



**SECURING AGRICULTURAL LABOUR PRODUCTIVITY: AN AI-DRIVEN
FRAMEWORK FOR ADDRESSING TRAUMA-INDUCED ABSENTEEISM IN
AGRIPRENEUR-LED ENTERPRISES IN SOUTHWEST CAMEROON**

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ABSTRACT

The main aim of this study was to develop and empirically test an AI-driven framework for identifying, predicting and mitigating trauma-induced absenteeism among agricultural workers in agriprenneur-led enterprises in Southwest Cameroon. Data were collected from 288 agricultural workers using structured questionnaires incorporating the PCL-5 and WPAI instruments, semi-structured interviews, and attendance record reviews. Quantitative data were analysed using descriptive statistics and logistic regression, while Random Forest, Support Vector Machine, and Gradient Boosting Machine algorithms were deployed to develop the predictive framework. The findings revealed alarming prevalence of trauma exposure (81.9%), with 68.4% of workers meeting criteria for probable PTSD and 47.9% experiencing trauma-induced absenteeism. Logistic regression confirmed that trauma exposure significantly increased absenteeism likelihood (AOR = 3.82, $p < .001$), alongside job demands, social support, and access to psychosocial services as significant determinants. The Random Forest model demonstrated excellent predictive accuracy (82.6%, AUC = 0.89), substantially outperforming traditional approaches. The study concludes that AI-driven frameworks can effectively predict trauma-induced absenteeism and enable proactive workforce interventions. Key recommendations include adopting trauma-informed practices, implementing AI-powered predictive tools for early identification of at-risk workers, and integrating psychosocial support into agricultural policies to safeguard productivity in conflict-affected regions.

Keywords: Agricultural, Artificial, Enterprises, Labour and Productivity

INTRODUCTION

Cameroon's agricultural sector stands as the backbone of the national economy, absorbing approximately 70% of the working population and contributing 15-20% of Gross Domestic Product (World Food Programme, 2023). Within this sector, agriprenneur-led enterprises in the Southwest Region have emerged as pivotal drivers of rural development and food security. Yet the productivity and long-term viability of these enterprises face a persistent challenge: trauma-induced absenteeism among agricultural workers.

Since 2016, the Southwest Region has endured a protracted socio-political crisis marked by armed conflict, widespread displacement, and systematic human rights violations. Pascaline and Nguh (2025) documented that this crisis has precipitated a dramatic decline in worker productivity due to recurring ghost towns, frequent lockdowns, and persistent threats against workers. The Cameroon Development Corporation has witnessed its workforce plummet from over 1,326 employees to less than half in certain estates (Kebe, 2025). Agricultural workers have



been subjected to multiple traumatic experiences, including direct exposure to violence, bereavement, forced displacement, and daily insecurity.

Despite robust evidence that trauma survivors exhibit hypervigilance, emotional numbing, avoidance behaviours, and cognitive impairments that undermine productive work capacity, the connection between trauma and labour productivity in Cameroon's agricultural sector has received scant attention. Research in Cameroon's banana sector revealed that workers average 46 days of absenteeism annually due to injury or illness, with 42.5% reporting stress and anxiety as daily challenges (Banana Link, 2024). In agricultural settings where physical stamina and consistent presence are paramount, the impact of trauma on absenteeism can be devastating.

The potential of artificial intelligence (AI) to address this challenge remains unexplored within Cameroon's agricultural context. While AI applications in agriculture have predominantly targeted precision farming and supply chain optimisation (Ajmi, 2019), significant opportunities exist to deploy AI for workforce well-being management. Recent scholarship demonstrates that machine learning techniques can predict workplace absenteeism with considerable accuracy, with decision tree models achieving 83.33% accuracy (Ajmi, 2019). Similarly, Ramadhan, Syah, and Rafiki (2026) showed that hybrid frameworks combining Principal Component Analysis with multi-objective prediction can extract actionable insights from multidimensional human resource data.

Statement of the Problem

Agripreneur-led enterprises in Southwest Cameroon confront a productivity crisis rooted in the psychological trauma inflicted by the protracted socio-political conflict. Despite well-documented labour centrality to agricultural productivity, no systematic framework exists for understanding or addressing trauma-induced absenteeism in Cameroonian agripreneurial enterprises. This absence carries several consequences: agripreneurs lack capacity to identify trauma signs among workers or appreciate productivity implications; without early detection, trauma-related absenteeism becomes entrenched; and opportunities for predictive analytics remain untapped. Existing research on agricultural productivity in Cameroon has largely overlooked psychosocial determinants of labour productivity, particularly trauma's impact on workforce attendance. The present study addresses this critical gap by developing and empirically testing an AI-driven framework for identifying, predicting, and mitigating trauma-induced absenteeism.

Research Objectives

- i. identify the prevalence and determinants of trauma-induced absenteeism among agricultural workers in agripreneur-led enterprises in Southwest Cameroon.
- ii. test an AI-driven framework for predicting and mitigating trauma-induced absenteeism.

Research Hypotheses

H₀₁: Trauma exposure significantly increases the likelihood of absenteeism among agricultural workers in agripreneur-led enterprises in Southwest Cameroon.

H₀₂: An AI-driven framework can predict trauma-induced absenteeism with greater accuracy than traditional human resource management approaches.

Conceptual and Theoretical Framework

Agricultural labour productivity encompasses not merely the quantity of produce generated but also its quality and efficiency of operations. This study conceptualises trauma as the psychological and emotional response to deeply distressing events such as violence, conflict,



displacement, or loss. Trauma-induced absenteeism represents a specific manifestation of trauma's broader impact on occupational functioning. An AI-driven framework refers to a structured system employing machine learning algorithms, predictive analytics, and decision support tools to address workforce management challenges.

The study was anchored on three theoretical perspectives. Conservation of Resources theory (Hobfoll, 1989) posits that individuals strive to obtain and protect resources; trauma precipitates resource depletion, leading to avoidance behaviours including absenteeism. The Job Demands-Resources model (Demerouti *et al.*, 2001) proposes that high job demands combined with low resources lead to burnout and disengagement. Human Capital Theory (Schultz, 1961; Becker, 1964) conceptualises workers' knowledge, skills, and health as forms of capital that yield returns; trauma-induced absenteeism represents depreciation of human capital affecting both individual and enterprise productivity.

Empirical Review

Pascaline and Nguh (2025) investigated the Anglophone crisis effects on CDC plantation workers, revealing drastic productivity reductions due to ghost towns, lockdowns, and threats against workers. Kebe (2025) examined CDC banana plantations, documenting a 55% decline in production from 200,000 metric tons in 2016 to 90,000 metric tons by 2023. Banana Link (2024) conducted 120 interviews across 11 farms, revealing average absenteeism of 46 days annually, with workers receiving only 4.5 days of sick pay on average. Fonjong and Clodine (2025) examined gender inequality, climate change, and armed conflict for female farmers in Northwestern Cameroon, finding that climate variability and armed conflict endanger local productivity and food security.

Regarding AI applications, Ajmi (2019) applied machine learning techniques to predict absenteeism, finding decision tree models achieved 83.33% accuracy with an AUC of 0.834. Ramadhan, Syah, and Rafiki (2026) presented a hybrid framework combining PCA and Multi-Objective Complexity Prediction for plantation HR data, achieving Mean Absolute Error of approximately 6.5 days and R^2 of approximately 0.82 for absenteeism prediction. Sharma, Devarapalli, and Jain (2025) integrated Workday Prism with AI pipelines for real-time HR analytics, demonstrating a 22% improvement in turnover prediction accuracy.

Literature Gap

No study has specifically examined trauma's impact on agricultural labour productivity in Cameroon, developed an AI-driven framework for workforce well-being in Cameroonian agriculture, or integrated insights from psychology, HR management, and agricultural economics to address psychosocial determinants of productivity. The present study addresses these gaps.

MATERIALS AND METHODS

Research Philosophy and Design

The study adopted a positivist research philosophy, grounded in the belief that social phenomena can be studied objectively. The research design was a mixed-methods sequential explanatory design, comprising a quantitative phase to identify prevalence and determinants of trauma-induced absenteeism, followed by a qualitative phase to explore contextual factors influencing AI framework effectiveness.



The Study Area

The study was conducted in the Southwest Region of Cameroon, specifically in Fako, Meme, and Ndian divisions. These divisions were purposively selected due to their high concentration of agriprenneur-led enterprises and significant exposure to the socio-political crisis. The target population comprised 1,200 agricultural workers employed in agriprenneur-led enterprises. Agriprenneur-led enterprises were defined as agricultural enterprises operated by entrepreneurs combining farming with business management.

Sampling and Sample Size

A stratified sampling technique was employed, with stratification by division and agricultural sub-sector (cocoa, oil palm, food crops). Within each stratum, agriprenneur-led enterprises were randomly selected, and workers were randomly sampled. The sample size of 300 workers was calculated using Yamane's formula, assuming 95% confidence level and 5% margin of error.

Data Collection Instruments

Three instruments were used: (1) a structured questionnaire administered to agricultural workers collecting quantitative data on demographic characteristics, trauma exposure (PCL-5), absenteeism patterns, and work-related factors; (2) an interview schedule for semi-structured interviews with agripreneurs and key informants; (3) an attendance record review instrument collecting secondary data on worker attendance patterns over 12 months. The questionnaire was administered in English and Pidgin English by trained enumerators.

Method of Data Analysis

For Objective 1, descriptive statistics and logistic regression were employed to identify determinants of trauma-induced absenteeism. The logistic regression model estimated odds of absenteeism as a function of trauma exposure, demographics, work-related factors, and access to psychosocial support. Model fit was assessed using Hosmer-Lemeshow test and pseudo- R^2 .

For Objective 2, an AI framework was developed using Random Forest (RF), Support Vector Machine (SVM), and Gradient Boosting Machine (GBM). The dataset was split into training (70%) and testing (30%) sets. Model performance was evaluated using accuracy, precision, recall, F1-score, and AUC-ROC. Qualitative data were analysed using thematic analysis.

RESULTS AND DISCUSSION

Demographic Characteristics of Respondents

Table 1 presents the demographic characteristics of the study participants. A total of 288 agricultural workers participated in the study, representing a response rate of 96% (288 out of 300). The majority of participants were male (62.5%), with a mean age of 42.3 years (SD = 11.7). The most common level of education was primary education (44.8%), followed by no formal education (26.7%), secondary education (23.6%), and tertiary education (4.9%). The majority of participants were married (68.4%), with an average household size of 6.2 members (SD = 2.8). The mean years of farming experience was 18.5 years (SD = 9.4), and participants had been employed in their current agriprenneurial enterprise for an average of 5.7 years (SD = 3.9).



Table 1: Demographic characteristics of respondents

Characteristic	Category	Frequency	Percentage
Gender	Male	180	62.5
	Female	108	37.5
Age Group	18-30 years	52	18.1
	31-45 years	128	44.4
	46-60 years	72	25.0
	>60 years	36	12.5
Education	No formal education	77	26.7
	Primary	129	44.8
	Secondary	68	23.6
	Tertiary	14	4.9
Marital Status	Married	197	68.4
	Single	58	20.1
	Widowed/Divorced	33	11.5
Division	Fako	104	36.1
	Meme	96	33.3
	Ndian	88	30.6

Prevalence of Trauma Exposure and Trauma-Induced Absenteeism

Table 2 presents the prevalence of trauma exposure and trauma-induced absenteeism among the respondents. The majority of participants (81.9%) reported exposure to at least one traumatic event in the past five years. The most commonly reported traumatic events were exposure to armed conflict or violence (72.2%), displacement from home or farm (63.5%), and loss of family members or close friends (57.6%). The mean PCL-5 score was 46.2 (SD = 13.8), with 68.4% of participants scoring ≥ 33 , indicating probable PTSD. The mean number of days absent from work in the past 30 days was 6.8 days (SD = 4.2), and the mean days of presenteeism (attending work but being unproductive due to health issues) was 8.3 days (SD = 3.7). The majority of participants (72.9%) reported that their absenteeism was at least partially attributable to trauma-related symptoms. The prevalence of trauma-induced absenteeism (defined as missing more than 5 days in the past 30 days due to trauma-related symptoms) was 47.9%.

Table 2: Prevalence of trauma exposure and trauma-induced absenteeism

Variable	Category	Frequency	Percentage	Mean (SD)
Trauma Exposure				
Any trauma exposure		236	81.9	
Exposure to conflict/violence		208	72.2	
Displacement		183	63.5	
Loss of family/friends		166	57.6	
PTSD Symptoms	PCL-5 ≥ 33	197	68.4	
PCL-5 Score				46.2 (13.8)
Absenteeism				
Days absent (past 30 days)				6.8 (4.2)
Days presenteeism (past 30 days)				8.3 (3.7)
Absenteeism attributed to trauma		210	72.9	
Trauma-induced absenteeism (>5 days)		138	47.9	

Determinants of Trauma-Induced Absenteeism

Logistic regression analysis was conducted to identify the determinants of trauma-induced absenteeism (Table 3). The model was statistically significant ($\chi^2 = 89.43$, $p < .001$, pseudo $R^2 =$



.24). Trauma exposure was the strongest predictor of trauma-induced absenteeism, with participants exposed to traumatic events having 3.8 times higher odds of absenteeism compared to those not exposed (AOR = 3.82, 95% CI: 2.47-5.91, $p < .001$). Higher PTSD symptom severity (PCL-5 score) was also significantly associated with increased odds of absenteeism (AOR = 1.07, 95% CI: 1.04-1.10, $p < .001$). Among demographic variables, gender was not significantly associated with absenteeism (AOR = 0.88, 95% CI: 0.54-1.43, $p = .591$), while education level showed a marginal association (AOR = 0.72, 95% CI: 0.51-1.02, $p = .064$).

Work-related factors showed significant associations with absenteeism. Higher job demands were associated with increased odds of absenteeism (AOR = 1.45, 95% CI: 1.12-1.88, $p = .004$), while higher social support at work was associated with decreased odds (AOR = 0.68, 95% CI: 0.50-0.92, $p = .013$). Supervisor support also showed a protective effect (AOR = 0.73, 95% CI: 0.54-0.99, $p = .041$). Access to psychosocial support services was associated with lower odds of absenteeism (AOR = 0.61, 95% CI: 0.43-0.87, $p = .006$).

Table 3: Determinants of trauma-induced absenteeism

Predictor	B	SE	AOR	95% CI	p-value
Trauma Exposure	1.34	0.22	3.82	[2.47, 5.91]	< .001
PCL-5 Score	0.07	0.01	1.07	[1.04, 1.10]	< .001
Gender (Female vs. Male)	-0.13	0.25	0.88	[0.54, 1.43]	.591
Education (years)	-0.33	0.18	0.72	[0.51, 1.02]	.064
Job Demands	0.37	0.13	1.45	[1.12, 1.88]	.004
Social Support	-0.39	0.15	0.68	[0.50, 0.92]	.013
Supervisor Support	-0.31	0.16	0.73	[0.54, 0.99]	.041
Access to Psychosocial Support	-0.49	0.18	0.61	[0.43, 0.87]	.006

Performance of the AI-Driven Framework

Table 4 presents the performance of the AI-driven framework in predicting trauma-induced absenteeism. Three machine learning algorithms were tested: Random Forest (RF), Support Vector Machine (SVM), and Gradient Boosting Machine (GBM). All models were evaluated on the test dataset (30% of the sample, $n = 86$). The Random Forest model demonstrated the best overall performance, with an accuracy of 82.6%, precision of 81.3%, recall of 84.6%, and F1-score of 82.9%. The area under the ROC curve (AUC) for Random Forest was 0.89 (95% CI: 0.83-0.94), indicating excellent predictive accuracy. The Gradient Boosting Machine also showed strong performance (AUC = 0.86, 95% CI: 0.80-0.91), while Support Vector Machine showed moderate performance (AUC = 0.82, 95% CI: 0.74-0.88).

Table 4: Performance of AI-driven framework for predicting trauma-induced absenteeism

Model	Accuracy (%)	Precision (%)	Recall (%)	F1-Score (%)	AUC	95% CI
Random Forest	82.6	81.3	84.6	82.9	0.89	[0.83, 0.94]
Gradient Boosting	79.1	78.5	80.2	79.3	0.86	[0.80, 0.91]
Support Vector Machine	74.4	73.2	75.8	74.5	0.82	[0.74, 0.88]
Traditional Approach	65.1	64.3	66.7	65.5	0.58	[0.48, 0.68]

Hypotheses Testing

In comparison with traditional human resource management approaches (operationalised as a simple rule-based model using attendance thresholds), the AI-driven framework demonstrated significantly better predictive accuracy. The rule-based model achieved an accuracy of 65.1% and



an AUC of 0.58, substantially lower than the AI models. These findings support Hypothesis H₂, indicating that an AI-driven framework can predict trauma-induced absenteeism with greater accuracy than traditional approaches. These findings confirm Hypothesis H₁ reveal alarmingly high prevalence of trauma exposure (81.9%) and trauma-induced absenteeism (47.9%). The finding that 68.4% met criteria for probable PTSD is consistent with Pascaline and Nguh's (2025) documentation of gross rights violations. The mean PCL-5 score of 46.2 is substantially higher than community samples and comparable to clinical populations.

The adjusted odds ratio of 3.82 indicates workers exposed to trauma have nearly four times the odds of absenteeism, consistent with Conservation of Resources theory suggesting trauma-induced resource loss leads to avoidance and withdrawal. The significant association between PTSD symptom severity and absenteeism aligns with Banana Link's (2024) findings on stress and anxiety among workers. Work-related factors provide important intervention insights: higher job demands increase absenteeism, consistent with the JD-R model, while social support, supervisor support, and access to psychosocial services buffer negative trauma effects. These findings align with Human Capital Theory emphasising that investments in worker well-being yield productivity returns.

Performance of the AI-Driven Framework

The Random Forest model demonstrated best performance with accuracy of 82.6%, precision of 81.3%, recall of 84.6%, and F1-score of 82.9%. AUC was 0.89 (95% CI: 0.83-0.94), indicating excellent predictive accuracy. Gradient Boosting showed strong performance (AUC=0.86, 95% CI: 0.80-0.91), while Support Vector Machine showed moderate performance (AUC=0.82, 95% CI: 0.74-0.88). Traditional HR approaches achieved only 65.1% accuracy and AUC of 0.58. These findings support Hypothesis H₂, demonstrating that AI-driven frameworks can predict trauma-induced absenteeism with superior accuracy compared to traditional approaches. The Random Forest model's performance (82.6% accuracy, AUC=0.89) is consistent with Ajmi's (2019) findings of 83.33% accuracy for decision tree models. The superior performance aligns with Ramadhan, Syah, and Rafiki (2026), who achieved R² of approximately 0.82 for absenteeism prediction in plantation settings.

The AI framework incorporates key predictors from Objective 1 trauma exposure, PTSD symptom severity, job demands, social support, supervisor support, and access to psychosocial support enabling early identification of at-risk workers and facilitating proactive interventions. The high prevalence of trauma exposure and absenteeism highlights urgent need for psychosocial support interventions in agriprenneur-led enterprises. Agripreneurs, policymakers, and development organisations must recognise that addressing worker psychological well-being is a strategic imperative for enhancing agricultural productivity. Significant associations between work-related factors and absenteeism underscore importance of improving working conditions: reducing excessive job demands, enhancing social support, and providing psychosocial support services. The superior AI framework performance demonstrates machine learning's potential to enhance workforce management in agricultural settings.

The study investigated trauma-induced absenteeism prevalence and determinants among agricultural workers in Southwest Cameroon and developed an AI-driven prediction framework. Findings reveal trauma exposure is alarmingly prevalent (81.9%), with 68.4% meeting PTSD criteria and 47.9% experiencing trauma-induced absenteeism. Logistic regression confirmed trauma exposure, PTSD symptom severity, job demands, social support, supervisor support, and access to psychosocial support as significant determinants. The Random Forest model



demonstrated excellent predictive accuracy (82.6%) and discriminatory power (AUC=0.89), substantially outperforming traditional approaches.

Agripreneurs must adopt trauma-informed workforce management practices: implementing regular trauma screening, providing accessible psychosocial support, and training supervisors to recognise trauma-related distress. Policymakers should develop comprehensive policies addressing worker psychosocial well-being, including dedicated mental health funding and integrating psychosocial support into agricultural extension programmes. Development organisations should support agripreneur-led enterprises through training programmes, technical assistance, and referral pathways to mental health providers. Agripreneurs are encouraged to adopt AI-powered workforce management tools validated in this research. Technology developers must collaborate with agricultural stakeholders to design contextually appropriate, ethically sound AI frameworks. Researchers should continue refining AI-driven frameworks through longitudinal studies, comparative analyses, intervention studies, and exploration of ethical implications.

REFERENCES

- Ajmi, S. Q. (2019). Applying machine learning techniques to predict absenteeism at work. *Muthanna Journal of Pure Science*, **6**(1).
- Banana Link. (2024). *Cameroon research summary: Decent work in the banana industry*. Banana Link.
- Becker, G. S. (1964). *Human capital: A theoretical and empirical analysis, with special reference to education*. University of Chicago Press.
- Demerouti, E., Bakker, A. B., Nachreiner, F. and Schaufeli, W. B. (2001). The job demands-resources model of burnout. *Journal of Applied Psychology*, **86**(3):499-512.
- Fonjong, L. and Clodine, M. (2025). Gender inequality, climate change, and armed conflict: Exploring the triple challenges for female farmers in Northwestern Cameroon. *Society & Natural Resources*, **38**(10):1368-1388.
- Hobfoll, S. E. (1989). Conservation of resources: A new attempt at conceptualizing stress. *American Psychologist*, **44**(3):513-524.
- Kebe, R. A. (2025). *Effects of the Anglophone crisis on the Cameroon Development Corporation banana plantations* [Bachelor's thesis]. Theseus.
- Pascaline, E. E. and Nguh, B. S. (2025). Effects of the Anglophone crisis on CDC workers in Tiko-Cameroon from 2014-2023. *International Journal of Research and Innovation in Social Science*, **9**(1):660-673.
- Ramadhan, G., Syah, R. and Rafiki, A. (2026). A hybrid PCA, MPK method for multi-objective human resource analytics in plantation management. *Jurnal RESTI*, **10**(3):555-566.
- Schultz, T. W. (1961). Investment in human capital. *The American Economic Review*, **51**(1):1-17.
- Sharma, M., Devarapalli, S. and Jain, A. (2025). Integrating Workday Prism with AI pipelines for real-time HR analytics and forecasting. In *2025 International Conference on Computer and Applications (ICCA)* (pp. 1-6).
- World Food Programme. (2023). *WFP Cameroon: Smallholder farmers' support and resilience strengthening*. ReliefWeb.