

Contribution of Onion (*Allium cepa* L.) Production to Women's Livelihoods and Household Welfare in The Gambia: Evidence from the Banjulinding Women's Horticultural Garden

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Abstract

Onion (*Allium cepa* L.) cultivation is an important horticultural activity that sustains the livelihoods of urban and rural households in The Gambia, especially among women. This study examined the impact of onion farming on the income of women and their household welfare based on evidence from the Banjulinding Women's Horticultural Garden. A descriptive cross-sectional survey design was used with 20 randomly selected female onion producers. Structured interviews were used to gather primary data, which were analyzed using a descriptive approach with the Sustainable Livelihoods Framework (SLF) to assess socioeconomic characteristics, livelihood outcomes, and constraints to production. The findings showed that 70% of respondents farmed onions for both household consumption and to earn income, and 80% of farmers used hired labor, thus showing that onion production also generated local employment. The earnings from onion sales were mostly used for household food consumption (60%) and children's education (40%), suggesting an improvement in household welfare. However, limited institutional support, lack of production inputs, pest and disease pressure, and water shortages were identified as factors that limited productivity and livelihood gains. The study recommends prioritizing investment in small-scale irrigation infrastructure and expanding access to production inputs, credit, and extension services as the most direct routes to improving women's livelihoods and household welfare through onion production.

Keywords: onion production, women's livelihood, household welfare, sustainable livelihood framework, The Gambia

Introduction

Onion (*Allium cepa* L.) is one of the most economically important vegetable crops cultivated worldwide, serving as both a staple food ingredient and a high-value cash crop that contributes significantly to household income, employment, and economic development in urban and rural areas (Arshad et al., 2026). Onion production has become a significant enterprise for smallholder farmers because of its high market demand, short production cycle, and high profitability (Puspitasari et al., 2024). Additionally, onions are one of the most commercially valuable year-round vegetable crops, with an attractive market price (Gulati et al., 2022).

In sub-Saharan Africa, horticulture is progressively acknowledged as a means of agricultural diversification, alleviation of poverty, and nutrition for the impoverished (James & Zikankuba, 2017). Therefore, vegetable cultivation has emerged as a strategic subsector for supporting sustainable agricultural transformation to improve economic returns from limited land resources and livelihood resilience (Liu et al., 2023).

In The Gambia, agriculture remains one of the largest contributors to employment and livelihood, especially in rural areas (Ceesay et al., 2021). Although smallholder farmers are resource-constrained, horticultural production is an important part of urban and rural development, as it is the dominant sector (Williams et al., 2019).

Community horticultural gardens have also contributed to women's participation in agricultural production through avenues of income generation, household food security, and local markets (Acevedo-Ortiz et al., 2024). The increased involvement of women in the higher-value vegetable sector has become a key focus of poverty alleviation and agricultural development policies

for gender equality and better rural living standards, as women make up a large share of the horticultural labor force (Ngutu et al., 2025).

Horticultural production has been shown to have a positive impact on poverty reduction, food security, employment creation, and household income in Sub-Saharan Africa in previous studies (Nkomoki et al., 2025; Van Den Broeck et al., 2018). Unlike many staple crops, vegetable crops provide better economic returns and regular cash income due to continuous demand from the market (Gurung et al., 2016). Women's involvement in horticultural production has also been found to enhance household welfare in terms of increased income, enhanced involvement in household decision-making, and improved spending on education, healthcare, and food consumption (Deißler et al., 2025; Mayesty et al., 2020).

However, current research has significant weaknesses. Most literature focuses on agronomic performance, production efficiency, profitability, and few consider the wider consequences of horticultural production for the livelihood and welfare of agriculturalists from an agricultural economics perspective (Mukherjee et al., 2024; Yeshiwas et al., 2026). Likewise, many socioeconomic research studies have taken income generation as the primary study variable, rather than incorporating other multidimensional welfare outcomes such as employment, diversification of livelihoods, household resilience, and women's economic empowerment (Miawonene et al., 2025). Furthermore, empirical data in The Gambia remain limited compared with other West African states, which limits the formulation of sustainable horticultural development policies based on empirical evidence.

Although the onion is a significant crop in community horticultural gardens in The Gambia, empirical evidence on its role in women's livelihoods and household welfare is limited. Most agricultural interventions have been directed towards increasing production through improved technologies, irrigation development, and extension services, and little attention has been paid to understanding the contribution of onion production to income generation, employment, the well-being of households, and women's economic well-being. Therefore, there is not enough information to support policymakers in understanding the wider socio-economic return of onion production by women (Cafer & Rikoon, 2018; Prajapati et al., 2025). This gap is reinforced by the broader absence of integrated evidence on onion production and women's livelihoods and welfare in The Gambia (Hummel et al., 2019). Little empirical evidence combines economic and social conditions with livelihood outcomes, production constraints, and institutional support in an integrated framework. The absence of contextual evidence limits the understanding of the role of female onion farmers in rural and urban development. This hinders the development of effective policies to enhance horticultural production in the region (Barrett & Browne, 1989; Beverly et al., 1991).

Additionally, women onion producers face several challenges, such as lack of irrigation facilities, drought, pest and disease pressure, limited access to production inputs, technical training, and financial services on a seasonal basis. These constraints affect productivity and profitability and limit the contribution of onion production towards improving the livelihoods and rural household welfare (Yeshiwas et al., 2025a).

Considering these challenges, this study examines the contribution of onion production to women's livelihoods and household welfare using evidence from the Banjulinding Women's Horticultural Garden in The Gambia. Banjulinding was selected as a purposive, information-rich case because it is among the largest and most active women-managed community horticultural enterprises in the West Coast Region, with onion recognized as its principal high-value cash crop (Fraval, Hammond, Bogard, et al., 2019; Pennings et al., 2002a). As a single-site case study of 20 producers, the findings are intended to generate context-rich, indicative evidence rather than results generalizable to all Gambian women onion producers. Specifically, it assesses the socioeconomic characteristics of female onion producers, evaluates the contribution of onion production to household livelihoods and welfare, identifies the major production constraints affecting female farmers, and proposes policy interventions to enhance the sustainability and socioeconomic benefits of women's horticultural enterprises.

This study contributes to the agricultural and resource economics literature by offering localized empirical evidence of the livelihood impacts of onion production by female farmers in the community horticultural system. Additionally, this study adopts a more comprehensive approach by incorporating onion production into the analysis of income generation, employment, household

welfare, and female economic involvement. In contrast, previous studies have been limited in scope, either to production or profitability. The results will guide the development of gender-sensitive interventions to support sustainable horticultural development, enhance the welfare of both urban and rural households, and facilitate inclusive agricultural transformation in The Gambia.

Methods

Study Area

The study was conducted in the Banjulinding Women's Horticultural Garden, located in the Kombo North District of the West Coast Region (WCR) in The Gambia (approximately 13.377°N, 16.658°W). The region is part of the humid west coast of the country and is situated in the Guinean savannah agro-ecological zone and falls under the Köppen–Geiger classification Aw (tropical savanna) with a unimodal rainfall pattern, annual mean rainfall of 900–1,200 mm, and an ethnically diverse population, including Mandinka, Fula, Wolof, and Jola communities. The site was purposively selected because it is one of the largest and most active women-managed community horticultural enterprises in the WCR, and onion is recognized as its principal high-value cash crop; thus, it provides an appropriate and information-rich instance for the study of the livelihood contribution of women-led onion production. Figure 1 is included to provide a clear geographical context for the study and to show the spatial relationship between the national, regional, and site levels. Panel (A) locates The Gambia within West Africa, providing the broader geographical context of the study. Panel (B) identifies the West Coast Region within The Gambia and shows the regional setting of the study site. Panel (C) provides a more detailed location of the Banjulinding Women's Horticultural Garden within the West Coast Region, allowing the specific field-study location to be identified.

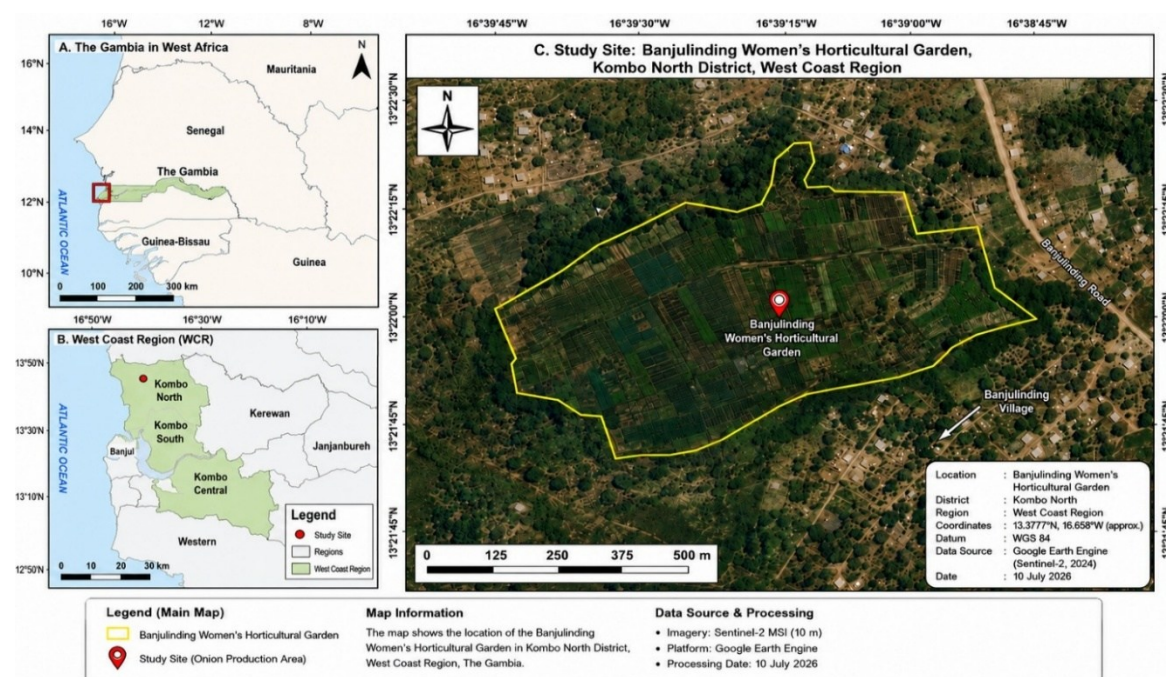


Figure 1. Geographical location of the study area: (A) The Gambia in West Africa, (B) West Coast Region in The Gambia, and (C) Banjulinding Women's Horticultural Garden in the West Coast Region

Population, Sampling Technique, and Sample Size

The study population consisted of all 67 women farmers registered as active members of the Banjulinding Horticultural Garden. From this population, 60 women (specifically involved in vegetable production) were selected as the target population. A two-stage sampling method was used. To study onion-based livelihood outcomes, purposive sampling was employed in the first stage to select women directly engaged in onion cultivation during the reference production period within the target population. In the second stage, the balloting method (without replacement) was used for simple random sampling to obtain a final sample of 20 respondents from this eligible subgroup. The

resulting sample size was approximately one-third of the eligible sub-population of onion producers, which is a methodological constraint for statistical power in relation to the inferential analysis. Thus, findings related to aspects of relationships among variables should be interpreted as indicative and not necessarily generalizable beyond the study site, as is recommended for small, well-defined agricultural case study populations (Fraval, Hammond, Wichern, et al., 2019; Pennings et al., 2002b).

Data Types and Sources

Both primary and secondary data were used. The primary data that formed the basis of this study were gathered firsthand from the sampled women onion farmers. Secondary data were obtained from the Gambia Bureau of Statistics (GBOS), the Ministry of Agriculture, peer-reviewed journal articles, and institutional reports to contextualize the study area profile and triangulate the primary findings.

Data Collection Instruments and Procedure

Primary data were gathered through face-to-face interviews with respondents using a pre-tested semi-structured questionnaire and direct observation on the ground in the field during onion production and marketing activities. The instrument contained five sections covering (i) socioeconomic and demographic information; (ii) onion production, production output, and marketing practices; (iii) household income and expenditure and welfare indicators; (iv) production and institutional constraints; and (v) access to extension, credit, and input services. Closed questions were mainly used to ensure consistency of responses and offered quantitative coding, with selected open questions gathering contextual information. The researcher interviewed the respondents in their local languages (Mandinka and Wolof) to reduce the possibility of translation bias, and the duration of each interview was approximately 30–40 minutes.

Analytical Framework and Model Specification

The data were coded and analyzed using IBM SPSS Statistics (Version 32.0.0), guided by the study objectives. (i) Socioeconomic Profile: Descriptive statistics, including frequencies, percentages, means, and standard deviations, were used to characterize respondents' ages, marital statuses, educational attainments, household sizes, and farming experiences. (ii) Contribution to Livelihoods and Household Welfare: Gross margin analysis was employed to estimate the profitability of onion enterprises, which was specified as follows:

$$GM = TR - TVC, \text{ where } TR = P_y \times Q_y \text{ and } TVC = \sum P_{xi} X_i \dots\dots\dots (1)$$

where GM is gross margin, TR is total revenue, TVC is total variable cost, P_y and Q_y are the unit price and quantity of onion output, and P_{xi} and X_i denote the price and quantity of the i -th variable input. To capture broader, non-income dimensions of welfare, a composite Household Welfare Index (HWI) was constructed from standardized indicators of household food security, expenditure on education and healthcare, and asset ownership, following established multidimensional welfare measurement approaches in agricultural economics. The relationship between onion-production characteristics and household welfare was further examined using an Ordinary Least Squares (OLS) regression model:

$$Y_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \epsilon_i \dots\dots\dots (2)$$

where Y_i is the household welfare index (or net onion income) of respondent i ; X_1 – X_5 represent age, educational level, farming experience, farm size, and access to credit/extension services, respectively; β_0 is the intercept; β_1 – β_5 are parameter estimates; and ϵ_i is the stochastic error term. (iii) Production Constraints: Constraints were assessed using a four-point Likert-type scale, with responses ranked by mean score and coefficient of variation to establish the relative severity of constraints such as irrigation inadequacy, input access, credit access, and pest and disease pressures. The results are presented using frequency and cross-tabulation tables, complemented by descriptive and inferential statistics, to ensure clarity and comparability with related studies in agricultural resource economics.

Ethical Considerations

Pre-data collection ethical clearance and community entry protocols were followed. All respondents were verbally informed of the purpose, voluntary nature, and confidentiality of the study and provided informed consent. The questionnaires were anonymous, and all data were used solely for academic purposes in line with accepted research ethics guidelines.

Results and Discussions

Table 1 presents the age, marital status, education level, and farming experience of the sampled female farmers who produced onions. By age, the largest proportion of respondents was aged 46–55 years (40.0%), followed by those aged 56 years and above (25.0%), 36–45 years (20.0%), and 26–35 years (15.0%). No respondent was recorded as below 26 years of age, which implies that onion production in the garden is mainly done by middle-aged and older women. Regarding marital status, most respondents (70.0%) were married, and 30.0% were divorced. Regarding the level of formal education, the sampled women had an overall low level, with 70.0% having not completed any formal education, 20.0% having completed primary-level education, and 10.0% having completed secondary-level education. Regarding years of farming experience, 50.0% of the respondents had 15–20 years of experience in onion production, while 20.0% had 6–10 years, 20.0% had 21 years or more, and 10.0% had less than five years, which shows that the enterprise is mainly operated by a very experienced group of farmers.

Table 1. Socio-Demographic Characteristics of Respondents

Variable	Category	Frequency	Percentage (%)
Age (years)	26 – 35	3	15.0
	36 – 45	4	20.0
	46 – 55	8	40.0
	56 and above	5	25.0
Marital Status	Married	14	70.0
	Divorced	6	30.0
Educational Level	No formal education	14	70.0
	Primary education	4	20.0
	Secondary education	2	10.0
Farming Experience	Less than 5 years	2	10.0
	6 – 10 years	4	20.0
	15 – 20 years	10	50.0
	21 years and above	4	20.0

Women aged 46 and above made up the bulk of the population in Banjulinding (65.0%), with no respondents under 26 years. In the Sustainable Livelihoods Framework, age-related labor capacity and experience are considered key human-capital assets that influence livelihood strategies (Bebbington, 1999). This ageing profile is similar to the general trend in Sub-Saharan Africa, which has seen a decline in youth involvement in smallholder farming, which has been attributed to farm labor being perceived as burdensome, limited availability of land and capital, and low returns to manual labor on small farms

(Mukwedeya & Mudhara, 2024). Unless this process is addressed, it threatens to erode the human capital of the garden and identifies a tangible policy option: involving younger women in training, membership of cooperatives, and asset transfers to facilitate intergenerational succession.

The marital status of the respondents, with married women dominating the sample (70.0%), is consistent with observations in West African horticultural schemes, where married women bear the primary responsibility for garden production and play complementary roles in the household (Adebayo & Worth, 2024). The significant percentage of divorced women (30.0%) reinforces the evidence of the social-protection role of community gardens, even though they also have a productive function for economically vulnerable women living in patrilineal rural contexts (Egah et al., 2023). This is indeed an emphasis on the social protection role of the Banjulinding garden, in addition to its more limited production role.

The high proportion of respondents with no formal education (70.0%) aligns with the results obtained from Northern Ghanaian vegetable farmers, where female farmers were significantly more likely than male farmers to be without formal education due to socio-cultural issues that affect girls'

education (Zaato et al., 2025). Farmers' lack of formal education is a latent constraint on diversification, in addition to their long years of practical experience, with half of the respondents having 15–20 years of experience in farming onions. Thus, as witnessed in other parts of West Africa (Sitachew et al., 2018) Farming experience is the key asset at Banjulinding, which is structurally fragile because of the lack of a growing youth population.

Table 2. Onion Production and Resource-Use Practices

Variable	Category	Frequency	Percentage (%)
Variety Cultivated	Galmeh (local red onion)	17	85.0
	Red Creole	3	15.0
Irrigation Frequency	Daily	13	65.0
	As needed	7	35.0
Fertiliser Type Applied	Organic	8	40.0
	Inorganic	7	35.0
	Both (organic and inorganic)	5	25.0

Table 2 shows that 85.0% of respondents cultivated the local Galmeh variety, compared with 15.0% using Red Creole, indicating a strong preference for the locally established cultivar. Daily irrigation was reported by 65.0% of farmers, highlighting the importance of reliable water access in onion production, consistent with evidence on the role of small-scale irrigation in supporting agricultural production in West Africa (Bryan & Mekonnen, 2023). Fertilizer use varied, with 40.0%, 35.0 %, and 25.0% using organic, inorganic, and both, respectively. Such variation reflects differences in input-use practices, while recent onion research also identifies access to production inputs, including fertilizer and irrigation, as important constraints in smallholder systems (Yeshiwas et al., 2025b).

Table 3. Purpose of Onion Production and Employment Generation

Variable	Category	Frequency	Percentage (%)
Purpose of Onion Production	Household consumption only	6	30.0
	Both consumption and income (commercial)	14	70.0
Engagement of Hired Labour	Yes	16	80.0
	No	4	20.0

Table 3 presents the respondents' primary purpose for cultivating onions and their engagement of hired labor. Most respondents (70.0%) had grown onions for both food and monetary purposes, compared to 30.0% who grew onions mainly for food. As for labor, 80.0% of respondents engaged in the use of labor for various agricultural activities, including land preparation, seed bed establishment, harvesting, etc., while 20.0% used only personal/household labor.

This high percentage of respondents (70.0%) growing onions for both food and income suggests a semi-commercial livelihood strategy that transforms farm assets into multiple outcomes, including food security and cash income, as reported in Nigeria, where vegetable production achieves dual purposes of enhancing food security and rural cash income (Mukaila et al., 2022). The prevalence of hired labor (80.0%) suggests positive employment spillover to the broader community. However, this labor intensity must be interpreted with gender-differentiated evidence indicating that women vegetable farmers primarily use manual and labor-intensive methods compared to men (Zaato et al., 2025), which would otherwise create a continued high labor burden for women producers if no investment is made in technology.

Table 4. Allocation of Onion Income to Household Needs

Variable	Category	Frequency	Percentage (%)
Primary Allocation of Onion Income	Household food needs	12	60.0
	Education-related expenses (school fees, uniforms, learning materials)	8	40.0

In addition to the production purpose stressed, respondents were asked about the uses to which the income from selling onions was put to satisfy alternative household purposes. Among the respondents, most (60.0%) indicated that their onion income was mainly used for food consumption within the household, while 40.0% mentioned that a considerable proportion of their income was used for education expenses, such as school fees, school uniforms, and learning materials (Table 4).

The allocation of onion income mainly to food needs (60.0%) and education (40.0%) is consistent with the body of evidence showing that the income received by women is likely to be spent disproportionately to meet household food security needs (Egah et al., 2023) and nutrition needs (Soh Wenda et al., 2024). This implies that the welfare benefit of producing onions is not limited to income but also includes other benefits, such as downstream effects on food security and human-capital formation (Zaato et al., 2025) which are more effectively captured by multidimensional welfare indicators.

Table 5. Constraints Faced by Respondents in Onion Production

Variable	Category	Frequency	Percentage (%)
Constraints Faced	Water shortage	9	45.0
	Pest and disease attack	7	35.0
	Lack of production tools	3	15.0
	Inadequate storage facilities	1	5.0

The constraints reported by the respondents for their onion production are listed in **Table 5**. The most common constraint reported was water shortage (45.0%), followed by pest/disease attacks (35.0%), lack of production tools (15.0%), and inadequate storage facilities (5.0%).

Water shortage (45.0%) and pest and disease pressure (35.0%) were the major constraints, reflecting the reliance on well-based irrigation during dry-season conditions in the study area. The same conditions have been observed in smallholder horticultural systems in sub-Saharan Africa, where poor irrigation infrastructure restricts dry-season production and demands more labor to manage water resources (Bryan & Mekonnen, 2023; Burney & Naylor, 2012). Therefore, the high frequency of irrigation (45.0%) is not only the result of agronomic decisions but also of labor intensity, which is determined by the limited irrigation infrastructure. Although tool inadequacy (15.0%) and storage deficiency (5.0%) were mentioned less often, post-harvest storage and handling constraints were acknowledged as significant constraints in reducing farmer incomes after production constraints were decreased (Affognon et al., 2015).

Table 6. Access to Institutional Support and Support Needed to Improve Production

Variable	Category	Frequency	Percentage (%)
Access to Training/ Institutional Support	Yes	8	40.0
	No	12	60.0
Support Needed to Improve Production	Irrigation facilities	9	45.0
	Access to production inputs	7	35.0
	Financial support/credit	4	20.0

Table 6 shows the training/institutional support that was available to respondents and what type of support was perceived as needed to enhance production. Most respondents (60.0%) said that they were not trained or supported in any way by an agricultural organization, and 40.0% were trained and supported. In terms of the need for support, better irrigation facilities were reported to be the greatest need (45.0%), followed by the provision of inputs (35.0%) and financial support and credit (20.0%).

Although some production constraints were documented, most respondents (60.0%) reported that they had not received any training or support from an institution for agricultural activities. Households' capacity to link assets to livelihood outcomes is also mediated by institutional structures (DFID, 1999), and this is consistent with available evidence in Ethiopia, where experience and access to credit are positively predictive of women's extension engagement, while domestic time burdens are negatively predictive of women's engagement in extension (Sitachew et al., 2018). Respondents' self-identified priorities, which included irrigation (45.0%), production inputs (35.0%), and financial support (20.0%), were consistent with documented constraints and supported the findings, suggesting that irrigation infrastructure should be a key component of future interventions. Increased irrigation, access to productive inputs, and women's empowerment also increase agricultural productivity and household welfare and are reported as key priorities across sub-Saharan Africa (Bryan & Mekonnen, 2023; Diiro et al., 2018; Doss, 2018; *The Status of Women in Agrifood Systems*, 2023).

Synthesis

These constraints mirror those documented among onion producers in Northwest Ethiopia, where limited water access and post-harvest losses similarly erode income gains despite comparable production intensity (Yeshiwas et al., 2025b) and align with broader evidence that women vegetable producers across West Africa face compounding technological and institutional disadvantages relative to men (Zaato et al., 2025). Relative to vegetable-based livelihood strategies documented in Nigeria (Mukaila et al., 2022) and Kenya (Deißler et al., 2025), the Banjulinding case shows a similar dual food–income orientation but a markedly weaker institutional support environment, suggesting that the binding constraint on welfare gains here is institutional access rather than production capacity or market demand.

Conclusion

This study shows that onion production is an important complement to the livelihoods and household welfare of women in the Banjulinding Women's Horticultural Garden. In addition, it improves food security, generates seasonal jobs with hired labor, and helps households cover their basic needs, including food and children's education. The findings of this study also show that the women-managed onion business is a valuable option for women's livelihoods, as it adds to both the economic and social welfare of urban and rural Gambia. The study further indicates that the sector is maintained largely by experienced but older women farmers with limited formal education, pointing to the strength of indigenous farming knowledge and the fragility of the enterprise if it fails to have young people and human capital renewal.

However, the potential for onion production is still limited by structural constraints, such as poor irrigation infrastructure, insufficient water availability, pest and disease risks, access to inputs, lack of institutional support, and limited access to capital. These constraints decrease productivity and increase labor demand, which affects the socioeconomic returns that women can reap from producing onions. Therefore, institutional support systems must be strengthened, in addition to investments in irrigation systems and agricultural services, to boost productivity and increase the welfare of the rural population, as well as to support inclusive urban-rural development. The findings provide empirical evidence of the importance of onion production by women in The Gambia. However, the relatively small sample size and single location of the study suggest the need for larger, multi-location datasets to support the external validity of this conclusion in the future.

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