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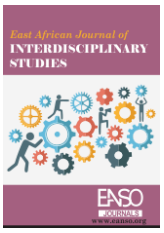

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Original Article

Awareness and Utilisation of Solar Food Drying Technology in Zambia: A Case Study of Traders of Dried Fruits and Vegetables at Lusaka City and Soweto Markets

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Awareness, Utilisation, Solar, Drying, Technology.

ABSTRACT

This research was set out to explore the levels of awareness and utilisation of solar food drying technology in Zambia. The overall research problem addressed was that despite the availability of solar food drying technology, which could reduce the current high post-harvest losses of fruits and vegetables, the technology was not widely used on a commercial basis in Zambia. To achieve the objectives, both quantitative and qualitative data were collected from three sets of populations, namely, traders of dried fruits and vegetables at Lusaka City and Soweto Markets, ordinary people on the streets of Lusaka, and supermarkets that sold dried fruits and vegetables. The research findings have indicated the following: 1) the main method of drying for the dried vegetables sold at Lusaka City and Soweto Markets was open sun drying; 2) almost all the traders of dried vegetables at Lusaka City and Soweto Markets were not aware of solar food drying technology; 3) there exists a market for dried vegetables at Lusaka City and Soweto Markets and Pumpkin leaves was the most traded vegetable; and 4) local people from the streets of Lusaka were interested in dried vegetables but did not buy dried fruits. It was concluded that the low utilisation of solar food drying technology was due to a lack of information about what the technology does and its benefits to potential users, such as traders and farmers of fruits and vegetables. This implies that Zambia may not fully utilise the opportunities that are currently available to export dried fruits and vegetables due to limitations of the open sun drying method that is currently widely used. The situation, therefore, requires drastic measures from both the Government and the Private Sector to disseminate solar food drying technology.

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INTRODUCTION

Globally, solar drying technology has emerged as a sustainable solution to reduce post-harvest losses and enhance food preservation. The International Energy Agency's Solar Heating and Cooling Program (2006) identified solar crop drying as a promising application for active solar heating, aiming to replace expensive wood and fossil fuels (Kaimal *et al.,* 2022). However, widespread adoption faces challenges such as limited awareness of cost-effectiveness, insufficient technical information, and lack of practical experience. In Canada, these barriers were addressed by providing technical and commercial information, leading to the successful design and operation of full-scale, commercially viable solar drying systems for various crops across different regions (Adamo *et al*., 2025). Similarly, Karlsson (2022) reported that in Nepal, approximately fifteen types of solar dryers have been utilised for drying diverse agricultural products. Despite this, high initial investment costs, lack of product-specific designs, and limited government support have hindered the technology's growth.

In Sub-Saharan Africa, solar drying technology has shown significant potential in enhancing agricultural productivity and reducing post-harvest losses. According to Mirembe *et al*. (2024), in Uganda, the Mbarara District Farmers' Association (MBADIFA) introduced solar drying technology to local farmers, enabling them to dry green bananas and create various products, resulting in an eighteen-fold increase in household incomes (Maendeleo Agriculture Technology Fund, 2011). Additionally, organisations like Fruits of the Nile have provided subsidised solar dryers to Ugandan villagers, who dry excess fruits and vegetables during harvest seasons (Rutta, 2022). These dried products are then sold to international markets, offering villagers higher incomes through fair trade practices (Lin, 2023). In Kenya, the African Centre for Technology Studies (ACTS) has initiated projects to scale up solar drying, aiming to deploy 500 affordable dryers over five years, benefiting over 40,000 smallholder farmers (Cairns *et al*., 2022). These initiatives not only reduce post-harvest losses but also promote inclusive entrepreneurship and green jobs, particularly for youth and women in agro-processing.

The agricultural sector in Zambia faces significant challenges, particularly in rural areas where infrastructural deficiencies hinder market access. Perishable commodities like fruits and vegetables are especially vulnerable, with post-harvest losses estimated at 50% due to inadequate storage and processing facilities. This situation underscores the need for effective preservation methods to mitigate losses and enhance food security. A study by Musonda & Mwila (2024) highlighted post-harvest challenges in Zambia's horticultural supply chains, notably at Soweto Market, the country's largest. Key issues included supply gluts leading to prolonged market stays without refrigeration, resulting in quality degradation and waste, and inadequate processing facilities causing significant wastage of seasonal fruits like guavas and mangoes. The study emphasised the necessity of improving processing capacities to handle excess seasonal produce for off-

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season sale or consumption. Dehydration of tropical fruits is a practical alternative to freezing and refrigeration in reducing the wastage of fruits during gluts as well as making them available in a variety of forms, during off-season periods.

Processing is a viable strategy for preserving product quality and adding value, thereby creating income opportunities in local, regional, and international markets. While methods like canning and freezing exist, simple solar drying technologies are particularly suitable for rural farming areas with limited infrastructure and resources. Solar dryers, especially the mixed-mode type, offer controlled drying conditions, protecting products from contaminants and enhancing drying efficiency compared to traditional open-air methods (Simate & Ahrné, 2006). Nguni & Mwila (2007) reported on the sun drying practices of African Leafy Vegetables (ALVs) in Zambia. Their study found that many households employed sun drying, often preceded by blanching to improve colour and nutrient retention. Drying surfaces varied, with some households using raised platforms or rooftops to minimise contamination. Despite these efforts, the drying process remained susceptible to insect infestation and inconsistent drying conditions. The advantages of dried foodstuffs include extended shelf life, reduced transportation costs due to lower weight and volume, and potential cash income for producers. Dried fruits, for instance, can serve as nutritious snacks or ingredients in various dishes, with dried mangoes being a rich source of vitamin A. These products can be marketed locally and beyond, provided quality standards are met and appropriate market channels are established.

Given that over 70% of Zambia's labour force is employed in agriculture, and the sector contributes significantly to non-traditional export earnings, enhancing agricultural productivity is crucial for economic diversification and poverty alleviation (Mbewe *et al.,* 2025). Adopting technologies like solar food drying can reduce post-harvest losses and create income-generating activities, as evidenced in countries like Uganda and the USA. Solar drying utilises the sun's energy in enclosed structures to produce dried products with lower moisture content, reducing spoilage risks and offering protection against contaminants. Thus, this research aimed at exploring the levels of awareness and utilisation of solar food drying technology in Zambia, addressing the gap between the availability of this technology and its limited commercial adoption.

METHODOLOGY

This research was exploratory. According to Kotler & Keller (2009), the goal of exploratory research is to shed light on the real nature of the problem and to suggest possible solutions or new ideas. To achieve this, the research adopted a descriptive survey design, which enabled the collection of information from respondents regarding their opinions and experiences with the use of solar food drying technology in Zambia. The study gathered both quantitative and qualitative data—quantitative data allowed for statistical analysis, while qualitative data provided insights from the respondents' perspectives. Three primary populations were targeted: traders of dried fruits and vegetables at Lusaka City and Soweto Markets, ordinary people on the streets of Lusaka, and supermarkets selling dried fruits and vegetables.

Data collection involved both primary and secondary sources. Primary data came from interviews and observations of traders, street respondents, and supermarket staff. Secondary data was sourced from books, journals, and the internet. The research site was Lusaka City, with a focus on Lusaka City and Soweto Markets, which serve as the largest centres for agricultural produce trading in Zambia. These markets were selected because of their wide variety of produce, lower prices, and significance in the agricultural value chain. The target population included market traders across various local markets in Lusaka, street respondents from Lusaka’s town centre, and major supermarkets such as Shoprite, Spar, Pick & Pay, and Melisa.

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A sample size of forty-two (42) subjects was selected, consisting of fourteen (14) market traders, twenty-four (24) street respondents, and representatives from four (4) supermarkets. Purposive sampling was used for market traders and supermarkets due to their known relevance to the study, while convenience sampling was used for street respondents aged 18 and above. Data collection was conducted using researcher-administered questionnaires with multiple-choice questions for ease of coding and interpretation. The questionnaires were pre-tested on five individuals to ensure clarity and appropriateness.

Data analysis involved tabulating quantitative data and generating frequency distributions using SPSS, with graphs prepared in Microsoft Excel for visual presentation. Qualitative data from interviews were thematically analysed and summarised in narrative form. Simple descriptive tables and percentages were used to present findings. The study's limitations included a lack of control over the accuracy of respondent information and geographical constraints, as the research was limited to Lusaka City due to time and financial limitations. As such, the findings may not fully represent the situation in other regions of Zambia.

RESULTS

Demographic Characteristics of Participants

Indicated in Table 1 below is the demographic analysis of 14 dried vegetable traders, highlighting the predominant involvement of women, with 92.9% (13 out of 14) being female; the sole male participant was substituting for his sister during the interview. This underscores the gendered nature of the trade, likely linked to traditional roles in food preparation. Age distribution reveals that 42.9% of traders are aged 60 and above, suggesting that older individuals, possibly due to accumulated knowledge and experience, are more engaged in this sector. Regarding educational attainment, 42.9% had completed primary education, 35.7% had never attended school, and only 21.4% had reached secondary education. This pattern implies that individuals with lower formal education levels are more prevalent in the dried vegetable trade, potentially due to limited alternative employment opportunities. The demographic profile of 24 Lusaka street interviewees reveals a slightly higher proportion of female participants (54.2%) compared to males (45.8%). A significant majority (75%) are under the age of 40, with 41.7% aged 18–29 and 33.3% aged 30–39, indicating a youthful demographic among street interviewees. Educationally, a substantial 79.2% have attained secondary education, while 20.8% have completed primary education. This suggests that the majority possess at least a basic level of formal education, which may influence their engagement in various economic activities within Lusaka's urban environment.

Table 1: Demographic Characteristics Traders of Dried Fruit/Vegetables at Lusaka City and Soweto Markets (n=14)

Category	Subcategory	Frequency	Percent (%)
Gender	Male	1	7.1
	Female	13	92.9
	Total	14	100.0
Age Group	18 – 29	1	7.1
	30 – 39	2	14.3
	40 – 49	1	7.1
	50 – 59	4	28.6
	60 and above	6	42.9

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Category	Subcategory	Frequency	Percent (%)
	Total	14	100.0
Level of Education	Never been to school	5	35.7
	Primary school	6	42.9
	Secondary school	3	21.4
	Total	14	100.0

Demographic Characteristics of Street Interviewees in Lusaka (n=24)

Category	Subcategory	Frequency	Percent (%)
Gender	Male	8	33.3
	Female	16	66.7
	Total	24	100.0
Age Group	18–29	10	41.7
	30–39	8	33.3
	40–49	4	16.7
	50–59	2	8.3
	Total	24	100.0
Level of Education	Primary School	5	20.8
	Secondary School	19	79.2
	Total	24	100.0

Table 3 below indicates that supermarket representatives were mostly male (75%) and aged between 30 and 49 years. All held post-secondary qualifications, with the majority (75%) holding at least a bachelor's degree. Their roles within the supermarket positioned them as key decision-makers in product sourcing and quality assurance, making them suitable informants for understanding institutional perspectives on dried vegetable sourcing and food drying technologies.

Table 3: Demographic Characteristics of Supermarket Representatives (n=4)

Category	Subcategory	Frequency (n)	Percent (%)
Gender	Male	3	75.0
	Female	1	25.0
Age Group	30–39 years	2	50.0
	40–49 years	2	50.0
Level of Education	Diploma	1	25.0
	Bachelor’s Degree	3	75.0
Job Role	Produce Manager	2	50.0
	Procurement Officer	1	25.0
	Quality Control Supervisor	1	25.0

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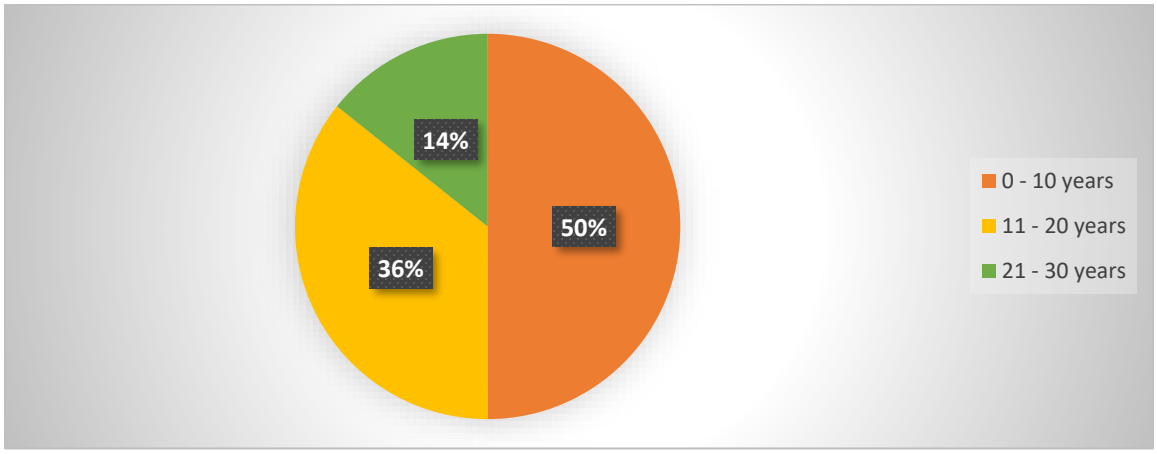
Number of Years of Selling Dried Fruits/Vegetables

The data indicates that 50% of dried fruit and vegetable traders have entered the trade within the past 10 years, 35.7% have been involved for 11–20 years, and only 14.3% have been trading for 21–30 years. This trend suggests a significant increase in participation in recent years, likely driven by rising domestic demand for dried produce. Factors such as urbanisation, heightened health awareness, and the promotion of traditional foods may have contributed to this growth. Additionally, the expansion of vegetable sales volumes in urban wholesale markets over the past decade supports the notion of increased demand and market opportunities in this sector.

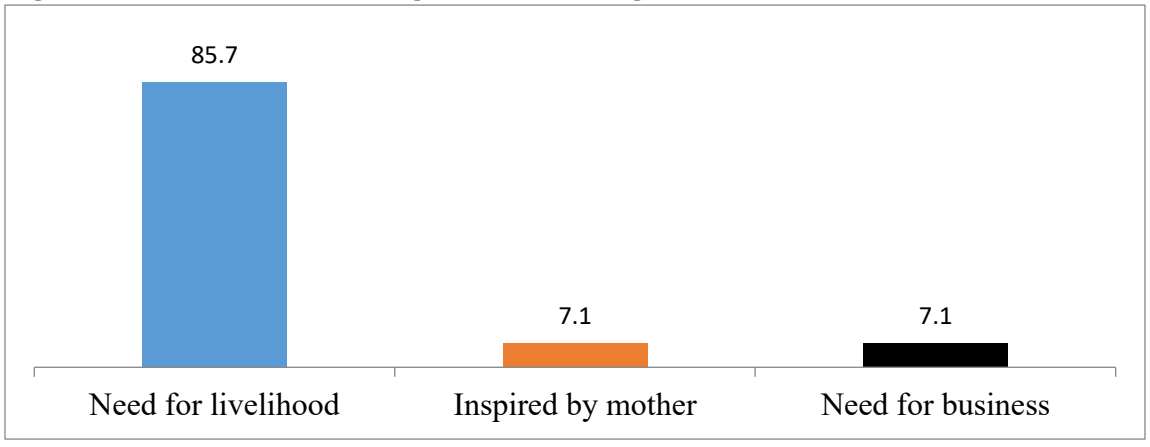
Figure 1: Number of Years of Selling Dried Fruits/Vegetables



Reasons to Start Selling Dried Fruits/Vegetables

The data indicates that 85.7% of dried fruit and vegetable traders entered the trade out of necessity for livelihood, while 7.1% were motivated by maternal encouragement and another 7.1% by entrepreneurial aspirations. This high proportion of livelihood-driven participation underscores the role of dried produce trading as a critical income-generating activity, particularly in contexts of limited formal employment opportunities. The prevalence of informal food markets in Zambia provides essential livelihood avenues for women, youth, and individuals with lower educational attainment, highlighting the sector's significance in supporting vulnerable populations amid economic challenges.

Figure 2: Reasons to Start Selling Dried Fruits/Vegetables



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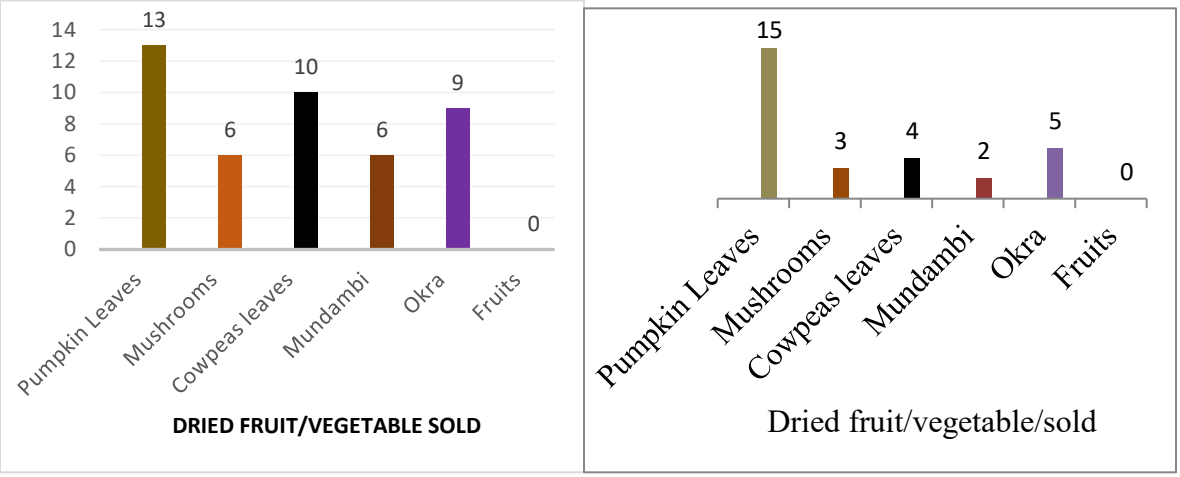
Dried Fruit/Vegetable Sold

The analysis revealed a strong market preference for traditional leafy vegetables among both traders and consumers. Among the 14 traders interviewed, 92.9% sold pumpkin leaves, 71.4% sold cowpea leaves, 64.3% sold okra, and 42.9% sold both mushrooms and *mundambi*, with no traders offering dried fruits. The prominence of pumpkin leaves (*chibwabwa*), widely consumed across all cultures in Zambia due to its high nutritional value and culinary versatility, was also reflected in consumer preferences. Of the 24 consumers interviewed, 62.5% (15 individuals) purchased pumpkin leaves—either alone or in combination with other vegetables—while 12.5% purchased mushrooms, 16.7% cowpea leaves, 8.3% *mundambi,* and 20.8% okra, with no purchases of dried fruits recorded. The universal appeal of pumpkin leaves, year-round availability, and their role in traditional dishes such as *nshima* likely drive both supply and demand. The data further suggests that consumers often buy multiple types of dried vegetables, though pumpkin leaves remain the consistent staple across purchases.

Figure 3: Dried Fruit/Vegetable Sold



Whether Trader Dries the Fruits/Vegetables or Orders Them from a Supplier Already Dried

According to Table 4 and Figure 4, the findings revealed that out of the 14 traders interviewed, only 1, representing 7.1%, dried the vegetables themselves, and the remaining 13, representing 92.9% ordered ready dried vegetables from their suppliers. Some traders indicated that their dried vegetables, in particular pumpkin leaves, come from as far as Petauke in Eastern Province of Zambia, while others indicated that their mushrooms come from as far as Kaoma in Western Province of Zambia. This result could indicate that it is easier for the traders to just order already dried vegetables for sale than to order fresh ones and dry the vegetables before selling. It also indicates that the people who do the drying were not being bypassed in the value chain of the vegetables from the farmer to the trader at the market.

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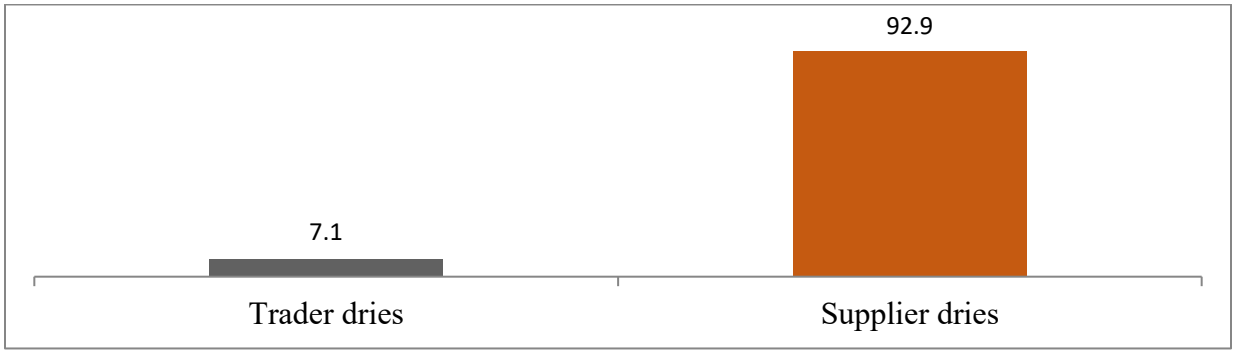
Figure 4: Whether Trader Dries the Fruits/Vegetables or Orders Them from a Supplier Already Dried



Knowledge of Drying Methods, Awareness of Solar Drying Technology, and Sales Turnover

Table 4 presents data on traders' knowledge of drying methods, awareness of solar food drying technology, and sales turnover levels. The majority (78.6%) utilise open sun drying, while 21.4% are unaware of the method used. Only 7.1% are aware of solar food drying technology, indicating limited exposure to improved drying methods. Regarding sales turnover, 21.4% of traders reported very low turnover, 21.4% low, 21.4% moderate, 21.4% high, and 14.3% very high. This distribution suggests that most traders experience low to moderate sales turnover.

Table 4: Knowledge of Drying Methods, Awareness of Solar Drying Technology, and Sales Turnover

Category	Response	Frequency	Percent (%)
Method of Drying Used	Open sun drying	11	78.6
	Do not know	3	21.4
	Total	14	100.0
Awareness of Solar Drying Technology	Yes	1	7.1
	No	13	92.9
	Total	14	100.0
Sales Turnover	Very low	3	21.4
	Low	3	21.4
	Moderate	3	21.4
	High	3	21.4
	Very high	2	14.3
	Total	14	100.0

Thematic Analysis Results

Based on the qualitative data collected from 42 participants in Lusaka, including 14 traders, 24 street consumers, and representatives from 4 supermarkets. A thematic analysis was conducted to explore awareness and utilisation of solar food drying technology in Zambia. The analysis yielded five primary themes, each elucidating key aspects of current practices, awareness levels, market dynamics, consumer preferences, and potential avenues for technological adoption. Each theme is substantiated with direct quotations from participants, providing authentic insights into their experiences and perspectives.

Predominance of Traditional Drying Methods

A significant majority of traders in Lusaka rely on open sun drying as the primary method for preserving fruits and vegetables. This traditional practice involves spreading produce on mats, rooftops, or directly on the ground to dry under the

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sun. Its widespread use is attributed to its simplicity, low cost, and the abundance of sunlight in the region. As one trader from Soweto Market explained, "*We just spread the vegetables on mats under the sun; it's how we've always done it."* However, this method poses challenges, including contamination from dust, insects, and animals, as well as uneven drying due to fluctuating weather conditions. These factors can compromise the quality and safety of the dried products, leading to potential health risks and economic losses. Despite these drawbacks, the practice persists due to the lack of access to improved drying technologies and limited awareness of alternative methods. Addressing these issues through education and the introduction of affordable, efficient drying technologies could enhance food safety, extend shelf life, and improve the livelihoods of traders and consumers alike.

"We just spread the vegetables on mats under the sun; it's how we've always done it." Trader 6, Soweto Market

This reliance on traditional methods underscores a gap in the adoption of modern preservation technologies, potentially affecting the quality and shelf-life of dried products.

Limited Awareness of Solar Drying Technology

Awareness of solar food drying technology among traders and consumers in Lusaka is notably low. Many participants had not encountered or utilised such technology, indicating a gap in knowledge dissemination and access to improved drying methods. This lack of awareness suggests the need for targeted educational initiatives to introduce and promote the benefits of solar drying technology.

"I've never heard of solar drying machines; we just use the sun directly." Trader 9, City Market

The notably low awareness of solar food drying technology among traders and consumers in Lusaka underscores the urgent need for targeted educational initiatives. Despite the potential benefits of solar drying, such as improved product quality, extended shelf life, and reduced post-harvest losses, indications are that many participants in the study had not encountered or utilised such technology. This gap in knowledge dissemination and access to improved drying methods suggests that without deliberate efforts to educate and inform stakeholders, the adoption of solar drying technologies will remain limited.

Market Demand for Dried Vegetables Over Fruits

In Lusaka, the demand for dried vegetables significantly surpasses that for dried fruits, with pumpkin leaves, locally known as *chibwabwa,* which is emerging as the most sought-after. This preference is deeply rooted in Zambian culinary traditions, where *chibwabwa* is a staple ingredient, often prepared with tomatoes and onions, and served alongside *nshima,* the nation's staple food. The popularity of pumpkin leaves is not only due to their cultural significance but also their nutritional value, being rich in vitamins A and C, iron, and calcium. Their versatility allows them to be consumed fresh or dried, making them accessible year-round. The prominence of *chibwabwa* reflects the broader dietary patterns in Zambia, where traditional leafy greens play a central role in daily meals, underscoring the importance of these vegetables in both cultural and nutritional contexts

"Everyone asks for chibwabwa; it's a staple in our meals." Trader 2, Soweto Market

The prominence of pumpkin leaves *(chibwabwa*) in the market highlights their central role in Zambian cuisine and the potential for focused marketing strategies around such staple products.

Consumer Preference for Multiple Vegetable Types

In Lusaka, consumers frequently purchase a variety of dried vegetables rather than a single type, reflecting a cultural preference for diverse ingredients in meal preparation. This practice aligns

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with traditional Zambian culinary habits, where meals are often composed of multiple vegetable dishes served alongside *nshima,* the staple maize-based food. For instance, a consumer from Lusaka town centre remarked, "*I usually buy pumpkin leaves, okra, and cowpea leaves together because they each bring a different taste and texture to the meal*." Such diversity not only enhances the sensory appeal of meals but also contributes to nutritional adequacy, as different vegetables provide a range of essential nutrients. The Food-Based Dietary Guidelines for Zambia emphasise the importance of consuming a variety of foods from different groups daily to maintain health and prevent diseases. Therefore, the preference for multiple types of dried vegetables among consumers underscores both cultural culinary practices and a move towards dietary diversity for better nutrition.

"I usually buy pumpkin leaves and okra together; they go well with nshima." Consumer 5, Lusaka Town Centre

This consumer behaviour suggests opportunities for traders to offer bundled products or mixed vegetable packages to cater to consumer preferences. By bundling complementary items such as pumpkin leaves, okra, and cowpea leaves, traders can simplify the shopping experience, reduce decision-making time, and provide added value to customers seeking variety in their meals. Research indicates that consumers often prefer product bundles because they require less cognitive effort to process, making the shopping experience more convenient and efficient. Implementing such bundling strategies not only aligns with cultural dietary practices but also has the potential to increase sales and customer satisfaction**.**

Need for Enhanced Utilisation of Solar Drying Technology

Participants expressed a keen interest in learning about and adopting improved drying methods, particularly solar technology, to enhance product quality and shelf life. This enthusiasm stems from the recognition that traditional open sun drying methods often compromise food safety and nutritional value due to exposure to contaminants and inconsistent drying conditions. Solar drying offers a sustainable and cost-effective alternative, utilising renewable energy to reduce moisture content in produce, thereby inhibiting microbial growth and extending shelf life. Moreover, solar dryers can preserve up to 70% of nutrients in dried foods, maintaining their flavour, texture, and colour. The adoption of solar drying technology not only addresses food safety concerns but also contributes to environmental sustainability by reducing reliance on fossil fuels and minimising carbon emissions. To facilitate this transition, participants suggested the implementation of training programs and awareness campaigns to educate traders and consumers on the benefits and operation of solar drying systems. Such initiatives could empower local communities to improve food preservation practices, enhance food security, and promote economic development through the production of higher-quality dried products

"If there's a better way to dry vegetables and keep them longer, I'd like to know about it." Trader 11, City Market

This openness to new methods indicates a readiness among traders to embrace technologies that could improve their products and business outcomes, provided they have access to the necessary information and resources. These themes collectively highlight the current practices and perceptions surrounding dried fruits and vegetables in Lusaka. They underscore the importance of educational outreach and resource provision to facilitate the adoption of solar drying technologies, which could lead to improved product quality, extended shelf life, and enhanced market competitiveness.

DISCUSSION

The study's findings underscore the enduring prevalence of open-sun drying among traders in

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Lusaka's markets, a method adhered to by approximately 79% of respondents. This aligns with traditional preservation techniques documented in Zambia and across Africa, where produce is commonly spread on mats, sacks, stone slabs, or raised platforms to dry (Binge *et al*., 2023; FAO, 2021). While cost-effective and culturally accepted, given Zambia's ample sunshine, this method lacks control over hygiene and quality, exposing produce to dust, insects, rodents, inconsistent drying, and nutrient loss (Rohith, 2021; FAO, 2020).

Despite the introduction of solar food drying technology in Zambia as early as 2006, awareness among traders remains remarkably low, with 93% unaware of its existence. This echoes broader patterns found across Africa, where lack of information, financial constraints, and institutional shortcomings hinder adoption (Maendeleo, 2011; Kimaro *et al.,* 2024). Although solar drying can significantly improve nutrient retention, hygiene, and drying efficiency, reducing moisture faster and preserving vital nutrients like beta-carotene (FAO, 2020), these benefits remain underutilised without concerted educational and institutional support. Coordinated efforts such as training, demonstration programs, subsidies, and improved technology diffusion are therefore essential to overcoming these barriers.

The study also confirmed a robust market for traditional dried vegetables, particularly pumpkin leaves, sold by the vast majority of traders and purchased by 62% of street consumers. This trend reflects both cultural significance and supply-side advantages, as pumpkin leaves are abundant, resilient, and nutritionally rich, fitting well into local dishes with *nshima.* This finding is consistent with surveys from Zambia and elsewhere in Africa, which highlight the central role of traditional leafy vegetables in local diets (Oniang'o *et al.,* 2025). However, traditional drying methods limit product quality and shelf stability, reducing consumer trust and market reach, challenges that solar drying could mitigate if awareness and access are improved.

CONCLUSION

This study revealed that while traditional open sun drying remains the dominant method used by traders of dried vegetables in Lusaka, awareness and utilisation of solar food drying technology are remarkably low. The persistence of traditional methods is largely due to their simplicity and cost-effectiveness, but these methods compromise product quality and food safety. In contrast, solar drying offers significant advantages in preserving nutritional value and extending shelf life, yet its adoption is hindered by a lack of awareness and institutional support. The study also confirmed a strong local market for dried vegetables, particularly pumpkin leaves, underscoring the cultural and nutritional importance of these products. Consumer preferences for diverse vegetable types further highlight opportunities for product innovation and marketing. Importantly, both traders and consumers expressed interest in adopting improved drying technologies if given access to information and training. To fully harness the potential of solar food drying in Zambia, coordinated efforts by the government, private sector, and development partners are needed to promote awareness, facilitate access to affordable technology, and build local capacity, thereby reducing post-harvest losses and improving livelihoods**.**

Acknowledgement

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Ethical Approval

This study was permitted by the Cavendish University and ERES Converge Ethics Committee. Permission to collect data from the study site was also obtained from **the** Board of Graduate Studies and other relevant authorities. Participants who took

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part in the study completed consent forms and were assured of anonymity.

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