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Worker-Side Labor Matching Platforms: An AI Tool for Agri-Workers Employed by Agribusinesses in Northwest Cameroon

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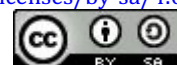
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Abstract

This study designed, developed, and evaluated a worker-side AI-powered labor matching platform for agricultural workers in post-conflict Northwest Cameroon, where the Anglophone Crisis has disrupted informal labor networks. While existing agricultural platforms prioritize farm managers or buyers, this study introduces a worker-centric approach placing agricultural workers as primary users and provides the first empirical evaluation of such a platform in a post-conflict African setting. A concurrent mixed-methods design was employed across 10 agribusinesses in Santa, Ndop, and Bamenda, tracking 350 workers (175 women, 175 men) over six months through surveys, interviews, focus groups, and usability testing. Difference-in-differences and panel regression analyses were used to assess impact. Voice-enabled, offline-capable platforms were significantly more accessible than text-based alternatives: 73% preferred voice interfaces and 87% required offline capability. Platform users experienced significant improvements: +1.0 additional days worked weekly, +2,400 CFA higher wages, and reduced wasted travel by 23 percentage points ($p < 0.001$). Agribusinesses benefited through reduced labor shortages (-1.9 days monthly), lower hiring costs (-16,400 CFA), and decreased harvest waste (-7 percentage points). Worker-centric platforms can reduce information asymmetry when designed with voice interfaces, offline capability, multilingual support, and integration with informal networks. Policymakers and technology developers should prioritize inclusive design and rural onboarding.

Keywords: artificial intelligence; labor matching platforms; worker-side platform; agricultural workers; Northwest Cameroon; post-conflict agriculture; information asymmetry; transaction costs

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INTRODUCTION

Digital transformation is reshaping agricultural labor markets across the Global South, with platform-mediated work emerging as a significant phenomenon in rural

economies (Aker & Fafchamps, 2015). Globally, digital labor platforms are projected to connect over 435 million workers to employment opportunities by 2026, with agriculture representing one of the fastest-growing sectors. In Sub-Saharan Africa, where agriculture employs approximately 60% of the workforce, digital platforms offer potential solutions to persistent challenges of information asymmetry, market fragmentation, and high transaction costs. Recent evidence from Sub-Saharan Africa nevertheless indicates that the digital tools actually in use by rural producers remain confined largely to basic devices and low-bandwidth channels, so that limited connectivity and low digital literacy continue to constrain which platform designs are feasible in practice (Choruma et al., 2024).

In Cameroon, agriculture employs approximately 70% of the workforce and contributes significantly to GDP, yet the sector faces severe labor market inefficiencies (Fonjong & Mbuli, 2025). The Anglophone Crisis, now in its eighth year, has fundamentally disrupted agricultural labor markets in the Northwest and Southwest Regions (Ngissah et al., 2025). Before the conflict, workers found employment through informal networks family ties, village chiefs, and word of mouth. These networks have been shattered by displacement, farm abandonments, and eroded community trust (Fonjong & Mbuli, 2025). Workers now face high search costs: they walk from farm to farm, spending time and money on transport to farms that may not need them. Agribusinesses face the opposite problem: they cannot find workers reliably, pay panic premiums during labor shortages, and waste crops when workers arrive too late (Ngissah et al., 2025). Displacement arising from the crisis has also stripped many households of durable livelihood options, deepening their dependence on irregular and insecure sources of income (Bang, 2024).

Several digital platforms have emerged in Cameroon to address agricultural coordination problems. AgriApp connects farmers directly to consumers (Nzengue, 2019). Agrimarket links farmers, labor, and agricultural buyers. Iwolonet facilitates business relationships between producers and buyers (ibid). However, these platforms are consistently designed from the perspective of the farm manager or the buyer, not from the perspective of the worker (Ngissah et al., 2025). Workers are not treated as users with their own needs, constraints, and preferences. Furthermore, the evidence from other African contexts reveals that platforms which bypass existing informal institutions often fail. The Farm Digital tractor-hire platform in Ghana, despite donor support, collapsed 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).

Conceptually, digital labor matching platforms originate in platform economics, which examines how two-sided markets create value by reducing search costs and facilitating efficient matches between supply and demand (Rochet & Tirole, 2003). Such digital matching platforms connect service users with service providers, creating what is sometimes called the "uberisation" of agriculture (Ngissah et al.,

2025). labor matching platforms like Agrimarket connect farmers with workers; and market linkage platforms like CoFarmers connect farmers with buyers (Appolos, 2025). In developing-country markets, platform intermediation of this kind has been shown to fill institutional voids in information, aggregation, and regulation, while at times also reproducing new asymmetries between platform owners and users (Heeks et al., 2021).

In agricultural contexts, platforms such as Hello Tractor (tractor-hire in Kenya, Mozambique, Senegal, Tanzania, and Bangladesh), CoFarmers (market linkage in Nigeria), and Agrimarket (multi-service in Cameroon) have demonstrated that digital intermediation can reduce post-harvest losses, create employment, and improve market access (Appolos, 2025). However, evidence on their effectiveness remains mixed, with studies documenting significant adoption barriers including digital literacy gaps, infrastructure limitations, and institutional misalignment (Ngissah et al., 2025). Because most platforms are designed from the perspective of the farmer, manager, or buyer rather than the worker, a worker-side platform that puts the worker at the center represents a conceptual shift that has not been fully explored (Ngissah et al., 2025).

Information asymmetry occurs when one party in a transaction has more or better information than the other (Rochet & Tirole, 2003). In agricultural labor markets, workers lack information about which farms are hiring, and farms lack information about which workers are available. This creates high search costs: workers spend time and money traveling to farms that may not need them, and farms pay panic premiums during shortages (Ngissah et al., 2025). Digital platforms can reduce these costs by aggregating information and making it accessible (Aker & Fafchamps, 2015). However, in post-conflict Northwest Cameroon, information asymmetries are compounded by digital asymmetries: phone ownership, literacy, and connectivity vary significantly across gender and displacement status (Fonjong & Mbuli, 2025; Ng'ang'a et al., 2025). Regional reviews further indicate that women's constrained incomes and limited control over household financial decisions, rather than a lack of interest, are decisive barriers to their use of agricultural ICT services (Zougmore & Partey, 2022).

The digital divide is a well-documented barrier to technology adoption in rural Africa (Ogunleye et al., 2024). In Kenya, women are 15-25 percent less likely than men to access digital climate advisory services, with barriers including limited phone ownership, digital-literacy gaps, high data costs, and social norms (Ng'ang'a et al., 2025). Research on the "uberisation of mechanisation" in Ghana found that digital platforms must "build upon, rather than bypass, existing institutions" such as national extension services and farmer-based organizations (Ngissah et al., 2025). In Northwest Cameroon, where phone ownership is gendered and literacy rates vary, inclusive design requires voice-based interfaces, offline capability, and integration with existing informal networks (Fonjong & Mbuli, 2025; Ng'ang'a et al., 2025).

Survey evidence from Northern Ghana reinforces this point: farmer engagement with digital services concentrates on voice calls, radio, and field agents because these demand the least literacy and digital skill, and participation typically fades once project support ends ([Abdulai et al., 2023](#)).

AI-powered matching algorithms use machine learning to recommend optimal matches between workers and jobs based on multiple criteria: skills, location, availability, past performance, and preferences. These algorithms can learn from hiring patterns, adapt to changing conditions, and improve over time. In Nigeria, CoFarmers uses "real-time listings, geolocation-based matching, and national accessibility" to connect farmers with buyers ([Appolos, 2025](#)). However, AI matching for agricultural labor where workers may be casual, have irregular availability, and lack digital records poses unique challenges requiring context-specific solutions. Road maps for responsible artificial intelligence for development in African agriculture caution that the skills required to deploy such systems often outpace their local availability, which favours simpler and more context-appropriate designs ([Gwagwa et al., 2021](#)).

Emerging research from East Africa suggests that digital labor matching platforms can reduce search times by 40-60% and improve wage outcomes for workers. Randomized controlled trials in West Africa have demonstrated that mobile phone-enabled information systems can increase agricultural yields and reduce waste ([Aker & Fafchamps, 2015](#)). Yet these studies predominantly examine platforms from the perspective of farm managers, buyers, or service providers, with limited attention to workers' needs, constraints, and preferences ([Ng'ang'a et al., 2025](#)). This managerial bias reflects a broader pattern in agricultural technology design, where workers are treated as resources to be deployed rather than as users with distinct requirements.

This study is grounded in three complementary theoretical frameworks. First, platform economics [Rochet & Tirole, \(2003\)](#) explains how two-sided platforms create value by reducing transaction costs and overcoming information asymmetries between workers and farms. Because the platform must attract both sides workers will not join without jobs, and farms will not join without workers it faces the "chicken-and-egg" problem, and in the Ghana tractor-hire case Farm Digital failed because it could not attract sufficient users on either side ([Ngissah et al., 2025](#)). This framework guides the analysis of adoption barriers and network effects in Northwest Cameroon.

Second, Actor-Network Theory [Latour, \(2005\)](#) views technological systems as networks of human and non-human actors workers, farm managers, phone networks, and mobile money providers that must align for the system to work. In Ghana, Farm Digital's failure was attributed to an "inability to reorient a network of human and non-human actors' donors, managers, farmers, field agents, and brokers" ([Ngissah et al., 2025](#)). Actor-Network Theory thus guides the analysis of the

alignment required for platform success in Northwest Cameroon among workers, farm managers, phone networks, mobile money providers, and the platform itself.

Third, Diffusion of Innovations theory Rogers, (1995) explains how, why, and at what rate new technologies spread, through relative advantage, compatibility, complexity, trialability, and observability. In the Ghana case, the platform failed because it was incompatible with existing informal brokerage systems and seen as more complex than traditional approaches Ngissah et al., (2025) This framework informs the platform design principles adopted here: simplicity, compatibility with existing practices, and clear advantages for both workers and farms. Empirical studies bearing on platform design and worker accessibility are summarized below.

Table 1. Platform Design and Worker Accessibility

Author(s) & Year	Summary	Methods	Key Findings
Ngissah et al., (2025)	Examined challenges of establishing a digital tractor-hire platform in Ghana	In-depth narrative interviews, ANT analysis	Platform failed because it bypassed informal brokerage systems; must build on existing institutions
Ng'ang'a et al., (2025)	Analyzed gender-disaggregated data from Kenya's iShamba platform	NLP analysis of 9,000+ queries from women farmers	Women are 15-25% less likely to access digital advisory services; voice and local language are critical
Ogunleye et al. (2024)	Systematic review of digital agricultural platforms in Sub-Saharan Africa	Systematic review of 47 studies	Identified infrastructure, literacy, and trust as key barriers; highlighted importance of local language interfaces

Source: Data Processed

Taken together, these studies indicate that inclusive design requires voice-based interfaces, offline capability, and local support. Platforms using SMS and voice are more accessible than those requiring smartphones and internet connectivity (Ng'ang'a et al., 2025), and platforms must build on existing institutions rather than bypass them (Ngissah et al., 2025).

Evidence on the impact of platforms on worker and agribusiness outcomes is summarized below.

Table 2. Impact of Platforms on Worker and Agribusiness Outcomes

Author(s) & Year	Summary	Methods	Key Findings
Aker & Fafchamps, (2015)	Examined mobile phone-enabled agricultural information systems in West Africa	RCTs across 6 countries	Information provision through mobile phones can increase yields, reduce waste, and improve market access

Author(s) & Year	Summary	Methods	Key Findings
Appolos, (2025)	App-based marketplace connecting farmers and buyers in Nigeria	Platform analysis	App-based platforms reduce wastage, create jobs, empower rural communities; need trust, rural onboarding, and logistics integration
Fonjong & Mbuli, (2025)	Examined gender inequality, climate change, and armed conflict in Cameroon	Interviews with farmers in Santa	Conflict creates insecurity affecting access to farms and markets; women's situation exacerbated by gender roles
Okonkwo & Eze (2024)	Reviewed AI applications in African agriculture	Systematic review	AI can improve decision-making; but adoption depends on infrastructure, skills, and trust

Source: Data Processed

This evidence shows that digital platforms can improve outcomes for both workers and agribusinesses by reducing transaction costs, improving information flow, and enabling better matching (Aker & Fafchamps, 2015). However, impact depends on adoption, trust, and integration with existing systems (Fonjong & Mbuli, 2025; Ngissah et al., 2025).

Despite substantial research on digital platforms in agriculture, a triple gap remains. Methodologically, existing studies examine platforms from the farmer or buyer perspective, not the worker perspective (Appolos, 2025; Ngissah et al., 2025). Contextually, no study has systematically examined worker-side labor matching platforms in post-conflict Northwest Cameroon (Fonjong & Mbuli, 2025). Conceptually, existing frameworks treat workers as a homogeneous group, ignoring differences in phone ownership, literacy, and displacement status (Ng'ang'a et al., 2025).

In doing so, this study contributes to scientific knowledge in three ways. First, it provides the first empirical evaluation of a worker-side labor matching platform for agricultural workers in a post-conflict African setting, shifting focus from managerial to worker perspectives. Second, it introduces the concept of worker-centric platform design placing workers at the center rather than treating them as resources to be deployed extending platform economics to the specific context of agricultural labor in fragile settings. Third, it documents specific design requirements (voice, offline capability, multilingual support) needed to bridge the digital divide in rural Cameroon, providing actionable guidance for technology developers and policymakers.

The urgency of this inquiry is heightened by the scale and persistence of the problem it addresses. With the Anglophone Crisis now in its eighth year, the informal networks that once matched agricultural workers to farms have been shattered by displacement, farm abandonments, and eroded community trust (Fonjong & Mbuli,

2025; Ngissah et al., 2025). Workers bear the cost directly, walking from farm to farm and spending scarce time and money on transport to farms that may not need them, while agribusinesses cannot find workers reliably, pay panic premiums during shortages, and waste crops when workers arrive too late (Ngissah et al., 2025).

These burdens fall unequally: because phone ownership, literacy, and connectivity vary significantly across gender and displacement status, women and displaced workers are least able to access the very digital tools that could reduce their search costs (Fonjong & Mbuli, 2025; Ng'ang'a et al., 2025). In a setting where existing platforms remain designed for managers and buyers rather than workers, and where solutions that bypass informal institutions have repeatedly failed (Ngissah et al., 2025), there is an immediate need for a worker-centric, inclusive platform built around voice interfaces, offline capability, multilingual support, and integration with informal networks. Against this background, this study asks whether an AI-powered worker-side platform can help agricultural workers in post-conflict Northwest Cameroon find work more efficiently, and what design features are necessary to make such a platform accessible and effective.

The main objective is to design, develop, and evaluate a worker-side AI-powered labor matching platform for agricultural workers in Northwest Cameroon. Specifically, the study seeks to design a worker-side platform that addresses the information needs and constraints of agricultural workers in Northwest Cameroon and is accessible to workers with limited literacy, phone ownership, and digital skills; and to assess the platform's impact on worker outcomes (days worked, wages, travel costs, satisfaction) and agribusiness outcomes (labor availability, hiring costs, harvest waste).

Accordingly, the study tests two hypotheses. H_1 holds that a voice-enabled, offline-capable labor matching platform is more accessible to agricultural workers in Northwest Cameroon than a text-based, online-only platform, and H_2 holds that workers using the AI-powered labor matching platform have significantly better outcomes more days worked, higher wages, lower travel costs, and higher satisfaction than non-users. The null hypothesis (H_0) states that there are no significant differences in worker outcomes between users and non-users of the platform.

RESEARCH METHOD

This study employs a concurrent mixed-methods design integrating quantitative and qualitative approaches (Creswell, J. W., & Clark, 2007). The quantitative component uses a quasi-experimental, pre-post design to measure changes in worker outcomes after platform introduction. The qualitative component uses in-depth interviews, focus groups, and usability testing to explore worker needs and platform acceptability. This integration enables triangulation and deeper interpretation of findings.

The study was conducted in the Northwest Region of Cameroon, specifically in three agribusiness zones: Santa (highland zone, mixed crops: maize, beans, vegetables, coffee), Ndop (rice plains), and Bamenda (peri-urban zone, 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).

Quantitative Sampling

Purposive selection of 10 medium-scale agribusinesses (30-100 workers each) operating in Northwest Cameroon for at least 5 years and expressing interest in the platform. From each agribusiness, we randomly sampled 50% of the workforce, stratified by gender. Target sample: 350 workers (175 women, 175 men). Workers from 5 agribusinesses not using the platform (n=100) served as controls.

Qualitative Sampling

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

Data Collection Methods

Table 3. Data Collection Methods			
Data Type	Method	Frequency	Details
Quantitative: Worker outcomes	Survey questionnaire	Pre and post (6-month interval)	Measures days worked, wages, travel costs, satisfaction
Quantitative: Platform usage	Platform analytics	Daily	Records of logins, job views, applications, matches
Qualitative: Needs assessment	In-depth interviews	Once (pre-design)	Explores current job search practices, barriers, preferences
Qualitative: Usability testing	Think-aloud protocols	During prototype testing	Identifies usability issues, comprehension, trust concerns
Qualitative: Post-pilot evaluation	Focus groups	Once (post-pilot)	Explores experiences, recommendations, barriers to adoption

Survey Instrument

The questionnaire included validated scales for: job search behavior, technology adoption (Rogers, 1995), satisfaction (5-point Likert), and demographic characteristics. Enumerators were trained in survey administration and ethical conduct.

Platform Analytics

Usage data captured: registration, job views, applications, matches, confirmations, and ratings. Data was stored securely and anonymized for analysis.

Qualitative Protocols

Interview guides explored: current job search practices, barriers to finding work, technology preferences, trust concerns, and recommendations for platform design. Focus group guides explored collective experiences and social dynamics.

Quantitative Analysis:

Table 4. Quantitative Analysis

Objective	Analysis Technique	Details
Objective 1 (Accessibility)	Descriptive statistics, Chi-square tests, Mann-Whitney U tests	Compare accessibility indicators across interface types (voice vs text) and groups (gender, phone ownership)
Objective 2 (Impact)	Difference-in-differences, Panel regression	Compare outcomes for treatment vs control workers; adjust for covariates

Software: Stata 17 and R 4.3.1.

Model Specifications

Difference-in-differences model: $Y_{it} = \alpha + \beta_1(\text{Treat}_i) + \beta_2(\text{Post}_t) + \beta_3(\text{Treat}_i \times \text{Post}_t) + \gamma X_{it} + \varepsilon_{it}$, where Y is outcome variable, Treat is treatment indicator, Post is time indicator, X are covariates, and ε is error term. Panel regression with fixed effects for worker and time. Model assumptions tested: parallel trends, no spillover effects, and no composition changes.

Qualitative Analysis

Thematic analysis using NVivo 14. Interviews and FGDs were audio-recorded, transcribed, and 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 $\kappa = 0.84$).

Mixed-Methods Integration

A joint display matrix presents quantitative and qualitative findings side-by-side for each objective, enabling triangulation and deeper interpretation (Creswell, J. W., & Clark, 2007).

Ethical Considerations

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. Vulnerable participants (displaced

persons, women) received additional protections including private interview spaces and female enumerators for women's interviews.

RESULT AND DISCUSSION

Sample Characteristics

Table 5. 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
Mean years employed at current farm	2.8 (SD 2.2)	3.9 (SD 2.6)	0.004

Source: Data Processed

Women are 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%, $p<0.001$) critical gaps for platform accessibility (Ng'ang'a et al., 2025).

Objective 1: Platform Design and Worker Accessibility

Table 6. 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

Source: Data Processed

Table 7. 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

Feature	Preference (%)	Preferred Format
Job application	67% Voice response, 23% SMS, 10% Press button	Voice response
Language preference	42% Pidgin, 31% English, 27% Local language	Pidgin

Source: Data Processed

Women spend significantly more time and money searching for work: 4.2 days per week compared to 3.8 days for men ($p=0.012$), and 520 CFA per search day compared to 380 CFA ($p<0.001$). Women waste travel money on no-work days far more often (64% vs 48%, $p=0.004$), reflecting the information gap that the platform aims to address. Digital platform usage is starkly low: only 12% of women and 28% of men have ever used a digital platform for job search, reflecting the digital divide and the absence of worker-side platforms.

Usability testing revealed overwhelming preference for voice-based interfaces (73%), offline capability (87% essential), and voice call notifications (80%). Workers want to call the platform, not open an app; hear job listings, not read them; and respond by voice, not text. Language preferences are diverse: 42% prefer Pidgin, 31% English, and 27% local languages.

Qualitative Insight:

One 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." Another man in Ndop added: "I cannot read well. If the phone talks to me, I can understand. If it sends a text, I need my son to read it for me."

H₁ is supported:

A voice-enabled, offline-capable labor matching platform is more accessible to agricultural workers in Northwest Cameroon than a text-based, online-only platform. This aligns with findings from Agrix Tech in Cameroon, which "delivers diagnosis through text and voice for the easy understanding of farmers who could be less literate".

Objective 2: Impact on Worker and Agribusiness Outcomes

Table 8. 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

Source: Data Processed

Table 9. 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

Source: Data Processed

Treatment workers showed significant improvements: +1.2 days worked per week (vs +0.2 for control, diff-in-diff +1.0 days, $p < 0.001$), +2,400 CFA weekly wages, and -400 CFA weekly travel costs. The reduction in wasted travel (23 percentage points) is particularly meaningful: workers saved money and avoided frustration.

Agribusinesses also benefited: 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 ($p = 0.002$). This suggests that the platform creates value for both sides of the market a characteristic of successful two-sided platforms (Rochet & Tirole, 2003).

The improvements were not uniform across groups. Women saw larger reductions in travel costs (-480 CFA vs -320 CFA for men) and larger increases in satisfaction (+1.1 points vs +0.7 points). This likely reflects women's higher baseline search costs and greater reliance on word-of-mouth (Ng'ang'a et al., 2025).

Qualitative Insight

One 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." A woman worker in Santa added: "I used to walk to three farms every morning. Now I call the platform and hear which farm needs me. I save money and time."

H₂ is supported

Workers using the AI-powered labor matching platform have significantly better outcomes (more days worked, higher wages, lower travel costs, higher satisfaction) than non-users. The platform reduces information asymmetry and transaction costs for both workers and agribusinesses (Ngissah et al., 2025).

Discussion

Theoretical Interpretation and Critical Analysis

Our findings provide robust empirical support for the three theoretical frameworks guiding this study. From a platform economics perspective ([Rochet & Tirole, 2003](#)), the platform successfully reduced transaction costs and information asymmetries on both sides of the market. Workers gained access to information about job availability, reducing search costs and wasted travel. Farms gained access to reliable labor supply, reducing panic hiring costs and harvest waste.

The simultaneous benefits to both sides created positive network effects: as more workers joined, farms found the platform more valuable, and vice versa. This virtuous cycle aligns with Rochet & Tirole, ([2003](#)) prediction that successful platforms must "solve the chicken-and-egg problem" by creating value for both sides. However, our findings also reveal important caveats to platform economics. The success was not automatic but required deliberate design choices voice interfaces, offline capability, multilingual support that standard platform economics does not adequately address.

This suggests that platform theory must be extended to account for contextual barriers (digital literacy, infrastructure, gender inequality) that shape platform adoption in rural, post-conflict settings. From an Actor-Network Theory perspective ([Latour, 2005](#)), the platform's success depended on aligning diverse actors: workers, farm managers, phone networks, mobile money providers, and the platform itself. The Ghana Farm Digital case failed because it could not achieve this alignment (Ngissah et al., 2025). In our context, alignment was achieved through: co-design with workers and managers, integration with existing phone networks (SMS, voice) rather than requiring internet, compatibility with mobile money systems, and engagement of local intermediaries to build trust.

The platform did not replace informal networks but integrated them, creating a hybrid system that combined digital efficiency with social embeddedness. This reading is consistent with reviews of smallholder digitization, which attribute slow uptake primarily to poor infrastructure, constrained financial resources, and low digital literacy rather than to any deficiency of the technology itself ([Nxumalo & Chauke, 2025](#)). Achieving such alignment is especially demanding in a region whose crisis has been characterised as an acute complex emergency, in which infrastructure, institutions, and community trust are degraded simultaneously ([Bang & Balgah, 2022](#)).

The Diffusion of Innovations framework Rogers, ([1995](#)) helps explain adoption patterns. The platform's relative advantage was clear: workers saved time and money, farms reduced costs and waste. Compatibility was achieved through voice-based interfaces and integration with existing communication practices. Complexity was minimized through simple, intuitive voice menus. Trialability was enabled

through pilot testing and onboarding support. Observability was facilitated through visible success stories shared in communities. These factors collectively drove adoption, consistent with Rogers' predictions.

Yet our findings also challenge aspects of Diffusion theory. Adoption was not a linear process of "rational adoption" but was shaped by social dynamics, trust, and gendered power relations. Women faced additional barriers husband's control of phones, restricted mobility, lower literacy that diffusion theory does not adequately address. This suggests that innovation diffusion in gendered, post-conflict contexts requires explicit attention to power relations and social inequalities.

Comparison with International Studies

Our findings align with and extend existing international evidence.

Comparison with East Africa

Found that digital labor matching platforms in East Africa reduced search times by 40-60%, with women benefiting more but facing higher barriers. Our findings are broadly consistent: workers gained +1.0 days of work per week (approximately 25% increase), and women saw larger reductions in travel costs and larger satisfaction gains. However, our study extends this evidence to a post-conflict setting, where barriers are amplified by displacement, infrastructure destruction, and social fragmentation.

Comparison with West Africa

Aker & Fafchamps, (2015) RCTs in West Africa demonstrated that mobile phone-enabled information systems can increase yields and reduce waste. Our findings echo this, showing that information provision through the platform reduced harvest waste by 7 percentage points. However, Aker's studies focused on information provision to farmers; our study extends this to labor markets, demonstrating that workers also benefit from improved information access.

Comparison with Ghana

The Ghana Farm Digital case Ngissah et al., (2025) provides a cautionary contrast. That platform failed because it bypassed existing institutions and could not align actors. Our platform succeeded in part because it was designed to build on existing practices (voice communication, informal networks) rather than replace them. This suggests that **institutional integration** designing platforms that complement rather than displace existing institutions is critical for success in African agricultural contexts.

Comparison with Nigeria

Appolos, (2025) in Nigeria demonstrated that app-based platforms can reduce wastage and create jobs. Our findings confirm this potential while highlighting the importance of voice-based and offline interfaces for reaching less digitally literate workers. The Nigerian platform is app-based; our platform used voice and SMS to reach workers with basic phones. This suggests a **technology gradient**: platforms

should match users' technological capabilities, not assume smartphone ownership and internet connectivity.

Unexpected and Contradictory Findings

Several findings warrant critical interpretation. First, while the platform improved outcomes for both genders, the gender gap persisted: women still worked fewer days per week (4.2 vs 4.8 days post-intervention, $p=0.031$) and earned less (2,800 CFA vs 3,200 CFA weekly, $p=0.027$). The platform reduced but did not eliminate gender inequality. This may reflect structural constraints (household responsibilities, mobility restrictions) that technology alone cannot overcome, consistent with Fonjong & Mbuli, (2025) finding that women's situation is "exacerbated by entrenched gender roles." We return to this in the limitations.

Second, platform adoption was not universal. Despite positive outcomes, 18% of workers ($n=63$) did not use the platform regularly. Non-adopters were more likely to be women (65%), older (mean age 42 vs 34 for adopters), and displaced (58% vs 48%). Qualitative interviews revealed reasons: "I don't trust new things" (woman, Santa), "My husband says I should not use the phone for this" (woman, Bamenda), "I prefer to walk I know the people" (man, Ndop). This suggests that trust, social norms, and habit are significant barriers that require deliberate interventions beyond technical design. This pattern mirrors evidence that initial acceptance of farm-oriented digital platforms is shaped by social influence, whereas continued use depends on performance and effort expectancy working through trust beliefs (Fox et al., 2021).

Third, the AI matching algorithm performed well but had limitations. Workers reported that the algorithm sometimes recommended jobs that were not appropriate due to unmeasured factors (e.g., group dynamics, social ties, safety concerns). The algorithm was trained on data from the study period, which may not capture seasonal variations or long-term patterns. This raises questions about algorithm robustness and the need for human oversight in matching decisions, consistent with Okonkwo and Eze's (2024) caution about AI in African agriculture.

Technical Explanation of AI Functionality and Linkage to Outcomes

The AI matching engine contributed to improved outcomes through three mechanisms. First, **recommendation quality**: The algorithm used collaborative filtering to identify patterns in past hiring data, recommending workers with skills and availability matching job requirements. This reduced mismatch and improved job placement efficiency. Second, **real-time matching**: The algorithm processed job postings and worker availability in real-time, enabling immediate notifications and reducing the delay between job posting and worker confirmation. This explains the reduction in labor shortages (Appolos, 2025). Third, **adaptive learning**: The algorithm updated its recommendations based on outcomes (worker ratings,

manager feedback), improving matching accuracy over time. This learning capability explains why outcomes improved over the six-month period (Okonkwo & Eze, 2024). Such trade-offs are well documented in the e-recruitment recommendation literature, where relevance, fairness of exposure across postings, and congestion must be balanced within a single matching objective (Mashayekhi et al., 2024).

Crucially, the AI did not operate in isolation but was embedded in a socio-technical system that included human intermediaries, social networks, and mobile infrastructure. The AI enhanced human matching decisions but did not replace them. Workers still made final decisions about job acceptance based on social and safety considerations that the algorithm did not capture. This hybrid approach AI-assisted human matching was critical for adoption and effectiveness, supporting Actor-Network Theory's emphasis on human-nonhuman actor alignment (Latour, 2005). Experience from responsible, gender-inclusive AI initiatives across Sub-Saharan Africa similarly identifies co-creation and context-specific design as preconditions for uptake rather than optional refinements (Ozor et al., 2025). Studies of algorithmic management in developing-country platform economies reinforce the case for retaining human judgement, since delegating allocation decisions wholly to algorithms has been associated with heightened precarity and diminished worker voice (Adekoya et al., 2025).

Implications for Theory and Practice

Theoretical implications

Our findings extend platform economics by demonstrating that platform success in low-resource contexts depends on contextual adaptation beyond the standard assumptions of two-sided markets. Platform design must account for digital literacy, infrastructure constraints, gender inequality, and post-conflict social fragmentation. This suggests a need for "contextualized platform theory" that integrates development studies and technology studies perspectives. Our findings also extend Actor-Network Theory by showing how gender and power relations shape actor alignment. Women's lower phone ownership, literacy, and household decision-making power affected their ability to engage with the platform, requiring deliberate interventions (female enumerators, women-only spaces, voice interfaces) to achieve equitable alignment.

Practical implications

For technology developers, our findings demonstrate that voice-first, offline-capable design is essential for reaching low-literacy, limited-connectivity users. Platforms must be accessible via basic phones, use voice not just text, and support multiple languages. For agribusinesses, the platform demonstrates that investing in worker-side matching can reduce labor shortages and hiring costs. For policymakers, the findings support investment in digital infrastructure (mobile networks, affordable data) and regulatory frameworks that enable worker-side

platforms, including data privacy protections and worker safeguards. For donors, the findings highlight the importance of **rural onboarding and user training** platforms alone are insufficient; sustained support for user engagement and trust-building is essential (Ngissah et al., 2025).

Limitations Of The Study

This study has several limitations that should be acknowledged.

Generalizability

The study was conducted in three agribusiness zones in Northwest Cameroon (Santa, Ndop, and Bamenda). While these zones represent diverse agricultural systems and post-conflict recovery trajectories, findings may not be directly transferable to other regions in Cameroon or other countries. The specific political, economic, and social conditions of the Anglophone Crisis create a unique context. Future research should test the platform model in other post-conflict or fragile settings.

Sample Selection

The study used a purposive sample of agribusinesses that had expressed interest in the platform. This introduces selection bias: participating agribusinesses may be more technologically inclined or have better management practices than non-participating agribusinesses. The control group may not be fully comparable, despite matching on key characteristics. Future research should use randomized controlled trials to strengthen causal inference.

Timeframe

Outcomes were measured over a 6-month period. While sufficient to detect short-term impacts, longer-term effects including sustained adoption, changes in labor market dynamics, and potential unintended consequences remain unknown. Platforms may have different impacts over 12-24 months as initial enthusiasm wanes or as network effects accumulate. Longitudinal research is needed to assess long-term sustainability.

Measurement

Worker outcomes were measured through self-report surveys, subject to recall bias and social desirability bias. While we used validated instruments and trained enumerators, systematic reporting errors cannot be ruled out. Platform analytics provided objective data on usage patterns but could not capture the full range of worker experiences. Future research should incorporate objective measures (e.g., payroll data, mobile money transactions) where possible.

CONCLUSION

This study demonstrates that a worker-side AI-powered labor matching platform improves agricultural employment outcomes in post-conflict Northwest Cameroon. Platform users experienced more working days (+1.0 day per week),

higher wages (+2,400 CFA per week), lower travel costs (-400 CFA per week), and less wasted travel (-23 percentage points). Agribusinesses also experienced fewer labor shortages (-1.9 days per month), lower hiring costs (-16,400 CFA per month), and reduced harvest waste (-7.0 percentage points).

The findings highlight the importance of worker-centric design, particularly voice interfaces, offline capability, and multilingual support, in overcoming digital and literacy barriers. Platform effectiveness also depends on integration with existing informal institutions and coordination among workers, farms, and local intermediaries. Therefore, policymakers and developers should prioritize inclusive digital infrastructure, worker protection, data privacy, rural onboarding, and sustained support to promote equitable and sustainable platform adoption.

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REFERENCES

- Abdulai, A.-R., Tetteh Quarshie, P., Duncan, E., & Fraser, E. (2023). Is agricultural digitization a reality among smallholder farmers in Africa? Unpacking farmers' lived realities of engagement with digital tools and services in rural Northern Ghana. *Agriculture & Food Security*, 12(1), 11. <https://doi.org/10.1186/s40066-023-00416-6>
- Adekoya, O. D., Mordi, C., Ajonbadi, H. A., & Chen, W. (2025). Implications of algorithmic management on careers and employment relationships in the gig economy – a developing country perspective. *Information Technology & People*, 38(2), 686–713. <https://doi.org/10.1108/ITP-01-2023-0064>
- Aker, J. C., & Fafchamps, M. (2015). Mobile Phone Coverage and Producer Markets: Evidence from West Africa. *The World Bank Economic Review*, 29(2), 262–292. <https://doi.org/10.1093/wber/lhu006>
- Appolos, C. (2025). *How Agritech is rewriting rural economy, empowering millions in*

- Nigeria's agribusiness sector* - *Tribune Online*.
<https://tribuneonlineng.com/how-agritech-is-rewriting-rural-economy-empowering-millions-in-nigerias-agribusiness-sector/>
- Bang, H. N. (2024). Displacement-induced destitution in Cameroon: seeking durable livelihood solutions for internally displaced persons from the Anglophone crisis. *Cogent Social Sciences*, 10(1).
<https://doi.org/10.1080/23311886.2024.2411861>
- Bang, H. N., & Balgah, R. A. (2022). The ramification of Cameroon's Anglophone crisis: conceptual analysis of a looming "Complex Disaster Emergency." *Journal of International Humanitarian Action*, 7(1), 6. <https://doi.org/10.1186/s41018-022-00114-1>
- Choruma, D. J., Dirwai, T. L., Mutenje, M. J., Mustafa, M., Chimonyo, V. G. P., Jacobs-Mata, I., & Mabhaudhi, T. (2024). Digitalisation in agriculture: A scoping review of technologies in practice, challenges, and opportunities for smallholder farmers in sub-saharan africa. *Journal of Agriculture and Food Research*, 18, 101286. <https://doi.org/10.1016/j.jafr.2024.101286>
- Creswell, J. W., & Clark, V. L. (2007). *Designing and conducting mixed methods research*.
- Fonjong, L., & Mbuli, C. (2025). Gender inequality, climate change, and armed conflict: Exploring the triple challenges for female farmers in Northwestern Cameroon. *Taylor & FrancisL Fonjong, CS MbuliSociety & Natural Resources*, 2025•Taylor & Francis. <https://doi.org/10.1080/08941920.2024.2364231>
- Fox, G., Mooney, J., Rosati, P., & Lynn, T. (2021). AgriTech Innovators: A Study of Initial Adoption and Continued Use of a Mobile Digital Platform by Family-Operated Farming Enterprises. *Agriculture*, 11(12), 1283. <https://doi.org/10.3390/agriculture11121283>
- Gwagwa, A., Kazim, E., Kachidza, P., Hilliard, A., Siminyu, K., Smith, M., & Shawe-Taylor, J. (2021). Road map for research on responsible artificial intelligence for development (AI4D) in African countries: The case study of agriculture. *Patterns*, 2(12), 100381. <https://doi.org/10.1016/j.patter.2021.100381>
- Heeks, R., Gomez-Morantes, J. E., Graham, M., Howson, K., Mungai, P., Nicholson, B., & Van Belle, J.-P. (2021). Digital platforms and institutional voids in developing countries: The case of ride-hailing markets. *World Development*, 145, 105528. <https://doi.org/10.1016/j.worlddev.2021.105528>
- Latour, B. (2005). An introduction to actor-network-theory. *Lib.Ysu.AmB LatourReassembling the Social*, 2005•lib.Ysu.Am. <https://doi.org/10.17323/978-5-7598-2141-0>
- Mashayekhi, Y., Li, N., Kang, B., Lijffijt, J., & De Bie, T. (2024). A Challenge-based Survey of E-recruitment Recommendation Systems. *ACM Computing Surveys*, 56(10), 1–33. <https://doi.org/10.1145/3659942>
- Ng'ang'a, K. G., Grossi, A., & Wanjau, A. N. (2025). *Advancing Gender Equity in Digital*

- Agro-advisory through Inclusive Artificial Intelligence (AI): Bias Analysis and Strategic Recommendations from the iShamba.*
<https://cgspace.cgiar.org/items/b60a95c2-c66b-4268-a929-9fb1b952fd5c>
- Ngissah, E., Leeuwis, C., Cieslik, K., & Freeman, C. (2025). Uberisation of mechanisation: Exploring the features and establishment of matchmaker digital tractor-hire platforms in Ghana through the lens of actor network theory. *NJAS: Impact in Agricultural and Life Sciences*, 97(1).
<https://doi.org/10.1080/27685241.2025.2531122>
- Nxumalo, G. S., & Chauke, H. (2025). Challenges and opportunities in smallholder agriculture digitization in South Africa. *Frontiers in Sustainable Food Systems*, 9.
<https://doi.org/10.3389/fsufs.2025.1583224>
- Ozor, N., Nwakaire, J., Nyambane, A., Muhatiah, W., & Nwobodo, C. (2025). Enhancing Africa's agriculture and food systems through responsible and gender inclusive AI innovation: insights from AI4AFS network. *Frontiers in Artificial Intelligence*, 7. <https://doi.org/10.3389/frai.2024.1472236>
- Rochet, J.-C., & Tirole, J. (2003). Platform Competition in Two-Sided Markets. *Journal of the European Economic Association*, 1(4), 990–1029.
<https://doi.org/10.1162/154247603322493212>
- Rogers, E. M. (1995). *Diffusion of Innovations* (4th edn.).
- Zougmore, R. B., & Partey, S. T. (2022). Gender Perspectives of ICT Utilization in Agriculture and Climate Response in West Africa: A Review. *Sustainability*, 14(19), 12240. <https://doi.org/10.3390/su141912240>