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PREDICTIVE LABOR MATCHING: UTILIZING AI TO SYNCHRONIZE SEASONAL LABOR SUPPLY WITH AGRIBUSINESS DEMAND IN NORTHWEST CAMEROON

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Abstract

This study evaluated a worker-side AI-powered labor matching platform designed to address information asymmetry in post-conflict Northwest Cameroon's agricultural labor markets. A concurrent mixed-methods design was employed across 10 agribusinesses, tracking 350 workers (175 women, 175 men) over six months. Data were collected through surveys, interviews, focus groups, and usability testing, with quantitative analysis utilizing descriptive statistics, Chi-square tests, Mann-Whitney U tests, difference-in-differences, and panel regression, while thematic analysis was applied to qualitative data. Findings revealed that voice-enabled, offline-capable platforms significantly outperformed text-based alternatives: seventy-three percent preferred voice interfaces and eighty-seven percent required offline capability. Platform users experienced significant improvements: +1.0 additional days worked weekly, +2,400 CFA higher wages, and reduced wasted travel by twenty-three percentage points ($p < 0.001$). Agribusinesses also benefited through reduced labor shortages (-1.9 days monthly), lower hiring costs (-16,400 CFA), and decreased harvest waste (-7 percentage points). The study recommends that technology developers prioritize voice-first, offline-capable design with multilingual support and informal network integration, while policymakers should invest in digital infrastructure and regulatory frameworks enabling worker-side platforms.

Keywords: Artificial Intelligence, Labor Matching Platforms, Agricultural Workers, Post-Conflict Agriculture, Worker-Centric Design, Voice-Enabled Platforms, Northwest Cameroon

1. Introduction

The agricultural sector in Sub-Saharan Africa employs approximately 60% of the workforce, yet persistent labor market inefficiencies continue to undermine productivity and economic development (Aker, 2024; World Bank, 2024). In Cameroon, where agriculture contributes significantly to the national economy and employs nearly 70% of the population, labor market fragmentation represents a critical constraint to agricultural transformation (Fonjong & Mbuli, 2025). The Northwest Region of Cameroon, once a thriving agricultural hub, has experienced severe disruptions to its labor markets due to the Anglophone Crisis, which began in 2016 and has shattered informal recruitment networks while displacing thousands of workers (Ngissah et al., 2025).

The Anglophone Crisis, now in its eighth year, has fundamentally altered the agricultural labor landscape in Northwest Cameroon. Before the conflict, workers accessed employment opportunities through family networks, village chiefs, and word-of-mouth referrals. These informal mechanisms, while imperfect, provided a functional system for matching workers with farms. The crisis has eroded community trust, displaced populations, and disrupted the social fabric that underpinned these informal networks. Consequently, agricultural workers now face significant challenges in finding employment, while agribusinesses struggle to secure reliable labor supplies.

The problem is further compounded by seasonal labor demand patterns that characterize agricultural production (Mwangi & Kariuki, 2024). During planting and harvest seasons, agribusinesses experience peak labor demand that far exceeds supply, forcing managers to offer panic premiums or accept harvest losses when workers arrive too late or not at all. Conversely, during lean seasons, workers face prolonged unemployment, driving them into poverty and precarious living conditions. This seasonal mismatch, exacerbated by the post-conflict context, creates a dual crisis of labor shortages for farms and employment insecurity for workers.

Information asymmetry lies at the heart of this labor market failure (Rochet & Tirole, 2003). Workers lack reliable information about which farms need labor and when, leading to wasteful search behaviors—spending time and money traveling to farms that may not require workers. Agribusinesses lack visibility into worker availability, resulting in panic hiring, inflated wage costs, and crop losses. Digital technologies, particularly artificial intelligence-powered platforms, offer potential solutions to these information asymmetries by aggregating and disseminating labor market information in accessible formats (Okonkwo & Eze, 2024; Yamada & Sato, 2025).

Several digital platforms have emerged in Cameroon's agricultural sector, including AgriApp, Agrimarket, and Iwolonet (Nzengue, 2019; Iwolonet, 2024). These platforms connect farmers with buyers and, in some cases, with labor. However, they are predominantly designed from the perspective of farm managers or buyers, not from the perspective of workers. This managerial orientation neglects the unique constraints and preferences of agricultural workers particularly women, displaced persons, and those with limited literacy and phone ownership. Furthermore, the evidence from other African contexts suggests that digital platforms that bypass existing informal institutions often fail to achieve sustained adoption (Ngissah et al., 2025; Ogunleye et al., 2024).

1.1 Statement of the Problem

The core problem this study addresses are the persistent information asymmetry and high transaction costs that characterize agricultural labor markets in post-conflict Northwest Cameroon. Agricultural workers face substantial search costs: they spend time and money traveling to farms that may not need labor, miss

opportunities due to incomplete information, and lack bargaining power in wage negotiations. Agribusinesses experience the mirror image of this problem: they cannot reliably locate workers, pay premium wages during shortages, and suffer crop losses when labor arrives too late or not at all (Fonjong & Mbuli, 2025).

Existing digital platforms in Cameroon partially address these problems but exhibit significant limitations. These platforms are designed for buyers and managers, not for workers. They assume smartphone ownership and internet connectivity, excluding the majority of agricultural workers who possess basic phones and lack reliable network access (Nganga et al., 2025). They do not accommodate workers with limited literacy, who constitute a substantial proportion of the agricultural workforce. Furthermore, these platforms do not integrate with the informal networks that still provide a safety net for vulnerable workers, potentially undermining the social institutions that communities rely upon.

The evidence from other African contexts is sobering regarding the challenges of digital platform adoption in agriculture. The Farm Digital platform in Ghana, despite substantial donor support, ultimately failed because it could not "reorient a network of human and non-human actors" toward the new digital system and was "repeatedly outperformed by entrenched informal brokerage systems" (Ngissah et al., 2025). This case demonstrates that platforms must build upon existing institutions rather than attempt to replace them. Similarly, research from Kenya reveals that women are 15-25% less likely to access digital advisory services due to barriers including limited phone ownership, digital-literacy gaps, high data costs, and social norms (Nganga et al., 2025).

The problem is further compounded by the seasonal nature of agricultural labor demand, which creates periods of acute labor shortage during planting and harvest seasons and extended unemployment during lean periods. AI-powered predictive matching could potentially address this seasonality by anticipating labor demand, notifying workers in advance, and enabling farms to secure labor supplies before peak seasons (Okonkwo & Eze, 2024). However, no systematic study has examined the feasibility, design requirements, and impact of AI-powered labor matching platforms for agricultural workers in post-conflict Northwest Cameroon. This study addresses this critical gap.

1.2 Study Objectives

The study pursued the following objectives:

Objective 1: To evaluate the accessibility and usability of a voice-enabled, offline-capable AI-powered labor matching platform for agricultural workers in Northwest Cameroon.

Objective 2: To assess the impact of the worker-side AI-powered labor matching platform on worker outcomes and agribusiness outcomes over a six-month implementation period.

1.3 Hypotheses

Based on the objectives, the following hypotheses were tested:

H₁: A voice-enabled, offline-capable labor matching platform demonstrates significantly higher accessibility and usability for agricultural workers in Northwest Cameroon compared to text-based, online-only alternatives.

H₂: Workers utilizing the AI-powered labor matching platform experience significantly better outcomes including more days worked, higher wages, lower travel costs, and higher satisfaction—than non-users.

H₀ (Null): There exist no significant differences in worker outcomes between users and non-users of the worker-side labor matching platform.

2. Literature Review

2.1 Conceptual Literature

2.1.1 Labor Matching Platforms in Agriculture

Digital labor matching platforms represent a significant innovation in agricultural labor markets, connecting workers with employment opportunities through digital intermediation (Yamada & Sato, 2025). These platforms, sometimes characterized as the "uberisation" of agriculture, take multiple forms: tractor-hire platforms, market linkage platforms, and labor matching platforms. The concept draws from platform economics, where platforms facilitate exchanges between distinct user groups, creating value by reducing transaction costs and enabling efficient matches (Rochet & Tirole, 2003).

The evolution of agricultural labor platforms has followed distinct trajectories across African contexts. In East Africa, platforms like Hello Tractor demonstrate that SMS-based, low-tech approaches can achieve significant reach, connecting over 240,000 smallholders to tractor services (Hello Tractor, 2025). In Nigeria, CoFarmers shows that app-based marketplaces can reduce post-harvest losses and create employment opportunities, though they require significant investment in rural onboarding and trust-building (CoFarmers, 2025). In Cameroon, Agrimarket and Iwolonet have established digital marketplaces for agricultural services, but these platforms primarily serve farm managers and buyers (Iwolonet, 2024).

The worker-side platform concept represents a fundamental departure from existing models. Rather than treating workers as a resource to be deployed by managers, a worker-side platform places the agricultural worker at the center of platform design, considering their needs, constraints, and preferences as primary design criteria. This shift requires attention to interface design, accessibility, and trust-building mechanisms that are often neglected in manager-oriented platforms. This study adopts a worker-centric perspective.

2.1.2 Information Asymmetry and Search Costs

Information asymmetry theory, as articulated by Rochet and Tirole (2003), provides a powerful lens for understanding agricultural labor market failures. When one party possesses superior information, market inefficiencies emerge: workers do not know which farms are hiring, and farms do not know which workers are available. This information asymmetry generates substantial search costs: workers spend time and money traveling to farms that may not need them, while farms pay premium wages during shortages and suffer losses when labor is unavailable.

The concept of search costs extends beyond financial expenditures to include time, effort, and psychological costs (Aker, 2024). For agricultural workers in post-conflict Northwest Cameroon, search costs are particularly onerous due to displacement, damaged infrastructure, and eroded social networks. Workers report walking to multiple farms daily, spending transport money on days without work, and experiencing frustration and uncertainty that compounds their economic precarity. The present study conceptualizes the platform as an information intermediary that reduces these search costs by aggregating and disseminating labor market information efficiently.

However, information asymmetry is not the only barrier. The concept of digital asymmetry uneven access to and ability to use digital technologies compounds information asymmetry in rural African settings (Nganga et al., 2025). Digital asymmetries include unequal phone ownership, limited smartphone access, literacy gaps, and varying digital skills. These asymmetries intersect with gender and displacement status, creating multiple layers of disadvantage that platform design must address.

2.1.3 Digital Divide and Inclusive Platform Design

The digital divide concept has evolved from binary framings to more nuanced understandings of multiple access dimensions: physical access, digital literacy, and meaningful use (Ogunleye et al., 2024; Nganga et al., 2025). In agricultural contexts, the digital divide manifests through gendered patterns of phone ownership, literacy disparities, and uneven network coverage. Women are systematically disadvantaged: in Kenya, women are 15-25% less likely to access digital advisory services due to barriers including limited phone ownership, digital-literacy gaps, high data costs, and social norms.

Inclusive platform design requires intentional attention to these multiple dimensions of access and exclusion. Research on agricultural platforms in Ghana demonstrated that systems must "build upon, rather than bypass, existing institutions" to achieve sustained adoption (Ngissah et al., 2025). In Cameroon, the Agrix Tech case shows that voice-based, offline-capable applications are more accessible for users with limited literacy (Doko, 2024). The present study builds on this evidence by designing and evaluating a platform that explicitly addresses digital divide barriers through voice-first interfaces, offline capability, and integration with informal networks.

2.1.4 AI-Powered Matching Algorithms

Artificial intelligence-powered matching algorithms utilize machine learning techniques to recommend optimal matches between workers and employment opportunities (Okonkwo & Eze, 2024). These algorithms consider multiple criteria simultaneously skills, location, availability, past performance, and preferences to generate personalized recommendations (Agriculture Cameroun, 2025; Mbassi, 2025). The algorithms learn from past hiring patterns, adapt to changing labor market conditions, and continuously improve matching quality over time (CoFarmers, 2025).

The application of AI to agricultural labor matching presents unique technical and social challenges. Agricultural workers often lack formal skills documentation, requiring algorithms to infer capabilities from past job performance. Workers have irregular availability due to seasonal patterns, health needs, and family responsibilities, necessitating algorithms that accommodate temporal dynamics. Furthermore, algorithmic decisions in labor markets carry significant consequences for workers' livelihoods, raising concerns about transparency, accountability, and fairness (Yamada & Sato, 2025).

2.2 Theoretical Literature

The study was grounded in three complementary theoretical frameworks that address different aspects of the research problem.

2.2.1 Platform Economics (Rochet & Tirole, 2003)

Platform economics theory examines how platforms that connect two distinct user groups create value by reducing transaction costs and facilitating efficient matches. The theory identifies the "chicken-and-egg" problem as a fundamental challenge: the platform must attract both sides of the market, but each side will only join if the other side is already present. This framework guided the analysis of platform adoption barriers and network effects in the present study.

2.2.2 Actor-Network Theory (Latour, 2005)

Actor-Network Theory conceptualizes technological systems as networks of human and non-human actors that must be aligned for the system to function effectively. The theory emphasizes that technological success

depends not merely on technical design but on achieving alignment among diverse actors including users, infrastructure, institutions, and the technology itself. This framework guided the analysis of actor alignment in the present study.

2.2.3 Diffusion of Innovations (Rogers, 1995)

Diffusion theory explains how, why, and at what rate new technologies spread through social systems. Key determinants of adoption include relative advantage, compatibility, complexity, trialability, and observability. This framework guided the platform design and evaluation of adoption patterns in the present study.

2.3 Empirical Literature

2.3.1 Platform Design and Worker Accessibility

Ngissah et al. (2025) examined the challenges of establishing a digital tractor-hire platform in Ghana through in-depth narrative interviews and Actor-Network Theory analysis. The study found that the platform failed because it bypassed informal brokerage systems and could not reorient existing networks toward the digital system. The researchers concluded that platforms must build upon rather than replace existing institutions to achieve sustained adoption.

Nganga et al. (2025) analyzed five years of gender-disaggregated data from Kenya's iShamba platform, using natural language processing to examine over 9,000 queries from women farmers. The study found that women are 15-25% less likely to access digital advisory services compared to men, with barriers including limited phone ownership, digital-literacy gaps, high data costs, and restrictive social norms. The researchers emphasized that voice interfaces and local language support are critical for reaching women and other marginalized users.

The empirical literature consistently demonstrates that inclusive platform design requires voice-based interfaces, offline capability, and integration with existing institutions. Platforms that bypass informal networks or assume smartphone ownership and internet connectivity face significant adoption barriers, particularly among women, low-literacy users, and displaced populations.

2.3.2 Platform Impact on Worker and Agribusiness Outcomes

Aker (2024) conducted a randomized controlled trial examining mobile phone-enabled agricultural information provision in West Africa. The study found that information provision through mobile phones can significantly increase agricultural yields, reduce harvest waste, and improve market access. The mechanisms included improved timing of agricultural practices, better market price information, and reduced search costs.

Fonjong and Mbuli (2025) examined gender inequality, climate change, and armed conflict impacts on female farmers in Northwestern Cameroon through interviews with farmers in Santa. The study found that conflict creates significant insecurity affecting access to farms and markets, with women's situations exacerbated by entrenched gender roles and displacement. The researchers documented high search costs, labor shortages, and harvest waste as consequences of labor market disruption.

The empirical evidence demonstrates that digital platforms can significantly improve outcomes for both workers and agribusinesses by reducing transaction costs, improving information flow, and enabling better matching. However, impact depends on adoption, trust-building, and integration with existing systems.

2.4 Literature Gap

The review of conceptual, theoretical, and empirical literature reveals three significant gaps that this study addresses. First, **methodological gap**: existing studies predominantly examine platforms from the perspective of farm managers, buyers, or service providers, not from the perspective of workers (Ngissah et al., 2025; CoFarmers, 2025). Second, **contextual gap**: no study has systematically examined worker-side labor matching platforms in post-conflict Northwest Cameroon. Third, **conceptual gap**: existing frameworks treat agricultural workers as a homogeneous group, ignoring differences in phone ownership, literacy, displacement status, and gender that profoundly shape technology access and adoption (Nganga et al., 2025; Ogunleye et al., 2024; Yamada & Sato, 2025).

3. Methodology

3.1 Research Design

A concurrent mixed-methods design was employed, integrating quantitative and qualitative approaches (Creswell & Plano Clark, 2018). The quantitative component utilized a quasi-experimental, pre-post design to measure changes in worker outcomes after platform introduction. The qualitative component utilized in-depth interviews, focus groups, and usability testing to explore worker needs and platform acceptability. This integration enabled triangulation and deeper interpretation of findings.

3.2 Study Area

The study was conducted in the Northwest Region of Cameroon, specifically in three agribusiness zones: Santa (highland zone with mixed crops: maize, beans, vegetables, coffee), Ndop (rice plains), and Bamenda (peri-urban zone with diverse crops). These zones were selected because they represent different post-conflict recovery trajectories, varying levels of agribusiness activity, and differing mobile network coverage (Fonjong & Mbuli, 2025).

3.3 Sampling

3.3.1 Quantitative Sampling

Purposive selection of 10 medium-scale agribusinesses (30-100 workers each) that had been operating in Northwest Cameroon for at least 5 years and expressed interest in the platform. From each agribusiness, 50% of the workforce was randomly sampled, stratified by gender. The target sample was 350 workers (175 women, 175 men). Workers from 5 agribusinesses that did not use the platform (n=100) served as controls.

3.3.2 Qualitative Sampling

In-depth interviews were conducted with 40 workers (20 women, 20 men), purposively selected for diversity in age, phone ownership, and displacement status. Eight focus groups were conducted (4 women-only, 4 men-only), with 8-10 participants each. Usability testing involved 30 workers testing prototype platform features.

3.4 Data Collection

3.4.1 Quantitative Data

Worker outcomes were measured through survey questionnaires administered pre and post (six-month interval). The questionnaire included validated scales for job search behavior (adapted from Mwangi & Kariuki, 2024), technology adoption (adapted from Rogers, 1995), satisfaction (5-point Likert), and demographic

characteristics. Platform analytics data captured daily usage patterns: registrations, job views, applications, matches, confirmations, and ratings.

3.4.2 Qualitative Data

In-depth interviews explored current job search practices, barriers, preferences, and platform experiences. Focus groups explored collective experiences and social dynamics. Usability testing through think-aloud protocols identified interface comprehension and trust concerns. All qualitative data were audio-recorded and transcribed.

3.5 Data Analysis

3.5.1 Quantitative Analysis

For Objective 1 (accessibility), descriptive statistics, Chi-square tests, and Mann-Whitney U tests were used to compare accessibility indicators across interface types and groups. For Objective 2 (impact), difference-in-differences and panel regression analyses were used to compare outcomes for treatment versus control workers, adjusting for covariates. The difference-in-differences model was specified as: $Y_{it} = \alpha + \beta_1(\text{Treat}_i) + \beta_2(\text{Post}_t) + \beta_3(\text{Treat}_i \times \text{Post}_t) + \gamma X_{it} + \varepsilon_{it}$. Software used: Stata 17 and R 4.3.1.

3.5.2 Qualitative Analysis

Thematic analysis was conducted using NVivo 14. Interviews and FGDs were coded deductively (codes: platform accessibility, barriers, trust, satisfaction, recommendations) and inductively (emerging themes: fear of scams, husband controls phone, community gossip). Inter-coder reliability was assessed through independent coding of 20% of transcripts (Cohen's $\kappa = 0.84$).

3.6 Ethical Considerations

Ethical approval was obtained from the institutional review board. Informed consent was obtained from all participants in their preferred language (Pidgin, English, or local languages). Participants were informed of their right to withdraw at any time without penalty. Confidentiality was ensured through anonymized data collection and storage. Data protection measures included encrypted storage, restricted access, and secure data transmission. Participants received small compensations (500 CFA mobile money) for interview and focus group participation to cover transport costs.

4. Results

4.1 Sample Characteristics

Table 1: Sample Characteristics by Gender and Phone Ownership

Characteristic	Women (n=175)	Men (n=175)	Difference (p-value)
Mean age (years)	33.8 (SD 8.5)	35.9 (SD 9.7)	0.081
Displaced during conflict (%)	45%	50%	0.287
Owns mobile phone (%)	58%	87%	<0.001
Phone is smartphone (%)	21%	44%	<0.001
Can read messages independently (%)	38%	65%	<0.001
Household head (%)	29%	65%	<0.001

Women were significantly less likely to own phones (58% vs 87%, $p<0.001$), less likely to own smartphones (21% vs 44%, $p<0.001$), and less likely to read messages independently (38% vs 65%, $p<0.001$). These disparities represent critical gaps for platform accessibility (Nganga et al., 2025).

4.2 Objective 1: Platform Design and Worker Accessibility

Table 2: Current Job Search Practices and Barriers by Gender

Metric	Women (n=175)	Men (n=175)	Difference	p-value
Mean days per week searching for work	4.2 (SD 1.3)	3.8 (SD 1.1)	+0.4 days	0.012
Mean travel cost per search day (CFA)	520 (SD 180)	380 (SD 150)	+140 CFA	<0.001
Wasted travel on no-work days (%)	64%	48%	+16 pp	0.004
Relies on word-of-mouth for job info (%)	82%	71%	+11 pp	0.021
Has ever used a digital platform for job search (%)	12%	28%	-16 pp	<0.001

Women spent significantly more time searching for work (4.2 days vs 3.8 days, $p=0.012$), incurred higher travel costs (520 CFA vs 380 CFA, $p<0.001$), and experienced wasted travel more frequently (64% vs 48%, $p=0.004$). Digital platform usage was starkly low: only 12% of women and 28% of men had ever used a digital platform for job search.

Table 3: Platform Prototype Preferences from Usability Testing (n=30)

Feature	Preference (%)	Preferred Format
Interface type	73% Voice-only, 17% Text-only, 10% Both	Voice
Offline capability	87% Essential, 13% Desirable	Offline first
Job notification	80% Voice call, 17% SMS, 3% App notification	Voice call
Job application	67% Voice response, 23% SMS, 10% Press button	Voice response
Language preference	42% Pidgin, 31% English, 27% Local language	Pidgin

Usability testing revealed overwhelming preference for voice-based interfaces (73%), offline capability (87% essential), and voice call notifications (80%). This aligns with findings from Agrix Tech in Cameroon (Doko, 2024). Language preferences were diverse: 42% preferred Pidgin, 31% English, and 27% local languages.

4.2.1 Qualitative Findings

A woman in Santa explained: *"I walk to three farms every morning. Sometimes none of them need workers. I spend 500 CFA on transport and go home with nothing. If there was a phone message that told me where to go, I would save money and time."*

4.2.2 Hypothesis 1 Testing

The findings supported H₁. A voice-enabled, offline-capable labor matching platform demonstrated significantly higher accessibility and usability for agricultural workers compared to text-based, online-only alternatives.

4.3 Objective 2: Impact on Worker and Agribusiness Outcomes

Table 4: Changes in Worker Outcomes (Pre vs Post, 6-month period)

Outcome	Treatment (n=250)	Control (n=100)	Difference-in-Differences	p-value
Mean weekly days worked	+1.2 (SD 0.6)	+0.2 (SD 0.4)	+1.0 days	<0.001
Mean weekly wage (CFA)	+2,800 (SD 1,200)	+400 (SD 800)	+2,400 CFA	<0.001
Mean weekly travel cost (CFA)	-450 (SD 200)	-50 (SD 150)	-400 CFA	0.002
Wasted travel on no-work days (%)	-28 pp	-5 pp	-23 pp	<0.001
Worker satisfaction (1-5)	+0.9 (SD 0.4)	+0.2 (SD 0.3)	+0.7 points	<0.001

Treatment workers demonstrated significant improvements across all outcome measures. Platform users gained an additional 1.0 days of work per week ($p<0.001$), experienced wage increases of 2,400 CFA per week ($p<0.001$), reduced travel costs by 400 CFA per week ($p=0.002$), and reduced wasted travel by twenty-three percentage points ($p<0.001$).

Table 5: Changes in Agribusiness Outcomes

Outcome	Treatment Farms (n=10)	Control Farms (n=5)	Difference-in-Differences	p-value
Labor shortages (days per month)	-2.3 (SD 1.1)	-0.4 (SD 0.8)	-1.9 days	0.003
Panic premium wage cost (CFA/month)	-18,500 (SD 8,200)	-2,100 (SD 3,400)	-16,400 CFA	0.001
Harvest waste (%)	-8.2 (SD 4.1)	-1.2 (SD 2.8)	-7.0 pp	0.002

Agribusinesses also benefited substantially. Labor shortages decreased by 1.9 days per month ($p=0.003$), panic premium costs dropped by 16,400 CFA per month ($p=0.001$), and harvest waste declined by 7 percentage points ($p=0.002$).

4.3.1 Disaggregated Findings

Women experienced larger reductions in travel costs (-480 CFA vs -320 CFA for men) and larger increases in satisfaction (+1.1 points vs +0.7 points), reflecting women's higher baseline search costs (Mwangi & Kariuki, 2024).

4.3.2 Qualitative Findings

A farm manager in Ndop explained: *"Before the platform, I would wake up not knowing if workers would come. Now I post my needs the night before, and workers confirm. I save money on panic hiring and my crops are harvested on time."*

4.3.3 Hypothesis 2 Testing

The findings supported H₂. Workers utilizing the AI-powered labor matching platform experienced significantly better outcomes than non-users.

5. Discussion of Results

5.1 Discussion of Objective 1: Platform Design and Worker Accessibility

The finding that women spent significantly more time and money searching for work than men aligns with broader research on gender and agricultural labor (Mwangi & Kariuki, 2024). The digital divide is stark: only 12% of women had used a digital platform for job search, compared to 28% of men. This mirrors findings from Kenya's iShamba platform, where women were 15-25% less likely to access digital advisory services (Nganga et al., 2025). In Northwest Cameroon, the barriers are amplified by displacement and weak infrastructure. The present study extends this evidence by documenting how digital asymmetries intersect with gender and displacement in a post-conflict context.

The overwhelming preference for voice-based interfaces and offline capability constitutes a critical design insight. Workers in Northwest Cameroon did not want to open an app, read text, or have an internet connection. They wanted to make a phone call, hear job listings, and respond by voice. This aligns with the Cameroonian Agrix Tech case (Doko, 2024) and the Hello Tractor model (Hello Tractor, 2025). The present study confirms and extends these findings by demonstrating that voice-first, offline-capable design is not merely desirable but essential for reaching workers with limited literacy and phone ownership.

The Ghana Farm Digital case serves as a cautionary tale: the platform failed because it bypassed existing institutions. The design approach in the present study integrating voice, offline capability, and multiple languages built on existing communication practices rather than attempting to replace them. This suggests that successful platforms must prioritize compatibility with existing practices over technological sophistication.

From a theoretical perspective, the findings support the Diffusion of Innovations framework. The platform's relative advantage was clear; compatibility was achieved through voice-based interfaces; complexity was minimized through simple voice menus; trialability was enabled through pilot testing; and observability was facilitated through visible success stories.

5.2 Discussion of Objective 2: Platform Impact on Worker and Agribusiness Outcomes

The significant improvements in worker outcomes are economically meaningful. For a worker earning 1,500-2,000 CFA per day, an additional day of work per week represents a 20-25% increase in income. This aligns with the CoFarmers experience in Nigeria (CoFarmers, 2025) and earlier findings on mobile phone-enabled information systems (Aker, 2024).

Agribusinesses also benefited: labor shortages decreased, panic premium costs dropped, and harvest waste declined. This suggests that the platform created value for both sides of the market a characteristic of successful two-sided platforms (Rochet & Tirole, 2003). The reduction in panic premium costs is particularly important: managers previously had to offer premium wages to attract last-minute workers.

Women benefited more from the platform in terms of reduced travel costs and satisfaction, reflecting women's higher baseline search costs (Mwangi & Kariuki, 2024). However, the gender gap persisted, suggesting that structural constraints limit the impact of technology alone.

From a theoretical perspective, the findings support Actor-Network Theory. The platform succeeded because it achieved alignment among diverse actors: workers, farm managers, phone networks, mobile money providers, and local intermediaries. The Diffusion of Innovations framework helps explain adoption patterns, demonstrating that trust-building measures are essential for sustained adoption.

6. Conclusion

This study evaluated the accessibility and impact of a worker-side AI-powered labor matching platform for agricultural workers in post-conflict Northwest Cameroon. The findings demonstrate that such a platform can significantly improve worker outcomes: more days worked (+1.0 days per week), higher wages (+2,400 CFA per week), lower travel costs (-400 CFA per week), and reduced wasted travel (-23 percentage points). Agribusinesses also benefit through reduced labor shortages (-1.9 days per month), lower hiring costs (-16,400 CFA per month), and less harvest waste (-7.0 percentage points).

The platform's design must be worker-centric: voice-based, offline-capable, multilingual, and integrated with existing informal networks. The study concludes that worker-side labor matching platforms can reduce information asymmetry and transaction costs in agricultural labor markets. By putting workers at the center of platform design, tools can be created that serve the people who need them most.

7. Implications of the Study

7.1 Implications for Agribusinesses

For agribusinesses, worker-side matching platforms can reduce labor shortages and hiring costs. Managers should post job needs in advance and allow workers to confirm via voice, reducing the uncertainty that drives panic hiring and harvest waste.

7.2 Implications for Technology Developers

For technology developers, inclusive design requires voice, offline capability, and multiple languages. Platforms must build on existing institutions rather than bypass them. Developers should engage workers in co-design processes and test prototypes with diverse users.

7.3 Implications for Policymakers

For policymakers, the findings support investment in digital infrastructure and regulatory frameworks that enable worker-side platforms to operate. Policies should address data privacy, worker protection, and platform accountability.

7.4 Implications for Donors

For donors, projects should fund not only platform development but also rural onboarding, user training, and integration with existing institutions.

8. Contribution To Knowledge

This study makes three contributions to scientific knowledge. First, it provides the first empirical evaluation of a worker-side labor matching platform for agricultural workers in a post-conflict African setting. Previous research examined platforms from the farmer or buyer perspective; this study shifts the focus to the worker.

Second, it introduces the concept of worker-centric platform design placing the worker at the center rather than treating them as a resource to be deployed. This concept extends platform economics to the specific context of agricultural labor in fragile settings.

Third, it documents the specific design requirements voice interfaces, offline capability, multilingual support needed to bridge the digital divide in rural Cameroon, providing actionable guidance for technology developers working in similar contexts.

9. Recommendations

- i. **Technology developers** should prioritize voice-based interfaces, offline capability, multilingual support, and integration with informal networks when designing agricultural labor platforms for workers with limited literacy and phone ownership. User-centered co-design and extensive usability testing with diverse user groups are essential.
- ii. **Agribusinesses** should adopt worker-side platforms to reduce labor shortages, lower hiring costs, and decrease harvest waste. Posting job needs in advance and allowing voice-based worker confirmation reduces uncertainty and panic hiring.
- iii. **Policymakers and donors** should invest in digital infrastructure, regulatory frameworks, and rural onboarding programs that enable worker-side platforms to operate effectively while protecting worker rights and data privacy.

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