practices.

Access to agricultural inputs is another significant determinant ($\beta = 0.842$; $p = 0.008$). Producers with access to inputs are more than twice as likely to store their production (OR = 2.321), reflecting the importance of production intensification and resource availability in enabling better postharvest strategies. Membership in a producers' organization exhibits the strongest effect ($\beta = 1.276$; $p = 0.002$). The odds ratio (3.582) indicates that members are more than three times more likely to adopt storage practices than non-members. This underscores the critical role of collective action, information sharing, and access to markets and services facilitated by producers' organizations.

In contrast, age ($\beta = 0.018$; $p = 0.134$) and household size ($\beta = 0.041$; $p = 0.143$) are not statistically significant at conventional levels. Although both variables show positive coefficients, suggesting a potential influence, their effects remain weak and inconclusive. This implies that socio-demographic characteristics alone are less decisive than structural and institutional factors in shaping storage decisions. Overall, the findings highlight that economic capacity (farm size), human capital (experience), and institutional support (input access and membership to producers' organizations) are key drivers of potato storage adoption. These results are consistent with the literature on agricultural value chains in developing countries, which emphasizes the importance of resource access and collective action in improving postharvest management and reducing losses.

Table 6. Logistic regression estimates of potato storage adoption

Variable	Coefficient (β)	Std Error	Wald	p -value	$\text{Exp}(\beta)$ (Odds Ratio)
Constant	-3.214	1.102	8.50	0.004	-
Age	0.018	0.012	2.25	0.134	1.018
Household size	0.041	0.028	2.14	0.143	1.042
Area	0.623	0.201	9.60	0.002	1.865
Experience	0.057	0.021	7.36	0.007	1.059
Inputs	0.842	0.318	7.01	0.008	2.321
Producers' Organization	1.276	0.402	10.07	0.002	3.582

Note. Statistical models: -2Log Likelihood = 112.45; Cox & Snell $R^2 = 0.29$; Nagelkerke $R^2 = 0.41$.

4. Discussion

This study provides new insights into the socio-economic characteristics, postharvest management, and marketing dynamics of potato production systems in the Tahoua region of Niger. The findings highlight both the economic potential of the sector and structural constraints affecting postharvest management and market performance.

4.1 Socio-economic Characteristics and Production Performance

The analysis of the socio-economic and agronomic characteristics highlights similarities among potato producers in the region and facilitates comparative interpretation of practices and performance across the three municipalities. Although the average producer age was 44 years, the results still indicate the participation of economically active rural populations in the potato value chain, including younger farmers attracted by the income-generating potential of irrigated horticulture (Abay et al., 2021; Ng'atigwa et al., 2020). Similarly, the average household size and number of farm workers confirm the central role of family labor in Sahelian farming systems, where the mobilization of household labor remains a major determinant of production capacity. Several studies show that the main constraint facing smallholder farms in Africa often lies more in labor availability than in access to land (Leonardo et al., 2015). The average cultivated area was 1.79 ha, with a mean production of 8,185 kg per producer, corresponding to an estimated yield of 4,573 kg ha⁻¹. These results show that yields are significantly lower than those commonly observed in smallholder potato systems in semi-arid African environments characterized by limited access to improved seeds, irrigation technologies, and mechanization (Misgina et al., 2025).

4.2 Storage Practices: Limited Adoption and Post-Harvest Constraints

In all these locations, potatoes are stored in heaps. These storage facilities are generally poorly ventilated and unsuitable for long-term preservation, as recent literature indicates that traditional storage systems lacking temperature regulation and adequate aeration promote sprouting, moisture loss, and microbial deterioration (Zhen et al., 2025). The average storage duration of around 30 days is significantly below optimal post-harvest periods for improved storage systems and varies across municipalities. These storage practices force farmers to sell quickly at harvest, saturating the market and depressing prices (Namugga et al., 2017). According to (Tadesse et al., 2018), improved storage infrastructure plays a critical role in extending storage duration, reducing post-harvest losses, stabilizing market supply, and improving producer incomes within potato value chains in sub-Saharan Africa. These findings support the observed importance of post-harvest facilities in strengthening the competitiveness and sustainability of potato production systems in Niger. These findings confirm that investment in decentralized post-harvest facilities is critical for enhancing the competitiveness of the potato value chain.

4.3 Collective Organization and Market Access: Strengths and Limitations

The high participation in marketing cooperatives (98.5%) reflects a significant comparative advantage, consistent with evidence from Sahelian agricultural systems, where collective action through producer organizations enhances market access, reduces transaction costs, and strengthens farmers' bargaining power (Zakari et al., 2023). However, cooperative membership alone does not resolve structural commercialization challenges. Marketing channels remain dominated by intermediaries, wholesalers, and middlemen who exercise significant market power and capture a large share of value added, particularly in West African agrifood systems (Kyomugisha et al., 2018). Rural markets and exports show some diversification but also reflect producers' dependence on intermediaries and limited bargaining power. Integrating the potato value chain into regional markets could stimulate local economic development and improve farmers' incomes (Walker et al., 2004).

4.4 Major Constraints: Low Demand, Price Drops, and High Transaction Costs

The main constraints reported by producers are a limited number of customers, harvest-time price drops, and high transportation costs, illustrating systemic market inefficiencies that directly affect incomes and reflect broader structural barriers to market participation in sub-Saharan Africa (Affognon et al., 2015). Developing local processing (chips, fries, pre-cooked potatoes) and strengthening links with large buyers (hotels, schools, prisons) could help absorb production surpluses and stabilize prices, strategies validated in comparable contexts.

4.5 Economic Potential and Strategic Value of the Potato Chain

The average gross revenue of 224,912 CFA francs demonstrates the economic importance of the potato sector. Differences between municipalities likely reflect variations in cultivated area, input use efficiency, marketing strategies, and infrastructure availability. The positive gross revenues recorded in this study confirm that potato is a profitable high-value crop with strong potential for income generation and dry-season employment. Across

Sub-Saharan Africa, potatoes have been identified as a strategic crop for food security because of their short cycle, high caloric yield per hectare, and market demand (Fuglie, 2007). The growing area has strong agronomic potential, supported by fertile soils, favorable cool-season temperatures, and producer expertise (Haverkort & Struik, 2015). With yields averaging 4.573 t ha⁻¹, the Tahoua region falls within the national average of 4 to 8 t ha⁻¹ obtained under a low-input production system and poor climatic conditions, but lags far behind the national average of 24 t ha⁻¹ (2SCALE, 2021; Vanderhofstadt & Jouan, 2007). These yields are below the national average due to low-quality seed, suboptimal pre-germination periods, and a lack of mechanization (plowing, fertilization, irrigation). These constraints negatively affect crop management and production conditions in the area. However, limited storage duration remains a major barrier to value chain development. The need to sell immediately after harvest undermines price stability and limits access to distant or higher-value markets. Improved storage facilities, such as ventilated warehouses, refrigerated units, stackable crates, and post-harvest management, such as sorting, could significantly extend shelf life, reduce losses, and enhance economic returns (Sidikou et al., 2003).

4.6 Logistic Regression

The logistic regression results indicate that potato storage adoption is primarily driven by structural and institutional factors rather than demographic characteristics. Farm size has a positive and significant effect, suggesting that storage is conditional on surplus production and investment capacity, which may exclude smaller producers. Similarly, farming experience significantly increases the likelihood of storage, reflecting the role of learning in managing price seasonality and risk. Access to inputs and membership in producers' organizations strongly enhance storage adoption, highlighting the importance of resource access and collective action. The large effect of producers' organizations suggests that institutional arrangements can partially compensate for individual constraints, particularly in contexts of market imperfections. However, this may also indicate unequal access to benefits among farmers. In contrast, the non-significance of age and household size confirms that socio-demographic factors are secondary to economic and institutional conditions. Overall, the results point to structural inequalities in storage adoption, raising concerns about inclusiveness in value chain development strategies.

5. Conclusion

The analysis of potato preservation and marketing practices in the Tahoua region highlights the importance of high-value horticultural crops in improving rural incomes. Storage systems remain mostly rudimentary and are used only for short periods to avoid losses, forcing producers to sell their crops at harvest. This often exposes farmers to significant marketing problems, including price fluctuations, limited access to buyers, and high transportation costs. The strong membership in cooperatives reflects a desire to improve access to inputs, better prices, and markets. Strengthening storage capacity would not only improve marketing outcomes but also enhance overall production system resilience. By allowing producers to spread sales over longer periods, improved storage enables farmers to benefit from price seasonality. Targeted technical support, along with improved storage infrastructure, can enhance potato production, contributing to food security and local economic development.

References

- 2SCALE. (2021). *Mécanisation de la culture de pomme de terre au Niger*. Retrieved from <https://www.2scale.org/fr/updates/introducing-mechanized-potato-farming-in-niger-fr-1>
- Abay, K. A., Asnake, W., Ayalew, H., Chamberlin, J., & Sumberg, J. (2021). Landscapes of opportunity: Patterns of young people's engagement with the rural economy in sub-Saharan Africa. *Journal of Development Studies*, 57(4), 594-613. <https://doi.org/10.1080/00220388.2020.1808195>
- Adamou, O. I. (2024). *Adapting to climate risks in the Sahel: strategies for smallholder farmers in Niger* (Doctoral dissertation, Cornell University, USA).
- Affognon, H., Mutungi, C., Sanginga, P., & Borgemeister, C. (2015). Unpacking Postharvest Losses in Sub-Saharan Africa: A Meta-Analysis. *World Development*, 66, 49-68. <https://doi.org/10.1016/j.worlddev.2014.08.002>
- Alawode, A. (2025). The Role of Agricultural Value Chains in Enhancing Food Security and Economic Development. *International Research Journal of Modernization in Engineering Technology and Science*, 05, 1930-1948. <https://doi.org/10.56726/irjmets75996>
- Degebas, A. C. (2020). Prospects and Challenges of Postharvest Losses of Potato (*Solanum Tuberosum* L.) in Ethiopia. *Global Journal of Nutrition & Food Science*, 2(5). <https://doi.org/10.33552/gjnfs.2020.02.000550>

- FAO. (2021). World Food and Agriculture—Statistical Yearbook 2021. *World Food and Agriculture—Statistical Yearbook 2021*.
- Fuglie, K. O. (2007). Priorities for potato research in developing countries: Results of a survey. *American Journal of Potato Research*, 84(5), 353-365. <https://doi.org/10.1007/BF02987182>
- Haverkort, A. J., & Struik, P. C. (2015). Yield levels of potato crops: Recent achievements and future prospects. *Field Crops Research*, 182, 76-85. <https://doi.org/10.1016/j.fcr.2015.06.002>
- INS. (2023). *Annuaire Statistique Edition 2023 PERIODE: 2018-2022* (p. 91). Institut National des Statistiques, Niamey, Niger.
- James, A., & Zikankuba, V. (2017). Postharvest management of fruits and vegetable: A potential for reducing poverty, hidden hunger and malnutrition in sub-Sahara Africa. *Cogent Food & Agriculture*, 3(1), 1312052. <https://doi.org/10.1080/23311932.2017.1312052>
- Kyomugisha, H., Sebatta, C., & Mugisha, J. (2018). Potato market access, marketing efficiency and on-farm value addition in Uganda. *Scientific African*, 1, e00013. <https://doi.org/10.1016/j.sciaf.2018.e00013>
- Leonardo, W. J., van de Ven, G. W. J., Udo, H., Kanellopoulos, A., Siteo, A., & Giller, K. E. (2015). Labour not land constrains agricultural production and food self-sufficiency in maize-based smallholder farming systems in Mozambique. *Food Security*, 7(4), 857-874. <https://doi.org/10.1007/s12571-015-0480-7>
- MAE. (2018). *Résultats définitifs de l'enquête sur les productions horticoles 2017/2018*. Ministère de l'Agriculture et de l'Élevage, Niamey, Niger.
- MAE. (2023). *Résultats définitifs de l'enquête sur les productions horticoles 2017/2018*. Ministère de l'Agriculture et de l'Élevage, Niamey, Niger.
- Misgina, N. A., Beshir, H. M., Yohannes, D. B., & Gebreyohanes, G. H. (2025). Growth, Yield, and Water Productivity of Potato Genotypes Under Supplemental and Non-Supplemental Irrigation in Semi-Arid Areas of Northern Ethiopia. *Agronomy*, 15(1). <https://doi.org/10.3390/agronomy15010072>
- Moënné, M. (2008). *Structuration d'une filière pomme de terre en Afrique sahelienne* (Vol. 11).
- Namugga, P., Melis, R., Sibiya, J., & Barekye, A. (2017). Participatory assessment of potato farming systems, production constraints and cultivar preferences in Uganda. *Australian Journal of Crop Science*, 11(08), 932-940. <https://doi.org/10.21475/ajcs.17.11.08.pne339>
- Ng'atigwa, A. A., Hepelwa, A., Yami, M., & Manyong, V. (2020). Assessment of Factors Influencing Youth Involvement in Horticulture Agribusiness in Tanzania: A Case Study of Njombe Region. *Agriculture*, 10(7), 287. <https://doi.org/10.3390/agriculture10070287>
- PDC, P. de D. C. (2021). *Rapport sur le développement communal Tahoua 1 Niger*.
- Sidikou, R. D. S., Sihachakr, D., Laverigne, D., Nato, A., Ellissèche, D., Jouan, B., & Ducreux, G. (2003). Etude de la microtubérisation de la pomme de terre (*Solanum tuberosum* L.) au Sahel. *Cahiers Agricultures*, 12(1), 7-14.
- Tadesse, B., Bakala, F., & Mariam, L. W. (2018). Assessment of postharvest loss along potato value chain: the case of Sheka Zone, southwest Ethiopia. *Agriculture & Food Security*, 7(1), 18. <https://doi.org/10.1186/s40066-018-0158-4>
- Vanderhofstadt, B., & Jouan, B. (2007). *Guide pratique de la culture de la pomme de terre en Afrique de l'Ouest*.
- Walker, B., Holling, C. S., Carpenter, S. R., & Kinzig, A. (2004). Resilience, adaptability and transformability in social-ecological systems. *Ecology and Society*, 9(2), 1-9. <https://doi.org/10.1103/PhysRevLett.95.258101>
- Zakari, S., Moussa, B., Ibro, G., & Abdoulaye, T. (2023). Analyzing the drivers of smallholder farmer's market participation in the Sahelian region of Niger. *Cogent Food & Agriculture*, 9(1). <https://doi.org/10.1080/23311932.2023.2220178>
- Zhen, Q., Xu, C., Tana, Wang, H., Yue, X., Yan, C., & Sun, Y. (2025). Research on the temperature and humidity distribution characteristics in potato storage facilities: Experimental analysis and numerical simulation. *Frontiers in Sustainable Food Systems*, 9. <https://doi.org/10.3389/fsufs.2025.1594791>

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Authors Contributions

Dr. Rabé Mahamane Mactar was responsible for the study conception, data collection and analysis, and drafting of the first version of the manuscript. Ibrahim Boukary. Baoua and Soumailla A. Almoustapha contributed to the methodology, interpretation of results, and scientific revision of the manuscript. Dr. Dieudonne Baributsa participated in the overall supervision of the study and the final validation of the manuscript. All authors read and approved the final version of the manuscript.

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