Revitalizing Agriculture in Conflict Zones: A Case Study on Machinery Restoration in Borno State

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Abstract

Agricultural productivity in northeast Nigeria has been drastically affected by armed conflict and Borno State ranks among the worst-affected states. Lack of farmland, mislocation of agricultural populations and destruction or damages of farm equipment(farm machinery) were some of the major results seen after years of violence, which is very important machinery in the big agricultural system. The paper examines how the restoration of machinery can be used to give new life to agriculture in conflict-struck lands by studying Borno State. With the use of qualitative field interviews, secondary data, and policy reports the paper focuses on how public, private and international stakeholders have helped in rebuilding agricultural equipment, and enabling accessibility of mechanized tools by the farmers. Results indicate that selective machinery repair schemes, equipment sharing co-operates, and homegrown repair training have helped to make farms productive and communities stronger. Nonetheless, the issues of insecurity that have lingered on, lousy infrastructure, and retention of spare parts has impeded sustainable recovery. The research highlights why it is so necessary to embed machine restoration into the larger agricultural and post-conflict development plans. It provides policy consideration in expanding an intervention to assist in the process of mechanization, livelihood recovery, and long-term food security in weak environments.

Keywords: *Agricultural recovery; Conflict zones; Borno State; Machinery restoration; Post-conflict development; Mechanization; Food security; Nigeria; Agricultural resilience.*

Introduction

Agricultural practice is still a mainstay of the Nigerian economy with more than 35% of the population working in the field and it plays a big role in sustaining rural lifestyles, national food security and Gross Domestic Product (GDP). Nevertheless, instability related to conflicts in places like Borno State in north-eastern Nigeria has heavily impaired agricultural output due to more than 10 years of Boko Haram insurgency. Millions of people have been displaced and vital infrastructure destroyed since 2009 due to violent conflict in the region and local food systems have collapsed. One of the worst consequences has been the wholesale destruction of agricultural equipment: the very farming machinery that once allowed the mechanization of the industry and increased production by both smallholder and commercial farmers: the tractor, combine, plow, and irrigation system.

Prior to the conflict, Borno State held a reputation as a productive agro-ecological zone within the Sahelian belt of West Africa, characterized by diverse crop cultivation and substantial livestock farming. The escalation of violence, however, not only displaced farmers and laborers but also dismantled the operational capacity of farming cooperatives and state-sponsored agricultural extension programs. Many farm machines were stolen, destroyed, or rendered nonfunctional due to lack of maintenance and spare parts, contributing to widespread food insecurity, income loss, and economic stagnation.

In post-conflict scenarios, the restoration of agricultural systems is recognized as a vital step toward peacebuilding and sustainable development. While existing studies have explored broader themes of agricultural resilience, land recovery, and farmer reintegration in conflict zones, there is limited empirical focus on the specific role that machinery restoration plays in the revitalization process. Machinery both large-scale and small-scale is not only central to boosting agricultural productivity but also serves as a catalyst for labor efficiency, job creation, and rural economic recovery.

This study addresses this gap by examining the restoration and reactivation of agricultural machinery in Borno State as a case study of post-conflict agricultural recovery. It investigates the strategies employed by government agencies, international development partners, and local communities to restore mechanized farming capacity in selected conflict-affected areas. Through a combination of field-based evidence and policy analysis, the study seeks to answer the following key questions:

- What has been the extent of machinery loss and degradation due to the conflict in Borno State?
- What interventions have been implemented to restore and distribute agricultural machinery in the region?
- To what extent have these efforts contributed to productivity recovery and food security?
- What challenges and opportunities exist for sustaining machinery-based agricultural revitalization in conflict-affected zones?

The significance of this research lies in its contribution to understanding post-conflict agricultural restoration not only from a humanitarian or food security lens, but through the operational dimension of mechanization. As Nigeria and other conflict-affected countries seek durable solutions to rebuild their rural economies, this case study of Borno State offers practical insights into how agricultural machinery restoration can serve as a foundation for economic resilience, youth employment, and long-term development.

Literature Review

Theoretical Framework: Post-Conflict Agricultural Recovery

Post-conflict recovery literature highlights agriculture as a foundational sector for restoring livelihoods, especially in rural economies. According to Collier et al. (2003), agricultural revitalization is central to reintegration efforts, stabilization of food supply, and poverty reduction. In conflict-affected zones, agriculture not only serves as a source of food but also as a medium for social reconstruction and economic rebuilding (FAO, 2017).

The Resilience Theory and the Livelihoods Framework offer valuable conceptual lenses for understanding agricultural restoration. These models emphasize systems' ability to absorb shocks, adapt, and transform in the face of conflict or crisis (Frankenberger et al., 2013). Applied to post-conflict zones, resilience entails not only restoring agricultural output but also re-establishing assets such as land, machinery, and knowledge networks necessary for sustainable productivity.

Impact of Armed Conflict on Agricultural Systems

Numerous studies confirm the extensive disruptions caused by conflict on agricultural systems. In contexts such as South Sudan, Syria, and Iraq, conflict has led to the loss of arable land, seed banks, and irrigation systems (Mason & Rigg, 2019). Agricultural machinery tractors, threshers, irrigation pumps, and sprayers have often been either destroyed, looted, or rendered inoperable due to lack of spare parts and maintenance support (FAO, 2015; World Bank, 2016).

In northeast Nigeria, Boko Haram's insurgency devastated both human capital and farming infrastructure. Between 2011 and 2019, it is estimated that more than 70% of agricultural equipment in affected local government areas of Borno State was damaged or abandoned (International Crisis Group, 2019). The Nigerian Ministry of Agriculture reported a 60% decline in tractor deployment in the region during the peak of the conflict.

Significance of Agricultural Machinery in Revitalization

Agricultural mechanization is widely recognized as a driver of productivity, efficiency, and food security in developing economies (Pingali, 2007). Mechanization enhances land preparation, planting, and harvesting, reducing labor bottlenecks and enabling timely farm operations. The Food and Agriculture Organization (2018) argues that mechanization, if inclusive, can improve resilience by lowering drudgery, increasing output, and enabling youth participation in agriculture.

Several post-conflict case studies support this view. For instance, in post-war Rwanda and Uganda, the introduction of subsidized tractors and mobile repair services significantly improved post-conflict agricultural output (Mwesigye & Matsumoto, 2016). However, these gains were often short-lived where support systems such as access to credit, technical training, and maintenance supply chains were not institutionalized.

Machinery Restoration Strategies: Global and Regional Practices

Machinery restoration in post-conflict settings takes several forms. These include direct government-led replacement, donor-funded refurbishment schemes, and
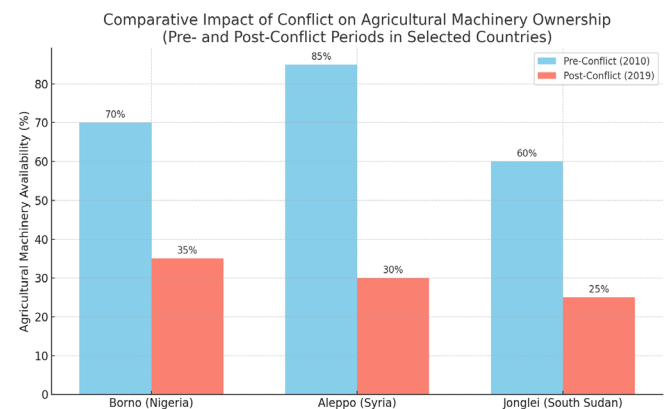
Fig 1: The bar chart titled "Comparative Impact of Conflict on Agricultural Machinery Ownership (Pre- and Post-Conflict Periods in Selected Countries)". It shows the sharp decline in machinery availability between 2010 and 2019 across Borno (Nigeria), Aleppo (Syria), and Jonglei (South Sudan) based on data from FAO, World Bank, and local ministry reports

community-level initiatives. The World Bank (2018) documents that in northern Iraq, a machinery-leasing program significantly boosted wheat production after ISIS withdrawal. Similarly, in Colombia, ex-combatants were trained to repair and operate restored machinery as part of reintegration programs.

In Nigeria, government programs such as the Agricultural Equipment Hiring Enterprises (AEHE) and the Nigeria Incentive-Based Risk Sharing System for Agricultural Lending (NIRSAL) have been deployed to address post-conflict agricultural needs, including access to tractors and inputs (FMARD, 2019). However, scholars like Akinola (2020) argue that these programs often face limitations in areas of insecurity due to logistical constraints, weak coordination, and community mistrust.

Gaps in the Literature

Despite the growing attention to post-conflict agricultural development, few studies provide in-depth, localized assessments of machinery restoration specifically in sub-Saharan Africa. Much of the literature remains generalized or focuses on national agricultural policy rather than conflict-affected subnational regions like Borno State. There is also limited documentation of farmer-led initiatives in machinery restoration, cooperative approaches, or the integration of youth in mechanization programs in volatile contexts. This paper addresses this gap by exploring Borno State as a focused case study to examine how machinery restoration contributes to agricultural revitalization in an active post-conflict zone.

Methodology

Study Area

This study was conducted in Borno State, located in northeastern Nigeria, an area profoundly affected by the Boko Haram insurgency. Borno is largely agrarian, with agriculture serving as the primary livelihood for over 70% of its rural population prior to the onset of conflict. The state's terrain comprises savanna grasslands and semi-arid zones conducive to crop production, especially millet, sorghum, maize, and cowpea. However, conflict-induced displacement, destruction of infrastructure, and the loss of farm machinery have severely disrupted the agricultural economy since 2009.

Three local government areas (LGAs) Jere, Konduga, and Biu were purposely selected for this study based on the following criteria: degree of conflict impact, extent of machinery loss, relative post-conflict return of displaced populations, and the presence of machinery rehabilitation initiatives.

Research Design

A mixed-methods case study design was adopted to explore the role of machinery restoration in revitalizing agriculture in conflict-affected zones. The approach combines qualitative and quantitative data collection and analysis to provide a nuanced understanding of both the technical and social aspects of agricultural recovery.

Data Collection Methods

Primary data

Primary data was collected through field visits, semi-structured interviews, and focus group discussions conducted between March and June 2020. Key informants included:

- Smallholder and medium-scale farmers (n = 60)
- Agricultural cooperative leaders (n = 10)
- Officials from Borno State Ministry of Agriculture and Natural Resources (n = 6)
- Representatives of international organizations (e.g., FAO, UNDP) (n = 4)
- Local technicians and machinery service providers (n = 8)

Focus group discussions were held in each LGA with an average of 8–10 participants to capture communal experiences on machinery access and restoration.

Secondary data

Secondary data was obtained from relevant reports, including:

- Federal Ministry of Agriculture and Rural Development (FMARD) machinery distribution records
- Post-conflict agricultural needs assessments by FAO and World Bank
- Academic literature and regional NGO reports on agricultural recovery

Sampling Techniques

A purposive sampling technique was used to identify study participants directly engaged in post-conflict agricultural activity or machinery-related interventions. Stratified sampling within selected LGAs ensured representation of both returnee and host community farmers. Snowball sampling was employed to locate informal machinery technicians and cooperatives that received restored or donated equipment.

Data Analysis

Quantitative data were analyzed using descriptive statistics (percentages, means, and frequency distributions) via SPSS (Version 22). This allowed for basic profiling of participants, types of machinery used or restored, and observable productivity changes.

Qualitative data, including interview transcripts and focus group notes, were analyzed using thematic content analysis. Emerging themes included the socio-economic impact of machinery restoration, operational challenges, accessibility issues, and community-led repair innovations.

Ethical Considerations

All participants were informed of the study's purpose and provided verbal consent. Anonymity and confidentiality were maintained throughout the research process. The

study received ethical clearance from the Departmental Review Board at the University of Maiduguri and adhered to international research ethics standards in humanitarian settings.

Limitations of the Methodology

The study acknowledges several limitations:

- Restricted access to high-risk or ongoing conflict zones limited broader geographic coverage.
- Incomplete or inconsistent official machinery distribution records hindered verification in some areas.
- Potential response bias due to the sensitive post-conflict environment may have influenced participants' disclosures.

Conflict Impact on Agricultural Machinery in Borno State

The protracted insurgency in Borno State has had devastating consequences on the agricultural sector, not only by displacing farmers and destroying arable land, but also by causing extensive damage to agricultural machinery and associated infrastructure. Agricultural machinery—such as tractors, power tillers, planters, harvesters, and irrigation pumps—plays a pivotal role in modernizing farming practices, improving yield, and reducing labor intensity. In Borno, where a significant portion of the population depends on agriculture for subsistence and income, the destruction of mechanized assets represents a critical setback to post-conflict recovery and food security.

During the height of the conflict, widespread insecurity severely restricted farmers' access to their lands. Many rural farming communities were abandoned as inhabitants fled to internally displaced persons (IDP) camps or more secure urban centers. Agricultural equipment left behind was often destroyed, stolen, or rendered non-functional due to neglect, vandalism, or deliberate sabotage. In some cases, farm machinery was repurposed by non-state actors for transportation or other non-agricultural uses, further diminishing the availability of functional equipment in the state.

In addition to physical damage, the conflict disrupted key support systems for agricultural mechanization. Workshops for machinery repair and maintenance were either destroyed or closed due to safety concerns. Skilled technicians either fled the region or abandoned their trade, leading to a significant loss of technical know-how. This erosion of human capital further compounded the challenges faced by farmers attempting to repair or maintain the machinery that did survive the conflict.

The logistics and supply chains that supported machinery importation, spare parts distribution, and fuel access also broke down. Borno State, like many parts of northern Nigeria, is heavily reliant on spare parts imported from other regions or countries. The insecurity, combined with the poor state of roads and transport services, made it increasingly difficult for spare parts dealers to operate. Fuel shortages in rural areas made the use of powered equipment both unreliable and expensive, disincentivizing investment in mechanized tools.

Additionally, cooperative societies and farming clusters often central to the shared ownership and use of agricultural machinery suffered organizational collapse. Many of these groups were disbanded or rendered inactive as members were displaced or killed. The absence of institutional support structures meant that even when machinery was available, mechanisms for coordinated use and management were often missing. This further reduced efficiency and increased the risk of underutilization or misuse of expensive equipment.

Another critical consequence of the conflict was the psychological toll on farmers and rural populations, which indirectly affected the use and maintenance of agricultural equipment. Many farmers reported fear of returning to farmlands, even in areas where machinery had been restored. The persistent threat of insurgent attacks discouraged investment in long-term assets such as tractors or irrigation systems, leading to a preference for low-risk, low-yield farming methods.

The combined effect of these factors has been a dramatic decline in the mechanization rate across Borno State. Areas once served by government tractor-hiring units, agro-service centers, or private machinery owners have seen a sharp decrease in equipment availability and utilization. This reduction has contributed to lower agricultural productivity, higher production costs, and a growing dependence on food aid and imports. The loss of machinery has not only undermined food security but has also weakened the livelihoods of thousands of households dependent on agriculture.

In summary, the conflict in Borno State has caused a multifaceted breakdown in agricultural mechanization. The destruction of physical machinery, loss of technical personnel, collapse of support infrastructure, and ongoing insecurity have collectively contributed to a significant decline in agricultural productivity. Any serious effort at revitalizing agriculture in the region must consider the strategic restoration of agricultural machinery as a central component of broader post-conflict recovery initiatives.

Machinery Restoration Interventions

The destruction of agricultural machinery during the conflict in Borno State disrupted food production and significantly weakened the economic backbone of rural communities. In response, a combination of federal and state government initiatives, international development programs, and community-led efforts emerged to address the machinery gap and restore mechanized agriculture. These interventions played a crucial role in reviving farming activities and restoring livelihoods, especially in areas gradually regaining stability.

Government-Led Machinery Restoration Programs

The Nigerian government, through agencies such as the Federal Ministry of Agriculture and Rural Development (FMARD), launched various schemes aimed at improving access to agricultural equipment in conflict-affected regions. A prominent initiative involved the deployment of tractor-hiring units (THUs), which allowed smallholder farmers to rent tractors and other machinery at subsidized rates. The Borno State government partnered with these efforts by rehabilitating disused equipment depots and reactivating service centers.

Additionally, the Central Bank of Nigeria (CBN), through its Anchor Borrowers' Programme (ABP), facilitated access to mechanized services by linking farmers with input suppliers, including machinery leasing companies. This encouraged the formation of cooperatives and enhanced collective bargaining power among farmers in Borno's rural communities.

International Donor and NGO Contributions

Several international organizations supported machinery restoration efforts either directly through the provision of equipment or indirectly by funding vocational training and infrastructure rehabilitation. The Food and Agriculture Organization (FAO) distributed hand-held and small-scale mechanized equipment to farmers in IDP-return areas, prioritizing women and vulnerable households. Similarly, the United Nations Development Programme (UNDP) launched community stabilization projects that included the establishment of agricultural service hubs equipped with tractors, planters, and harvesters.

Non-governmental organizations also played a vital role in capacity-building. For instance, programs focused on training young people to become tractor operators and maintenance technicians, thus ensuring sustainability and reducing dependence on external support for machinery upkeep.

Community-Led Refurbishment and Equipment-Sharing Models

In several localities, farmers' groups and cooperatives spearheaded low-cost refurbishment of damaged or abandoned machinery. With technical support from local engineers and NGOs, these groups managed to restore functionality to tractors and processing units, often using locally sourced parts. These community efforts contributed significantly to building trust, economic solidarity, and self-reliance among returnee farmers.

The emergence of equipment-sharing cooperatives also facilitated machinery access for smallholder farmers who could not afford individual ownership. By pooling resources, members collectively rented or maintained shared tractors, threshers, and irrigation pumps. This model improved efficiency and optimized land use, particularly in areas recovering from displacement.

Machinery Training and Maintenance Programs

One of the persistent challenges in post-conflict agricultural restoration is the lack of skilled operators and mechanics for sophisticated equipment. To address this, targeted vocational training programs were introduced by both governmental institutions and international partners. These programs included short courses in tractor driving, engine diagnostics, and preventive maintenance. Some centers also incorporated certification, enabling trained individuals to secure employment or offer services commercially.

The revitalization of technical colleges in Maiduguri and nearby towns helped sustain these efforts. Partnerships with agricultural engineering departments in Nigerian universities further enhanced the quality of training and provided access to diagnostic tools and machinery models used across the country.

Table 1: Summary of Machinery Restoration Interventions in Borno State

Actor/Agency	Type of Intervention	Tools/Equipment Provided	Target Beneficiaries	Outcomes
Federal Ministry of Agriculture	Tractor Hiring Units, depot rehabilitation	Tractors, ploughs, harrows	Smallholder farmers	Increased access to mechanized services
Borno State Government	Depot restoration, subsidy programs	Repaired tractors, threshers	Local farming cooperatives	Reactivated local agricultural economy
FAO	Equipment distribution, training	Tillers, seeders, harvesters	IDPs, returnees, women	Boosted food production in return areas
UNDP	Agricultural service hubs, capacity-building	Tractors, planters, irrigation units	Community groups	Enhanced community resilience and stability
NGOs (various)	Youth vocational training, refurbishment assistance	Training kits, basic tools	Displaced youth, local technicians	Improved technical capacity and local jobs
Farmers' Cooperatives	Shared ownership and refurbishment of machinery	Repaired old equipment	Low-income and displaced farmers	Promoted self-reliance and resource pooling

Overview of Machinery Restoration Interventions in Borno State

The Table 1 summarizes key actors, their interventions, and the target outcomes associated with machinery restoration in Borno State:

Despite these successes, several limitations persist. Many rural areas remain insecure, deterring equipment deployment and service delivery. The lack of spare parts especially for imported tractors constrains repair efforts, while fuel scarcity in some regions hampers consistent machinery use. Furthermore, gender equity remains a challenge, as cultural norms sometimes restrict women's participation in mechanized farming or training.

To ensure the sustainability of machinery restoration, interventions must be embedded in broader agricultural development strategies that include infrastructure investment, market access, and climate-smart practices. Ensuring local ownership, technical training, and private sector engagement is crucial for long-term resilience.

Outcomes and Challenges

The restoration of agricultural machinery in Borno State has led to several tangible and measurable outcomes that support the broader agenda of agricultural revitalization in conflict-affected zones. These outcomes include improved agricultural productivity, re-engagement of displaced populations in farming, the establishment of local repair networks, and enhanced food security at community levels. However, these gains are tempered by persistent challenges, including security concerns, logistical difficulties, limited financing, and inadequate infrastructure.

Outcomes of Machinery Restoration

Efforts to restore damaged or abandoned agricultural machinery through public-sector investments, donor programs, and private initiatives have yielded measurable benefits in affected local government areas (LGAs) across Borno State. Key outcomes include:

- **Increased Farm Output**: Mechanized tools such as tractors, harvesters, and water pumps have significantly reduced labor time and enabled the cultivation of larger areas of farmland. This has led to increased yields, especially for staple crops such as maize, millet, and rice.
- **Farmer Reintegration**: Restoration programs have facilitated the reintegration of internally displaced persons (IDPs) into agricultural livelihoods. Mechanized farming has proven especially effective in attracting youth and returning male household heads to agriculture.
- **Skill Development and Employment**: Several intervention programs incorporated vocational training for local youth in machinery maintenance and repairs. This has created job opportunities and reduced dependency on external technicians.
- **Cooperative Farming Models**: The establishment of cooperative groups to share restored machinery has encouraged communal farming practices and enhanced equitable access to agricultural assets among smallholder farmers.
- **Food Security Improvements**: The cumulative effect of restored farming activity has contributed to an increase in local food availability and a gradual reduction in dependence on food aid in some communities.

The Table 2 summarizes these outcomes across selected LGAs where machinery restoration interventions were implemented:

Persistent Challenges

Despite these achievements, machinery restoration initiatives in Borno State continue to face several complex and interrelated challenges:

- **Security Volatility**: The ongoing presence of insurgent groups in rural areas limits access to farmland and deters both government and private sector engagement in long-term restoration programs. Insecurity also disrupts equipment transportation and installation.
- **Spare Parts and Maintenance Infrastructure**: The lack of reliable supply chains for spare parts, lubricants, and maintenance tools severely constrains the operational longevity of restored machinery. Most LGAs do not have authorized service centers, forcing farmers to travel long distances for repairs.
- **Fuel Accessibility and Cost**: Fuel scarcity and high prices limit the regular use of heavy machinery such as tractors and pumps. Many farmers are forced to ration usage or revert to manual methods.
- **Limited Financial Access**: Although some microcredit and government subsidy schemes exist,

Table 2: Key Outcomes of Machinery Restoration Programs in Borno State

Outcome category	Examples from field (Selected LGAs)	Impact summary
Farm Output	Mafa, Konduga, Jere	40–60% increase in acreage cultivated post-restoration
Farmer Reintegration	Gwoza, Bama	Over 1,200 IDPs resumed farming in 2019–2020
Skill Development	Maiduguri, Chibok	300+ youths trained in tractor repair and servicing
Cooperative Farming	Damboa, Monguno	22 machinery-sharing cooperatives formed
Local Food Security	Kaga, Dikwa	15–25% reduction in food aid dependency

many smallholder farmers lack the collateral or documentation needed to access them. This restricts their ability to purchase, rent, or maintain mechanized equipment.

- **Weak Institutional Coordination**: Duplication of efforts among different actors governmental, non-governmental, and international agencies—leads to inefficiencies. A lack of centralized databases and monitoring frameworks makes it difficult to track equipment allocation, usage, and condition.
- **Gender Inequality in Access**: Women farmers, who represent a significant portion of agricultural labor, often have less access to restored machinery due to socio-cultural norms and cooperative group dynamics dominated by men.

These challenges suggest that while machinery restoration is a critical lever for post-conflict agricultural recovery, it must be embedded within a broader ecosystem of support that addresses finance, logistics, gender equity, and peacebuilding.

Discussion

The restoration of agricultural machinery in conflict-affected areas of Borno State has demonstrated measurable contributions to agricultural revitalization, socio-economic recovery, and community resilience. This discussion section synthesizes the empirical findings with practical considerations, highlighting key mechanisms through which machinery restoration initiatives impact agricultural output, labor engagement, and long-term sustainability.

Machinery as a Catalyst for Agricultural Revitalization

Mechanization plays a critical role in reactivating farmlands that were abandoned during the conflict. The reintroduction of functional tractors, ploughs, planters, and other equipment significantly reduced the physical labor burden on returning farmers. Additionally, mechanization enabled the expansion of cultivated land beyond pre-conflict levels in some communities, particularly where cooperative ownership models or NGO-supported schemes facilitated access to shared equipment.

Farmers interviewed across southern and central Borno confirmed that machinery availability shortened planting and harvesting cycles, leading to higher productivity even within the first year of reintegration. Many community members emphasized how the return of basic mechanized services marked a turning point in their decision to re-engage in agriculture, particularly among youth who had previously disengaged from farming due to manual labor intensity.

Socio-Economic Implications

Machinery restoration not only improved agricultural output but also created new livelihood pathways. Youth previously involved in non-agricultural informal labor, or those displaced by conflict, began engaging in machinery repair, operation, and maintenance services. This shift contributed to a modest but notable increase in rural employment, particularly in areas where training programs were offered by international agencies or state-supported initiatives.

Table 3 summarizes observed socio-economic impacts from machinery restoration activities in Borno State:

While mechanization positively impacted most communities, the distribution of benefits was uneven. Larger, more accessible communities often received earlier or better machinery support compared to remote or highly insecure areas.

Constraints and Persistent Challenges

Despite the progress, machinery restoration in Borno remains constrained by several persistent challenges:

- **Insecurity:** Ongoing sporadic attacks and the presence of insurgent groups limit the accessibility of certain farmlands and discourage investment in machinery storage or repair hubs.
- **Infrastructure Decay:** Poor road networks hinder the transportation of machinery, spare parts, and fuel, especially during the rainy season.
- **Lack of Spare Parts and Technical Support:** Most restored machinery relies on imported components, creating long repair timelines and increased operational costs.
- **Inequitable Access:** Farmers without affiliation to cooperatives or lacking political connections often remain excluded from restoration initiatives.

These challenges underline the need for a more localized and decentralized approach to machinery support, one that prioritizes equitable access and community-led management.

Broader Insights and Comparative Perspectives

Comparisons with similar post-conflict recovery contexts in other regions suggest that machinery restoration can be most effective when embedded in broader agricultural development programs. Stand-alone interventions often

Table 3: Summarizes observed socio-economic impacts from machinery restoration activities in Borno State

Impact area	Description
Increased Farm Productivity	Reduced time and labor in land preparation and harvesting
Youth Employment	Job creation in machinery operations and repairs
Cooperative Strengthening	Formation of farmer groups for machinery sharing and maintenance
Income Recovery	Boost in household earnings through increased yields and surplus sales
Gender Inclusion	Mechanization reduced labor intensity, enabling more female participation

lack the resilience needed to survive political changes, donor exit, or renewed conflict.

A notable pattern from the case study in Borno is the effective role of multi-stakeholder collaboration. In areas where state agencies worked in partnership with NGOs and local cooperatives, the restoration process was more efficient, inclusive, and sustainable. This supports the case for integrated recovery models that address infrastructure, training, market access, and input support alongside mechanization.

Furthermore, the reintroduction of agricultural equipment serves as a psychological symbol of normalcy and recovery. Farmers noted that the mere presence of functioning machinery in a village sent strong signals of peace and opportunity, contributing to improved social cohesion.

Toward Sustainable Mechanization in Fragile Settings

The long-term sustainability of machinery restoration efforts in Borno hinges on several strategic priorities:

- **Capacity Building:** Continuous training of local technicians and operators is essential for reducing dependence on external support.
- **Decentralized Maintenance Hubs:** Establishing rural workshops for spare parts production and machinery servicing would strengthen local ownership and responsiveness.
- **Inclusive Financing Models:** Micro-loans, leasing schemes, and equipment cooperatives can enhance machinery access, especially for smallholder and female farmers.
- **Security Integration:** Mechanization programs should be aligned with regional stabilization strategies to ensure sustained field access and operational safety.

These priorities reflect the broader need to shift from emergency response to developmental planning in conflict-affected agricultural regions.

Conclusion and Policy Recommendations

This study examined the role of agricultural machinery restoration in revitalizing farming livelihoods within the conflict-affected region of Borno State, Nigeria. The evidence demonstrates that targeted interventions in machinery repair, distribution, and training have contributed to improved farm productivity, increased community resilience, and the gradual restoration of rural economies.

Findings indicate that mechanization reduces labor burden, expands cultivated land, and encourages the return of displaced populations to farming activities. Additionally, machinery-related services have generated alternative employment, particularly for youth and returnees. However, these gains are unevenly distributed and remain vulnerable to persistent challenges such as insecurity, infrastructural decay, limited technical capacity, and inequitable access to restoration programs.

The restoration of agricultural machinery should not be treated as a standalone intervention. Rather, it must be part of a broader recovery framework that integrates livelihood support, rural infrastructure, training, access to finance, and security stabilization. The Borno case illustrates the transformative potential of machinery when properly coordinated and community-led, offering important lessons for similar conflict zones across sub-Saharan Africa and beyond.

Policy Recommendations

To sustain and scale the gains observed in Borno State, the following policy actions are recommended:

1. Institutionalize Machinery Restoration in Post-Conflict Agricultural Policy

Federal and state agricultural recovery strategies should explicitly incorporate machinery restoration as a central pillar. This includes budgetary allocations, legislative backing, and coordination platforms for multi-stakeholder engagement.

2. Strengthen Community-Based Mechanization Models

Support for farmer cooperatives and local machinery pools should be expanded to ensure equitable access. These models reduce costs, enhance ownership, and build local capacity for machinery management.

3. Develop Rural Mechanization and Maintenance Hubs

Establish decentralized service centers for machinery repairs, spare parts supply, and operator training. These hubs should be strategically located in accessible rural zones and operated through public-private-community partnerships.

4. Promote Youth Engagement and Technical Skills Training

Machinery repair and operations training should be integrated into existing agricultural extension and vocational education systems. Certification programs can improve employability and stimulate rural enterprise development.

5. Facilitate Access to Financing for Equipment Acquisition

Introduce flexible financing mechanisms such as equipment leasing, revolving funds, and interest-free loans targeted at smallholder farmers, youth, and women. Partnerships with microfinance institutions and development banks can enhance outreach.

6. Integrate Mechanization into Regional Peacebuilding Frameworks

Agricultural revitalization programs, including mechanization, must be aligned with broader peace and stabilization strategies. Local security assessments should inform the roll-out of interventions to ensure safety and continuity.

7. Monitor and Evaluate Machinery Restoration Programs

Establish data-driven monitoring systems to track machinery distribution, usage, maintenance, and outcomes. This can inform real-time decision-making, resource allocation, and future scale-up efforts.

By aligning machinery restoration with inclusive, localized, and resilience-focused strategies, Borno State and other regions facing similar conflict-induced agricultural collapse can rebuild their food systems, empower rural populations, and drive sustainable development in the post-crisis era.

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