
ASSESSING THE RELEVANCE OF COMMUNITY-BASED MANURE PRODUCTION PROJECT IN ENHANCING FOOD SECURITY: A CASE STUDY OF DZOOLE VILLAGE, NTCHEU DISTRICT.

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1.0 INTRODUCTION

Food security remains a major development challenge in sub-Saharan Africa, where poverty, climate variability, land degradation, and unsustainable agricultural practices continue to constrain agricultural productivity. In Malawi, the situation is particularly severe in rural areas where livelihoods depend largely on smallholder farming. Declining soil fertility and increasing reliance on costly inorganic fertilizers have significantly reduced crop yields, thereby threatening household food security (FAO, 2021). As a result, there is growing interest in sustainable, low-cost agricultural practices that enhance soil productivity while reducing dependence on external inputs.

Community-based manure production has emerged as a viable alternative to inorganic fertilizers, particularly in resource-constrained rural settings. Organic manure derived from livestock waste and crop residues improves soil structure, increases nutrient availability, enhances moisture retention, and supports long-term soil health (Chikowo et al., 2017). Beyond agronomic benefits, community-driven manure initiatives promote local participation, knowledge sharing, and collective responsibility for agricultural development. In Malawi, where access to chemical fertilizers remains limited for many smallholder farmers, manure production offers a locally available and environmentally sustainable solution to declining agricultural productivity (Mhango et al., 2020).

Despite these potential benefits, food insecurity persists. The Malawi Vulnerability Assessment Committee reported that more than 4.4 million people experienced food shortages during the 2021/2022 agricultural season, particularly in rural areas affected by poor soils and high input costs. While government fertilizer subsidy programs exist, many

farmers continue to face challenges related to affordability, accessibility, and environmental impacts associated with inorganic fertilizers (Mloza-Banda et al., 2019). Consequently, there is a need to explore alternative approaches that are affordable, sustainable, and locally adaptable.

Dzoole Village in Ntcheu District has implemented a community-based manure production project aimed at improving household food security through enhanced soil fertility and crop productivity. Although anecdotal evidence suggests positive outcomes, there has been limited empirical assessment of the project's relevance and effectiveness. This study therefore examined the contribution of community-based manure production to food security in Dzoole Village, focusing on household food availability, crop productivity, community awareness and adoption of manure production practices, and the sustainability of the intervention. By providing empirical evidence from a rural Malawian context, the study contributes to policy discussions and development strategies aimed at promoting sustainable agriculture and resilient food systems.

2.0 Literature Review

Community-based manure production has gained global recognition as a sustainable agricultural practice that enhances soil fertility and contributes to improved food security, particularly among smallholder farmers. Organic manure derived from livestock waste and crop residues improves soil structure, increases nutrient availability, and enhances moisture retention, thereby supporting crop productivity and long-term soil health (Vanlauwe et al., 2015; Smith et al., 2017). Unlike inorganic fertilizers, organic manure promotes ecological balance and reduces environmental degradation, making it a viable option for resource-constrained farming systems (Pretty et al., 2018).

At the global level, studies indicate that manure-based soil fertility management can significantly increase crop yields and improve household food availability. A meta-analysis by Lee and Lee (2019) found that integrated manure management practices increased yields by up to 30 percent in smallholder systems. The Food and Agriculture Organization (FAO, 2018) further emphasizes that community participation is critical in scaling manure production and enhancing adoption through collective action, knowledge sharing, and social capital development.

In African contexts, empirical evidence demonstrates that community-based manure production positively influences food security outcomes. Studies conducted in Kenya, Rwanda, Uganda, and Tanzania show that smallholder farmers adopting manure-based

practices experience increased crop yields, improved household food availability, and reduced dependence on costly chemical fertilizers (Ndiritu et al., 2017; Munyaneza et al., 2019; Kabirizi & Mulema, 2018). Participatory approaches have been shown to enhance adoption rates and sustainability by fostering ownership and integrating indigenous knowledge into manure management practices (Mugisha et al., 2020).

In Malawi, declining soil fertility and limited access to inorganic fertilizers have intensified interest in organic manure as a sustainable alternative. Research conducted in rural districts, including Ntcheu, indicates that farmers who utilize organic manure report improved crop performance and enhanced food availability (Mwale & Banda, 2020; Phiri et al., 2021). Government and non-governmental organizations have increasingly promoted manure production as part of sustainable agricultural intensification strategies (Chirwa et al., 2019). However, adoption remains uneven due to labor demands, limited technical knowledge, seasonal availability of manure, and persistent preferences for chemical fertilizers (Zuze & Chilanga, 2018).

Despite its benefits, community-based manure production faces several challenges that limit its effectiveness. Common constraints include high labor requirements, inadequate infrastructure for manure collection and storage, and insufficient extension support (Gichangi et al., 2017; Kadzamira & Mvula, 2018). Socio-cultural perceptions and gender dynamics also influence participation, with women often bearing disproportionate labor burdens without equal access to benefits (Mhone & Chirwa, 2019). These challenges highlight the importance of institutional support, capacity building, and gender-sensitive approaches in manure project implementation.

Beyond agronomic outcomes, manure production projects generate important socio-economic benefits. Reduced expenditure on chemical fertilizers improves household financial stability, while increased crop yields enhance food availability and dietary diversity (Anderson & Peters, 2018; Phiri et al., 2021). Community collaboration strengthens social cohesion, knowledge exchange, and collective problem-solving, contributing to livelihood resilience (Mugisha et al., 2020). However, inequitable benefit distribution and limited market access for surplus production may constrain broader socio-economic gains.

The effectiveness and sustainability of community-based manure production projects depend on targeted strategies that address technical, social, and institutional constraints. Strengthening agricultural extension services, promoting improved composting and storage technologies, and integrating manure initiatives into national agricultural policies are widely recommended (FAO, 2018; Lee et al., 2020). In Malawi, demonstration plots, community

sensitization, and support for farmer groups have been identified as critical for improving adoption and long-term sustainability (Mwale & Banda, 2020; Phiri et al., 2021).

This study is guided by the Sustainable Livelihoods Framework and the Diffusion of Innovations Theory. The Sustainable Livelihoods Framework emphasizes how improvements in natural, human, and social capital contribute to resilient livelihoods and food security (DFID, 1999; Scoones, 2015). The Diffusion of Innovations Theory explains how manure production practices are adopted within communities based on perceived advantages, compatibility, and observability (Rogers, 2003; Dearing, 2019). Together, these frameworks provide a comprehensive lens for analyzing both the livelihood impacts and adoption dynamics of community-based manure production in Dzoole Village.

3.0 Study Design and Approach

The study employed a mixed-methods approach, integrating quantitative and qualitative techniques to assess the relevance of a community-based manure production project in enhancing food security in Dzoole Village, Ntcheu District, Malawi. The mixed-methods design enabled triangulation of data by combining numerical evidence on manure production and food security outcomes with qualitative insights into community experiences, perceptions, and implementation challenges (Creswell & Creswell, 2018; Fetters et al., 2013). A descriptive research design was adopted to provide an accurate representation of the project's current status and outcomes without manipulating variables (Saunders et al., 2019).

3.1 Study Area and Population

The study was conducted in Dzoole Village, Ntcheu District, a predominantly agrarian rural community reliant on smallholder farming. The target population comprised all farming households involved in or affected by the community-based manure production project. According to records from the Ntcheu District Agricultural Office (2023), the village has approximately 420 farming households. Key informants, including agricultural extension officers, local leaders, and project coordinators, were also included due to their direct involvement and knowledge of the project.

3.2 Sampling Techniques and Sample Size

Stratified random sampling was used to select farming households based on their level of involvement in the manure production project, ensuring representation of both participating and non-participating households. Purposive sampling was applied to select key informants with specialized knowledge of the project's implementation (Etikan et al., 2016; Palinkas et al., 2015).

The household sample size was determined using Cochran's formula at a 95% confidence level and a 5% margin of error. After applying the finite population correction for a total population of 420 households, a sample of 201 households was obtained. Additionally, approximately 10 key informants and three focus group discussions comprising 6–10 participants each were included to generate in-depth qualitative data.

3.3 Data Collection Methods

Data were collected using structured questionnaires, semi-structured interviews, focus group discussions, and non-participant observations. Structured questionnaires captured quantitative data on household characteristics, manure production practices, and food security indicators. Semi-structured interviews with key informants explored project implementation processes, perceived benefits, and operational challenges. Focus group discussions facilitated collective reflection on community experiences and adoption of manure production practices. Observations were conducted during farm visits to document manure production, storage, and application practices, thereby validating self-reported information (Robson, 2016).

Prior to data collection, research assistants were trained to ensure consistency and reliability. Data collection was conducted through face-to-face interviews to accommodate varying literacy levels among participants. With informed consent, interviews and discussions were audio-recorded and supplemented with field notes.

3.5 Data Analysis

Quantitative data were coded and analyzed using statistical software (SPSS or STATA). Descriptive statistics, including frequencies, percentages, means, and standard deviations, summarized household characteristics and food security indicators. Inferential analyses, such as chi-square tests and correlation analysis, examined relationships between manure use and food security outcomes (Field, 2018; Pallant, 2016).

Qualitative data from interviews and focus group discussions were transcribed verbatim and analyzed thematically following the procedures outlined by Braun and Clarke (2019). Themes were identified through iterative coding and comparison. Integration of qualitative and quantitative findings enhanced analytical depth and strengthened the validity of the results.

3.6 Ethical Considerations

Ethical approval was obtained from the relevant Institutional Review Board prior to data collection. Permission was also secured from district authorities and local community leaders. Participants were informed about the study's purpose, voluntary nature, and confidentiality of their responses. Written informed consent was obtained, and anonymity was ensured through

the use of identification codes. All data were securely stored and accessed only by the research team, in accordance with established ethical research standards (Israel & Hay, 2018; Resnik, 2018).

4.0 RESULTS AND DISCUSSION

4.1 Socio-Demographic Characteristics of Respondents

The majority of respondents (62%) were aged between 30 and 55 years, representing the economically active farming population in Dzoole Village. Younger farmers aged 18–29 accounted for 18%, while respondents above 55 years constituted 20%. This distribution indicates that the community-based manure production project primarily engaged active producers capable of implementing labor-intensive soil fertility practices. Female respondents represented 55% of participants, reflecting women’s central role in crop production and soil fertility management in rural Malawi. Similar patterns have been reported in smallholder farming systems where women play a critical role in household food security.

4.2 Community Awareness and Participation

Awareness of the Community-Based Manure Production Project was high, with 88% of respondents reporting knowledge of the initiative. Village meetings (52%), lead farmers (28%), and agricultural extension officers (20%) were the main sources of information. High awareness suggests effective community sensitization and aligns with participatory development principles that emphasize information sharing as a driver of adoption.

Participation levels were also substantial, with 46% of households reporting high participation and 34% reporting moderate participation. Only 20% demonstrated low involvement. Activities included raw material collection, compost preparation, storage, and field application. High participation levels indicate strong community ownership and acceptance of the project, which is essential for sustainability and long-term impact.

4.3 Effects on Soil Fertility and Crop Productivity

Most respondents (79%) reported noticeable improvements in soil fertility following manure application. Farmers observed improved soil structure, enhanced moisture retention, and increased workability of soils, including the restoration of previously degraded fields locally referred to as *malo a chouma*. These findings are consistent with studies highlighting the role of organic manure in improving soil organic matter and microbial activity.

Increased crop yields were a key outcome of the project. Average maize yields increased from 8 to 13 bags per acre (+62%), groundnuts from 4 to 6 bags per acre (+50%), and beans from 2 to 3.5 bags per acre (+75%). Yield improvements were attributed to enhanced nutrient

availability and improved soil conditions. However, variations were observed depending on manure application rates, composting quality, and complementary practices such as crop rotation, underscoring the importance of technical guidance.

4.4 Household Food Availability

Improved crop productivity translated into enhanced household food availability. Approximately 72% of households reported improved food security, with maize stocks lasting between 8 and 10 months compared to 4 to 6 months prior to the project. Increased production of legumes also contributed to improved dietary diversity and protein intake. These findings demonstrate a direct link between manure-based soil fertility management and household food security outcomes.

4.5 Perceived Benefits and Cost-Effectiveness

Most respondents perceived the project as beneficial and cost-effective. Reduced dependence on chemical fertilizers was reported by 79% of households, while 74% cited improved crop yields and 69% reported increased food availability. Additionally, 82% of respondents perceived manure use as a cheaper and more sustainable alternative to synthetic fertilizers, particularly in the context of rising input prices. Savings from reduced fertilizer purchases enabled households to meet other essential needs, reinforcing livelihood resilience.

4.6 Challenges Affecting Sustainability

Despite positive outcomes, several challenges threatened project sustainability. Limited access to raw materials affected 58% of households, particularly during the dry season. Manure production was also labor-intensive, placing a heavy burden on women and households with limited labor capacity. Inadequate technical knowledge resulted in improper composting and suboptimal application practices, while poor storage facilities led to nutrient losses and reduced manure quality.

These challenges mirror findings from other rural contexts where labor constraints, limited extension support, and infrastructure gaps undermine organic soil fertility initiatives.

4.7 Long-Term Sustainability

Most respondents expressed willingness to continue manure production due to visible benefits in soil fertility, crop yields, and food availability. Sustainability was strengthened by peer learning, collective labor arrangements, and the use of locally available resources. However, continued extension support, access to appropriate tools, improved storage facilities, and targeted training were identified as critical for sustaining adoption and scaling benefits.

Overall, the findings demonstrate that the community-based manure production project was relevant, effective, and aligned with local farming systems, but its long-term success depends on addressing technical, labor, and institutional constraints.

5.0 DISCUSSION, CONCLUSION AND RECOMMENDATIONS

5.1 DISCUSSION

The findings of this study demonstrated that the Community-Based Manure Production Project (CBMPP) significantly contributed to improved soil fertility, crop productivity, and household food security in Dzoole Village, Ntcheu District. The widespread application of organic manure enhanced soil structure, moisture retention, and nutrient availability, resulting in increased yields of maize, beans, and groundnuts. These findings align with sustainable agriculture literature in Malawi, which emphasizes organic manure as an effective and affordable soil fertility management strategy for smallholder farmers.

Community-based manure production improved accessibility to organic fertilizer, particularly for households with limited livestock ownership. Collective manure management arrangements enabled resource-sharing, reduced individual constraints, and strengthened social cohesion. In addition, capacity-building activities enhanced farmers' technical knowledge on composting, storage, and application practices, leading to more efficient manure utilization and improved crop performance.

The project also positively influenced household food security. Increased crop yields translated into longer food availability periods, with most households reporting maize stocks lasting between eight and ten months. Surplus production generated additional income for some households, enhancing economic resilience and reducing vulnerability to seasonal food shortages. These outcomes highlight the role of manure-based soil fertility interventions in supporting both food availability and livelihood security.

Despite these benefits, several challenges constrained full adoption and sustainability. Manure production was labor-intensive, limiting participation by households with inadequate labor. Inadequate technical knowledge, poor manure storage facilities, and limited livestock ownership further reduced the effectiveness of manure application. Initial community perceptions also affected early adoption, as some households viewed the practice as demanding and slow to yield results. However, acceptance improved over time as tangible benefits became evident.

Overall, the findings indicate that community-based manure production is a viable and sustainable approach to enhancing food security in rural Malawi, provided that technical, labor, and infrastructural constraints are adequately addressed

5.2 CONCLUSION

The study concluded that the Community-Based Manure Production Project significantly enhanced soil fertility, crop yields, and household food security in Dzoole Village, Ntcheu District. The use of organic manure improved agricultural productivity while reducing reliance on costly chemical fertilizers, making crop production more affordable and sustainable for smallholder farmers. Capacity-building initiatives strengthened farmers' knowledge and confidence in manure management practices, supporting continued adoption beyond the project period.

However, the sustainability of the intervention was challenged by labor demands, inadequate storage facilities, limited manure availability, and gaps in technical knowledge. Despite these constraints, the project demonstrated strong potential for long-term impact when supported by community participation, training, and extension services. The study therefore concludes that community-based manure production is an effective, low-cost, and environmentally sustainable strategy for improving food security in rural farming communities.

5.3 RECOMMENDATIONS

1. **Strengthen Community Participation:**

Continued community engagement through collective labor arrangements, participatory decision-making, and peer learning should be promoted to enhance ownership and sustainability of manure-based interventions.

2. **Improve Training and Extension Support**

Regular training and extension services should be strengthened to enhance farmers' technical knowledge on manure composting, storage, and application, as well as integrated soil fertility management practices.

3. **Enhance Access to Tools and Infrastructure**

Provision of appropriate tools such as wheelbarrows, composting pits, and covered storage facilities is essential to reduce labor constraints and minimize nutrient losses.

4. **Expand Community Manure Production Units**

Establishing additional or larger communal manure production units would improve access for households with limited livestock and ensure equitable distribution of organic fertilizer.

5. Integrate Complementary Agricultural Practices:

Manure application should be combined with practices such as crop rotation, intercropping, mulching, and residue management to maximize soil fertility and long-term productivity.

5.4 Suggestions for Further Research

Further research is recommended to assess the long-term effects of repeated manure application on soil health and crop productivity, as well as the labor and cost-efficiency of community-based manure production systems. Studies should also explore social and behavioral factors influencing adoption, and evaluate innovative low-cost manure storage and distribution systems suitable for smallholder farmers.

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