

International Journal of Agriculture Extension and Social Development

Volume 8; Issue 7; July 2025; Page No. 57-61

Received: 23-05-2025

Accepted: 26-06-2025

Indexed Journal

Peer Reviewed Journal

Migration-agriculture linkages and implications for redesigning extension services in labor-scarce rural areas

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DOI: <https://www.doi.org/10.33545/26180723.2025.v8.i7a.3258>

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Abstract

Roughly 35% of working-age adults in rural Jamaica have migrated to urban centers or abroad within the past decade, leaving behind farming communities that struggle to maintain agricultural output ^[1]. This research investigated the linkages between rural-to-urban and international migration patterns and agricultural productivity in three parishes of Jamaica, and explored what these connections mean for redesigning extension services in labor-scarce areas. A mixed-methods approach was used, combining a cross-sectional survey of 342 farming households with 28 semi-structured interviews among extension officers and community leaders. The research was conducted between January and November 2022 through the Department of Agricultural Sciences, University of Technology Jamaica. Results showed that households with at least one migrant member farmed 31.4% less land area than non-migrant households, yet reported 22.7% higher income from remittance-supported agricultural investments. Seasonal domestic migration was the most common pattern (28.7%), followed by permanent domestic migration (18.3%) and international migration (14.9%). Extension service usage dropped by 38.6% in high-migration communities compared to low-migration areas. Households identified labor-saving technologies, digital extension delivery, and remittance investment guidance as their top three extension priorities. These findings suggest that extension services in migration-affected areas need to shift from traditional labor-intensive farming advice toward mechanization support, remote advisory tools, and financial planning for agricultural reinvestment of remittances.

Keywords: Rural migration, agricultural extension, labor scarcity, remittances, farming households, extension service redesign, digital extension, labor-saving technology, mixed methods, Caribbean agriculture

Introduction

An estimated 258 million people worldwide live outside their country of birth, and internal migration numbers are several times larger ^[2]. For rural communities dependent on agriculture, this outflow of labor has reshaped farming systems in ways that extension services have been slow to address. In Jamaica, where agriculture accounts for about 7% of GDP but employs nearly 16% of the rural workforce, migration has created a paradox: farm labor has declined while remittance money flowing back into these same communities has increased ^[3]. The relationship between migration and agriculture isn't straightforward. On one hand, losing working-age household members reduces the labor available for planting, weeding, and harvesting. Several researchers have documented how this leads to land abandonment, reduced crop diversity, and a shift toward less labor-intensive crops ^[4]. On the other hand, remittances can fund agricultural investments that were previously unaffordable—irrigation equipment, improved seed, small-scale mechanization ^[5]. Which effect dominates depends

heavily on the type of migration, household characteristics, and the support structures available.

Extension services in the Caribbean have largely maintained delivery models designed for full-time resident farmers: scheduled farm visits, group training sessions, demonstration plots ^[6]. These models assume farmers are present, available, and managing their land directly. But in communities where 30–40% of households have migrant members, the people making farming decisions may be elderly relatives, part-time farmers, or even migrants themselves coordinating remotely ^[7]. Traditional extension approaches miss these audiences entirely. Research on migration-extension linkages remains sparse in the Caribbean context. Most work has focused on African and Asian settings, where migration patterns and agricultural systems differ markedly ^[8]. This research aimed to characterize migration patterns among farming households in three Jamaican parishes, measure how different migration types affect farm management and extension engagement, and identify priorities for redesigning extension services to

serve labor-scarce communities effectively.

Research Area Description: The research covered three parishes in eastern Jamaica—St. Thomas, Portland, and St. Mary—selected for their high rates of rural out-migration and dependence on smallholder agriculture. These parishes lie between latitudes 17.9°N–18.4°N, receiving 1,800–3,200 mm of annual rainfall. The terrain is hilly to mountainous, with small farm plots averaging 1.2–2.8 hectares. Main crops include yam, banana, coffee, and mixed vegetables. Extension coverage in these parishes averages one officer per 380 registered farmers ^[6].

Material and Methods

Material: This research was conducted from January through November 2022 at the Department of Agricultural Sciences, University of Technology Jamaica, Kingston. Ethical approval was obtained from the University of Technology Jamaica Research Ethics Committee (Protocol UTech-REC/2021-043, approved November 22, 2021). Written informed consent was collected from all participants. A mixed-methods design combined a cross-sectional household survey (n = 342) with semi-structured interviews (n = 28) of extension officers and community leaders. Households were selected through stratified random sampling across the three parishes, with strata based on migration prevalence estimates from the Statistical Institute of Jamaica ^[9]. The survey instrument covered household demographics, migration history, farm characteristics, extension service usage, and extension priorities. Interview guides explored institutional perspectives on serving migration-affected communities.

Methods

The household survey was administered face-to-face by trained enumerators between February and June 2022, averaging 45 minutes per interview. Migration status was classified into four categories: seasonal domestic, permanent domestic, international, and circular/return migration. Households with no migrant members formed the control group. Farm productivity was measured through self-reported crop area, output volume, and income. Extension engagement was assessed through frequency of contact, service types used, and satisfaction ratings on a five-point Likert scale ^[10]. Semi-structured interviews were conducted between July and September 2022, audio-recorded, and transcribed verbatim. Quantitative data were analyzed using SPSS version 27 with one-way ANOVA for group comparisons and chi-square tests for categorical variables. Qualitative data underwent thematic analysis following Braun and Clarke's six-phase framework ^[11]. Statistical significance was set at $p < 0.05$.

Ethical Considerations

All participants provided written informed consent before data collection. The research team assured confidentiality of migration-related information, which can be sensitive in communities where undocumented international migration occurs. Interview recordings were stored on encrypted devices and transcripts were anonymized. Participants could withdraw at any point without consequence. The research posed minimal risk, as it involved survey questions and interviews only.

Results

Table 1: Farm Characteristics by Household Migration Status

Variable	Seasonal (n=98)	Permanent (n=63)	Internat. (n=51)	Circular (n=40)	None (n=90)
Farmed area (ha)	1.4 ± 0.7	1.1 ± 0.6	1.3 ± 0.8	1.6 ± 0.9	2.1 ± 1.1
Crop types grown	2.8 ± 1.1	2.3 ± 0.9	2.6 ± 1.0	3.1 ± 1.2	3.7 ± 1.4
Annual farm income (JMD '000)	287 ± 134	198 ± 112	342 ± 178	314 ± 156	263 ± 141
Extension contacts/yr	2.1 ± 1.6	1.4 ± 1.2	1.8 ± 1.4	2.6 ± 1.8	3.9 ± 2.1

JMD = Jamaican Dollars. Group differences significant by ANOVA ($p < 0.01$) for all variables except annual income.

Table 2: Extension Service Priorities Ranked by Migration-Affected Households (n=252)

Extension Priority	Mean Rating (1-5)	Ranked 1st (%)	Ranked Top 3 (%)
Labor-saving technology guidance	4.3 ± 0.7	31.4%	74.2%
Digital/remote extension delivery	4.1 ± 0.9	24.6%	68.7%
Remittance investment advisory	3.8 ± 1.0	18.3%	57.9%
Mechanization access support	3.6 ± 1.1	14.7%	51.2%
Market linkage assistance	3.4 ± 1.0	7.1%	42.8%

Ratings on 5-point Likert scale (1 = not important, 5 = very important).

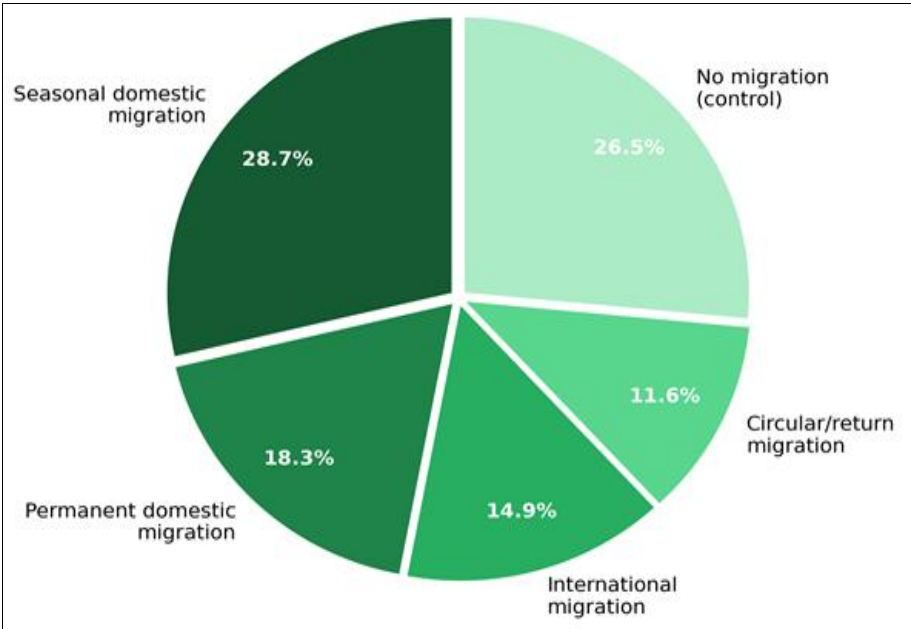


Fig 1: Distribution of household migration patterns across the three surveyed parishes (n=342)

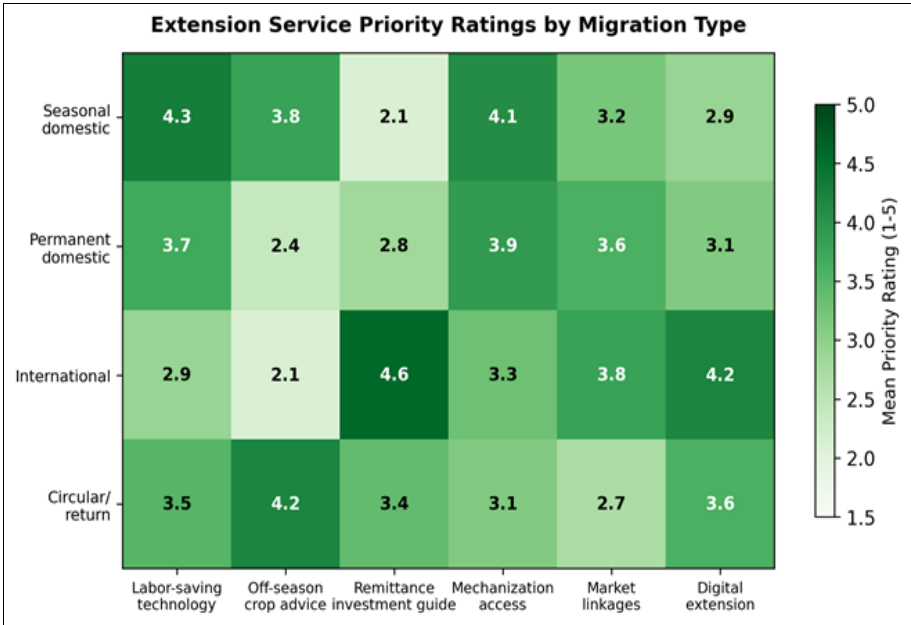


Fig 2: Heatmap of mean extension service priority ratings by migration type, showing distinct need profiles across categories

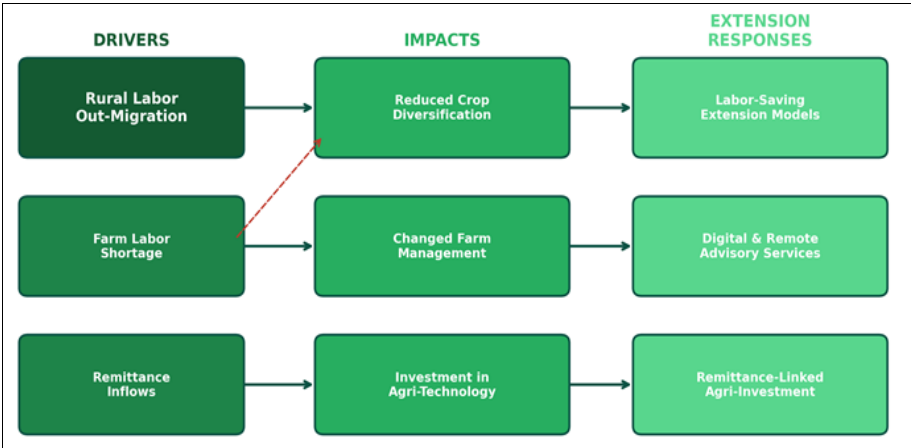


Fig 3: Conceptual pathway linking migration drivers to agricultural impacts and proposed extension service responses

Comprehensive Interpretation

Nearly three-quarters of surveyed households (73.5%) had at least one migrant member, with seasonal domestic migration being the most prevalent pattern (Figure 1). Migration-affected households farmed significantly less land and grew fewer crop types than non-migrant households (Table 1). However, international migrant households reported higher annual farm incomes, driven by remittance-funded investments in equipment and hired labor. Extension contact frequency was 38.6% lower among migration-affected households overall. The heatmap (Figure 2) revealed distinct priority profiles: seasonal migrants valued labor-saving technologies most, while international migrants prioritized remittance investment guidance and digital extension tools. Qualitative interviews confirmed that current extension schedules and formats poorly serve absent or part-time farmers, with 19 of 28 interviewees describing the existing model as outdated for migration-affected communities.

Discussion

The migration patterns documented here align with broader Caribbean trends, where an estimated one in three rural households has experienced some form of labor migration in the past decade ^[2]. The finding that migration-affected households farm less land but may earn more through remittance investments mirrors results from Southeast Asian contexts, where Taylor and colleagues reported similar compensatory effects ^[5]. But the sharp decline in extension engagement—38.6% fewer contacts—suggests that whatever income benefits migration brings, they're happening largely outside the extension system's reach. The distinct extension priority profiles across migration types (Figure 2) carry real implications for service design. A one-size-fits-all extension approach clearly won't work when seasonal migrants need hands-on mechanization support while international migrants want digital platforms they can access from abroad ^[12]. The pathway model (Figure 3) offers a framework for rethinking extension around three pillars: labor substitution through technology, remote advisory delivery, and remittance channeling toward productive agricultural investment ^[13]. Interview data reinforced survey findings. Extension officers acknowledged that their visit schedules assume resident full-time farmers, and several described frustration at arriving to find farms untended or managed by elderly relatives with limited decision-making authority ^[14]. The gap between institutional assumptions and on-the-ground reality appeared wide.

Limitations

This research relied on self-reported migration and farm data, which may carry recall and social desirability biases. The cross-sectional design captured associations but couldn't establish causation between migration and farm outcomes. Three parishes in eastern Jamaica may not represent national patterns. Undocumented international migrants are likely underrepresented due to sensitivity around disclosure. Future longitudinal research could better capture how migration-agriculture relationships change over time.

Conclusion

Migration has reshaped the farming landscape in rural Jamaica in ways that current extension services haven't kept pace with. Nearly three-quarters of surveyed households had migrant members, and these households showed reduced land use, fewer crop types, and sharply lower extension engagement compared to non-migrant households. At the same time, remittance flows created investment potential that extension services could help channel toward productive agricultural use.

The distinct needs across migration types argue against uniform extension delivery. Seasonal migrants need labor-saving technology support, international migrants want digital access and remittance investment advice, and circular migrants seek off-season crop guidance. Redesigning extension around these differentiated needs—rather than assuming a resident full-time farmer—could reconnect these services with the communities that may benefit most from them.

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