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RESEARCH ARTICLE

ACCEPTABILITY OF MEAT DRIED IN SOLAR DRYERS IN NORTH-CENTRAL BURKINA FASO

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ABSTRACT

This study aims to analyze the determinants of the acceptability of solar meat drying in the municipalities of Kaya and Kongoussi in the North-Central region of Burkina Faso, an area with high livestock potential. The methodology combined qualitative and quantitative approaches, through five focus groups and the administration of individual survey forms to 138 actors in the meat sector (processors, butchers, restaurateurs, and grillers). A logit model was used to identify the determinants of the acceptability of meat dried in solar dryers. The results indicate that the tested technology was well received by respondents. They also reveal that factors such as gender, level of education, and prior knowledge of the technology have a positive influence on its acceptability. However, the high cost of the dryer remains the main barrier to its acceptability. It is essential to strengthen awareness-raising activities on the usefulness of the technology. The price of the solar dryer should also be subsidized for certain social groups, such as women's associations working in agri-food processing.

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INTRODUCTION

Livestock farming occupies an important place in the economy of Burkina Faso. It is practiced by 63.2% of households (INSD, 2024) and contributes 21% to the formation of gross domestic product (GDP) and 40% to agricultural value added (MARAH/DGESS, 2023; FAO, 2019). This sector represents the third source of exports and revenues after gold and cotton (MARAH, 2022). Indeed, the Burkinabè livestock was estimated at 81 million animal heads in 2024 (MRAH/DGESS, 2024), enabling the export of more than 88,749 cattle, 290,960 sheep, and 7,929 goats in 2022 (INSD, 2024). Furthermore, livestock contributes to food and nutritional security through the supply of meat, milk, and other animal products. Processed meats mainly include grilled meat, processed meats, butchery products, and soup (Kabore *et al*., 2020). The animal product processing sector in Burkina Faso is poorly developed. Industrial processing of meat is virtually non-existent (Kabore *et al*., 2022). As a highly perishable product, meat requires appropriate preservation. Several techniques exist: refrigeration, salting, smoking, heat treatment, chemical treatments, frying, and drying (Pal *et al*., 2022). Adequate temperatures for preserving fresh meat range between -12°C and 5°C (Pal and Devrani, 2018), requiring electricity-powered equipment. Yet in Burkina Faso, only 7.02% of the rural population has access to electricity (MEMC/DGESS, 2024), and renewable energy conversion technologies remain inaccessible for many (Barry, 2023; Barry *et al*., 2022). This vulnerability leads to use of conventional techniques including drying, frying, and smoking (Kabore *et al*., 2020), which require long drying times and increase contamination risks (Houssou *et al*., 2022). Yet the country benefits from 8.3 hours of daily sunshine (Barry, 2023). This, combined with high meat production potential, creates an opportunity for solar dryers. The solar dryer reduces drying time and improves visual, organoleptic, and sanitary quality (Houssou *et al*., 2022). It is ecological, hygienic, and easy to use (Tiendrebeogo *et al*., 2016). Hien *et al*. (2015) introduced artisanal solar dryers for meat drying in Burkina Faso, but few studies have addressed the endogenous appropriation of this technique. This article aims to identify the explanatory factors of the acceptability of meat dried in solar dryers in the municipalities of Kaya and Kongoussi in north-central Burkina Faso.

MATERIALS AND METHODS

Study Area: The study was conducted in the municipalities of Kaya and Kongoussi, located in the Kuilse province in north-central Burkina Faso. These municipalities are intervention areas of the Feed The Future Innovation Lab for Livestock Systems program, implemented by Joseph Ki-Zerbo University

(UJKZ) in partnership with INERA and funded by USAID. Within the project "Focus on Improving Traditional Production Techniques for Healthy and Nutritious Dried Meats," these sites were selected due to the presence of key meat sector actors and prior technology promotion interventions. The North-Central region has strong livestock potential: in 2022, the regional herd numbered 3,769,400 heads, of which 141,940 were slaughtered (MARAH/DGESS, 2022). The region also hosts a large number of internally displaced persons (IDPs): 493,954 were registered by SP/CONASUR as of March 31, 2023. This project could help develop economic activities around meat drying and support food security.

Sampling of Survey Respondents: The study involved food processing actors in Kaya and Kongoussi. Two sub-samples were formed in each area: project beneficiaries (association members trained in solar dryer meat drying) and non-beneficiaries. Cochran's (1977) formula was used to calculate the sample size:

$$n = z^2 \times p(1-p) / m^2$$

Where: n = sample size; z = 1.96 (95% confidence level); p = 0.5; m = 0.05. This yielded a target of 385 persons. However, due to actor unavailability and insecurity in the study areas, only 138 persons were surveyed, still sufficient for statistical analysis as n > 30. Respondents included project beneficiaries (93 association members trained in solar dryer meat drying, selected by purposive sampling) and non-beneficiaries (45 persons from the cattle-meat value chain, livestock farmers, butchers, grillers, and consumers; selected randomly).

Data Collection: A questionnaire was administered individually to gather information on annual income, occupation, gender, age, education level, meat preservation practices, access to credit, farmer organization membership, and actors' perceptions.

Focus groups were conducted with trained farmer organization members using an interview guide, collecting information on collective barriers and favorable factors for acceptability of solar dryer meat drying in Kaya and Kongoussi.

Analytical Method

Perceptions and Characteristics of Actors: Statistical analysis was used to understand actors' perceptions. Frequencies were calculated for qualitative variables (actor characteristics, preservation practices, acceptance factors). Paired-sample analysis was used to estimate acceptance rates and compare means. SPSS 22 was used for descriptive tests, Excel 2013 for tables and graphs, and Stata for logistic regression.

Determinants of Acceptability of Meat Dried in Solar Dryers

Model Choice and Specification: Acceptance of an innovation is binary (accept or reject). The logit model was preferred over linear probability and probit models, as it identifies factors influencing acceptability as a probability (Barry, 2016; Sama, 2014). The explained variable is:

$Y = 1$ *if the actor accepts solar dryer drying;* 0 *otherwise (1)*

This logistic modeling assumes a latent variable Y* (function of exogenous variables Xi, error terms and threshold) such that:

$$Y_i^* = \beta 0 + \beta 1X1 + \beta 2X2 + \beta 3X3 + \ldots + \beta kXk + \varepsilon_i \quad (4)$$

If $Y^* > 0$ then $Y_i = 1$ (accepts); if $Y^* \leq 0$ then $Y_i = 0$ (does not accept). The logistic probability function is:

$$P_i = \Lambda(X_i\beta) = 1 / (1 + e^{-X\beta}) \quad (6)$$

$$Log[P_i / (1 - P_i)] = \beta 0 + \beta 1x1 + \beta 2x2 + \ldots + \beta kxn \quad (7)$$

Model Variables

The dependent variable "acceptance" may be affected by several independent variables. After multicollinearity analysis, the retained variables are described below and summarized in Table I.

- **Gender (Sexe):** May affect acceptance positively or negatively. Expected sign (+/−).
- **Education level (Instruc):** Higher education improves understanding of innovation advantages. Expected sign (+).
- **Access to credit (Accredit):** Financial support enables technology purchase. Expected sign(+).
- **Technology knowledge (Connaissance):** Prior knowledge guides and facilitates adoption decisions. Expected sign: (+).
- **Barriers (Barrieres):** High perceived barriers reduce likelihood of acceptance. Expected sign: (−).
- **Solutions (Solutions):** Adequate solutions to barriers stimulate acceptability. Expected sign: +.

RESULTS

Socioeconomic Characteristics of Respondents: Respondents present diverse socioeconomic characteristics. Men account for 26.10% compared to 73.90% for women. More than half had no formal schooling (66.70%). Persons belonging to a farmer organization represent 67.40% of the sample. Only 15.20% had previously accessed credit from an institution (Table I). The average age of actors was 35 years (SD: 10.84), indicating a young population. Annual income was distributed across brackets: the most represented was 200,000–400,000 FCFA (31.2% of respondents), suggesting that the majority have low income levels (Figure 1).

Actors' Perceptions of Solar Dryer Meat Drying: The surveys revealed that several variables influence perceptions (Table II). Individuals with knowledge of solar dryer meat drying represent 67.40% of the total sample. All respondents appreciate the technology. Regarding cost: 32.60% find the dryer price very high, 26.10% find it high, and only 8.70% consider it affordable. The majority thus view the price unfavorably.

Acceptability of Meat Dried in Solar Dryers: The determinant regression model fits the data well: Chi2 = 88.86 (p > chi2 at 5%), correct prediction rate = 56%, pseudo R2 = 0.56 (Table III).

Table I. Descriptive statistics of qualitative variables

Variable	Modality	Frequency (n)	Percentage (%)
Gender	Male	36	26.10
	Female	102	73.90
Education level	Not educated	92	66.70
	Educated (primary or above)	46	33.30
Farmer organization membership	Member	93	67.40
	Non-member	45	32.60
Access to credit	Has accessed credit	21	15.20
	No credit access	117	84.80
Total		138	100.00

Table II. Descriptive statistics of variables explaining actors' perceptions

Variable	Modality	Frequency (n)	Percentage (%)
Knowledge of solar dryer drying	Yes	93	67.40
	No	45	32.60
Appreciation of technology	Positive	138	100.00
	Negative	0	0.00
Assessment of solar dryer price	Very high	45	32.60
	High	36	26.10
	Moderate	45	32.60
	Affordable	12	8.70
Total		**138**	**100.00**

Table III. Results of the logistic regression of the acceptability model

Variable	Coefficient	Std. Error	z-stat	p-value	Signif.
Gender (Male=1)	-3.831	0.762	-5.03	0.000	***
Education level	2.032	0.783	2.60	0.010	**
Access to credit	1.862	1.068	1.74	0.083	*
Technology knowledge	0.739	0.259	2.85	0.004	***
Barriers	-0.653	0.228	-2.87	0.004	***
Solutions	1.389	0.544	2.55	0.011	**
Constant	-1.204	0.841	-1.43	0.153	ns

*n = 138 | Pseudo R2 = 0.5610 | Log-likelihood = -34.72 | Prob > chi2 = 0.0000 | Correct prediction rate = 56%Significance levels: *** p<0.01; ** p<0.05; * p<0.10; ns = not significant*

Among project beneficiaries, the acceptance rate reached 100%, compared to only 6.52% among non-beneficiaries. The model is globally significant (Prob > chi2 = 0.0000) with pseudo R2 = 0.5610. Gender appears as a major determinant, with a highly significant negative coefficient (-3.831; p = 0.000), reflecting a lower probability of acceptance among men. Education level exerts a positive and significant effect (2.032; p = 0.010). Prior knowledge of the technology positively and significantly influences acceptability (0.739; p = 0.004). Access to credit increases the probability of acceptance (1.862; p = 0.083, significant at 10%). Economic barriers constitute a significant obstacle (-0.653; p = 0.004). Proposed support solutions have a positive and significant effect (1.389; p = 0.011).

DISCUSSION

Overall, the results showed that the interviewed actors have a positive perception of solar dryer meat drying. All actors gave a favorable assessment of solar dryer meat drying. Furthermore, the advantages of the innovation perceived by respondents are technical, sanitary, socioeconomic, and environmental. Indeed, respondents perceive that their current meat preservation techniques are less efficient and do not allow for long-term meat storage. Their current techniques include frying, smoking, refrigeration, and freezing. This is explained by ignorance of other techniques and lack of adequate preservation equipment. For example, with refrigeration and freezing, meat must be kept at a specific temperature to avoid deterioration. Our results corroborate those of Pal *et al*. (2022) and De Souza *et al*. (2020). According to Pal *et al*. (2022), when meat is not preserved under good conditions, its deterioration process can accelerate. De Souza *et al*. (2020) found that proper meat drying can extend its shelf life, with well-dried meat preserved for up to two years without spoilage. Thus, respondents believe that technically, this innovation will help improve their preservation practices and extend meat shelf life. From a sanitary perspective, the technology is perceived as an effective means of producing dried meat that is safe for consumption. These results are consistent with those of Houssou *et al*. (2022) and FAO and WHO (2022). According to Houssou *et al*. (2022), solar dryers improve food drying conditions, protecting food during drying from contamination by dust, flies, and other sources. As noted by FAO and WHO (2022), direct exposure of meat to sunlight deteriorates its nutritional quality and flavor, and poorly dried meat can be a source of disease. Solar dryer drying therefore improves the sanitary, nutritional, and organoleptic quality of food. From a socioeconomic standpoint, results show that actors are interested in meat drying. According to respondents, solar dryer meat drying can influence their daily lives or that of their community. Beyond developing the meat processing segment in these areas, this innovation can also serve as an economic source through job creation (for processors, livestock farmers, and welders for dryer fabrication). The study results reveal an overall favorable acceptance of solar dryer meat drying among the surveyed population in Burkina Faso. Several determinants of acceptance were identified through logistic regression analysis.

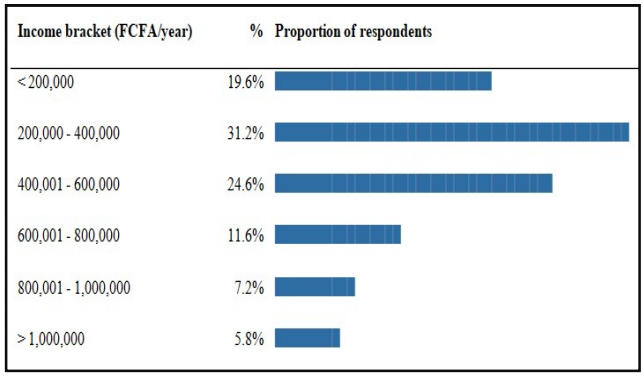

Figure 1. Annual income distribution among respondents

In this study, gender significantly influences acceptability. Women showed considerably more interest in the innovation, both in their numbers attending training sessions and in their favorable opinions regarding acceptance of solar dryer meat drying. This demonstrates the strong presence of women in the food processing sector. These results corroborate those of Rivier (2017), who showed that in Burkina Faso, the mango drying sector is dominated by women. Education level has a significantly positive effect and is considered a major factor in technology acceptance. Individuals with higher education levels are more willing to accept innovations. According to the theory of diffusion of innovations, education promotes the understanding and appropriation of new technologies (Rogers, 2003). Our results align with those of Teno *et al*. (2018) and Kouma (2017). Knowledge of the technology strongly influences acceptance. The acceptance rate calculation showed a significant difference between knowing the technology and accepting it. The acceptance rate among those who do not know the technology is very low (6.52%), while the acceptance rate among those who know it is 67.39%. This is explained by the fact that an individual who knows the technology has a much higher chance of accepting it. Our results are consistent with those of Ouedraogo *et al*. (2019) and Rogers (2003), who showed that greater individual exposure to a technology increases its acceptability. Furthermore, all those who had the opportunity to practice or test the technology endorsed solar dryer meat drying. This shows that information and knowledge sharing can increase the acceptability of a technology, underscoring the importance of awareness and group demonstrations of the solar dryer. Authors such as Ouedraogo *et al*. (2019) and Ndjeunga *et al*. (2012) have noted that access to information about technology, particularly regarding sanitary and economic aspects, often influences its acceptability more than purely theoretical training.

The perceived barriers to solar dryer meat drying include environmental and economic obstacles. The environmental barrier mainly refers to the limited period of solar dryer use (rain, cool weather, etc.). Indeed, results show that the solar dryer can be effectively used for only seven months out of twelve. Yet some actors would prefer technologies that allow them to remain active year-round. However, the economic barrier constitutes the main obstacle to the rejection of solar dryer meat drying. The acquisition price of the solar dryer is set at 700,000 FCFA, while the majority of respondents have an annual income between 200,000 and 600,000 FCFA. Some fall even below the poverty threshold with an annual income below 200,000 FCFA (INSD, 2024). Actors therefore find the solar dryer price high and their financial means insufficient to acquire it. This confirms the findings of Ndjeunga *et al*. (2012), who showed that when the initial cost of a technology is perceived as high, its adoption may decline. Nevertheless, when solutions to barriers exist, they can stimulate acceptability by reducing actors' perception of the high cost. Actions such as price reductions and financial support such as subsidies can increase acceptability. Access to credit also showed a significant positive effect on solar dryer acceptability. Those who have the possibility of financial support accept the innovation more readily even if it is costly, as they have means to facilitate access. These results align with those of FAO (2022), Fadare *et al*. (2014), and Ndjeunga *et al*. (2012), who demonstrated that adapted financing mechanisms are necessary to broaden access to technologies, especially for poor populations.

CONCLUSION

This article aimed to identify the determinants of the acceptability of solar dryer meat drying in the Kuilse region of Burkina Faso. Through a mixed approach combining qualitative and quantitative analysis, results showed an overall positive perception of this innovation, particularly among project beneficiaries, for whom the acceptance rate reached 100%, compared to 6.52% among non-beneficiaries. The analysis also highlighted the significant influence of several socioeconomic factors on acceptability, including gender, education level, prior knowledge of the technology, and access to credit, all of which increase the probability of adopting solar dryer meat drying. Conversely, the acquisition cost of the solar dryer, perceived as high by the majority of respondents, constitutes the main barrier to adoption. Thus, while the innovation is technically and socially appreciated, its large-scale adoption will depend on appropriate support mechanisms, including financing mechanisms, targeted subsidies, and strengthened awareness-raising activities.

A comparison of acceptability rates based on technology knowledge revealed a significant positive influence on acceptability. However, age did not influence the level of acceptability among respondents. In light of the results obtained, several perspectives merit further investigation to better understand and strengthen the adoption of solar dryer meat drying in Burkina Faso. It would first be relevant to extend the analysis to other regions of the country where processing practices are more developed, in order to compare acceptability dynamics across different socioeconomic and agroclimatic contexts.

Such an extension would help identify territorial factors influencing technology adoption. Furthermore, a rigorous assessment of the economic and financial profitability of the solar dryer, including investment costs, operating expenses, productivity gains, and generated value added, would help objectively evaluate its performance and guide subsidy policies. It would also be useful to strengthen research on the effectiveness of awareness and community dissemination mechanisms, such as demonstrations, training, and local campaigns, particularly for the most vulnerable socio-professional groups. Finally, the integration of solar drying into local value chains represents another avenue to explore, particularly by analyzing commercial outlets, the structure of the dried meat market, consumer perceptions of sanitary quality, and certification possibilities that could further enhance the product's value.

Author Contributions

Conceptualization: F.B., D.O., A.W.K.; Methodology: F.B., D.O., A.W.K.; Validation: F.B., D.O., H.B., M.Z.; Formal analysis: A.W.K.; Investigation: F.B., A.W.K.; Data curation: F.B., A.W.K.; Original draft: F.B., D.O., H.B., A.W.K., M.Z.; Review & editing: all authors; Supervision: all authors. All authors have read and approved the published version of the manuscript.

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