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Evaluating The Socioeconomic Impact of Dairy Farming on Rural Communities in Nigeria: A Case Study of The ALDDN Program

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Abstract **Original Research Article**

This study evaluates the socioeconomic impact of dairy farming on rural communities in Nigeria, with a specific focus on the Accelerated Livestock Development and Dairy Nigeria (ALDDN) Program. The study adopts a mixed-methods research design, combining quantitative data from 899 respondents across multiple states with qualitative insights from focus group discussions and key informant interviews. Using the Women's Empowerment in Agriculture Index (WEAI) framework alongside descriptive and inferential statistics, the study assesses income generation, gender empowerment, resource access, and livelihood outcomes. Findings reveal that the program has significantly improved household income, milk production, and women's participation in productive decision-making, with 96.3% of women demonstrating empowerment in this domain. However, substantial gaps persist in asset ownership, access to credit, market participation, and leadership roles, with women disproportionately disadvantaged. Additionally, high workload burdens and limited leisure time highlight ongoing issues of time poverty, particularly among women. While the program has strengthened dairy value chains and enhanced rural livelihoods, socio-cultural barriers and structural inequalities continue to constrain equitable benefits. The study concludes that dairy farming holds strong potential for rural transformation but requires more inclusive, gender-sensitive policies and targeted interventions to ensure sustainable and equitable development outcomes.

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Introduction

Dairy farming plays a significant role in rural livelihoods across developing economies, particularly in sub-Saharan Africa where agriculture remains a primary source of income and employment (Magaji & Musa, 2024). In Nigeria, the livestock subsector contributes meaningfully to the agricultural gross domestic product (Musa et al., 2025), with dairy production offering opportunities for income diversification, food security, and nutritional improvement (Food and Agriculture Organization [FAO], 2022). Despite its potential, Nigeria's dairy industry is still largely underdeveloped, characterized by low productivity, inadequate infrastructure, and limited access to modern technologies. Rural communities, which form the backbone of dairy production, often face structural challenges that hinder their ability to fully benefit from this economic activity.

The introduction of structured dairy development initiatives such as the Alddn Program represents a strategic effort to address these constraints and enhance the productivity of rural dairy farmers. The Alddn Program is designed to improve milk production, strengthen value chains, and promote inclusive participation among smallholder farmers. By integrating training, financial support, and access to improved breeds and veterinary services, the program aims to transform traditional dairy farming practices into more sustainable and commercially viable ventures. Such interventions are critical in bridging the gap between subsistence farming and market-oriented agricultural systems (World Bank, 2021).

Socioeconomically, dairy farming has the potential to generate employment, increase household income, and stimulate rural development. It also contributes to poverty alleviation by providing a steady source of revenue and improving access to essential services such as education and healthcare. Studies have shown that livestock-based livelihoods, particularly dairy farming, enhance resilience

among rural households by offering a buffer against economic shocks and seasonal fluctuations in crop production (Otte et al., 2019). However, the extent to which these benefits are realized often depends on the effectiveness of policy frameworks and development programs like Alddn.

In addition to economic benefits, dairy farming has important social implications for rural communities. It fosters community cohesion through cooperative structures and shared resource management systems. Moreover, it empowers marginalized groups, especially women, who are often actively involved in milk production, processing, and marketing. Women's participation in farming has been linked to improved household welfare and gender equity, as it enhances their decision-making power and financial independence (Njuki & Sanginga, 2013; Dada et al., 2025). Therefore, evaluating programs like Alddn requires a multidimensional approach that captures both economic and social outcomes.

Despite the recognized importance of dairy farming, there is limited empirical evidence on the specific impact of targeted interventions such as the Alddn Program within the Nigerian context. Many existing studies focus broadly on agricultural development without isolating the effects of specific programs on rural livelihoods. This creates a knowledge gap that hinders effective policy formulation and program design. Understanding how the Alddn Program influences income levels, employment opportunities, social inclusion, and overall community development is essential for scaling up successful strategies and addressing existing shortcomings.

Against this backdrop, this study seeks to evaluate the socioeconomic impact of dairy farming on rural communities in Nigeria, with a specific focus on the Alddn Program. By adopting a case study approach, the research aims to provide in-depth insights into the program's effectiveness in improving the livelihoods of rural households. The findings are expected to contribute to academic discourse, inform policymakers, and guide stakeholders in enhancing the sustainability and inclusiveness of dairy development initiatives in Nigeria.

Literature Review and Theoretical Framework

Conceptual Review

Socioeconomic

The concept of socioeconomic refers to the interaction between social and economic factors that influence the well-being and quality of life of individuals and communities (Jummai et al., 2025; Magaji et al., 2025). It encompasses variables such as income, education, employment, social status, and access to basic services, all of which determine living standards and development outcomes (Magaji et al., 2026). In rural development studies, socioeconomic conditions are often used to assess poverty levels, inequality, and social inclusion, particularly in agrarian societies where livelihoods are closely tied to natural resources (Ologbonori et al., 2025; Musa et al., 2024). A strong socioeconomic framework is essential for understanding how economic activities, such as agriculture or dairy farming, translate into improved welfare and social progress (Todaro & Smith, 2020).

Dairy Farming

Dairy farming refers to the agricultural practice of breeding, raising, and managing livestock—primarily cattle—for milk production and related dairy products such as cheese, butter, and yogurt. It plays a critical role in food systems by providing essential nutrients, including protein and calcium, while also serving as a source of income and employment for farmers. In developing countries like Nigeria, dairy farming is predominantly practiced on a smallholder scale using traditional methods, although there is increasing emphasis on modernization through improved breeds, feeding systems, and veterinary care. The sector holds significant potential for economic growth and rural transformation if supported by appropriate policies and infrastructure (Food and Agriculture Organization [FAO], 2022).

Rural Communities

Rural communities are settlements located outside urban and metropolitan areas, typically characterized by low population density, limited infrastructure, and a strong dependence on agriculture and natural resources for livelihoods (Bello et al., 2025). These communities often face challenges such as poverty, inadequate access to healthcare and education, and limited economic opportunities (Ijoko et al., 2021; Enaberue et al., 2024). However, they also possess unique social structures, cultural traditions, and communal support systems that can enhance resilience and collective development. In Nigeria, rural communities are central to agricultural production, including dairy farming, and their development is critical for achieving national food security and sustainable economic growth (International Fund for Agricultural Development [IFAD], 2021).

ALDDN Program

The ALDDN (Accelerated Livestock Development and Dairy Nigeria) Program is an intervention initiative aimed at transforming Nigeria's livestock and dairy sector through improved productivity, value chain development, and inclusive participation of smallholder farmers. The program focuses on enhancing milk production, promoting the use of improved cattle breeds, strengthening extension services, and facilitating access to markets and financing. It also seeks to address systemic challenges such as inadequate infrastructure, poor animal health management, and low technological adoption. By targeting rural communities, the ALDDN Program aims to improve household incomes, create employment opportunities, and contribute to broader socioeconomic development within the agricultural sector (World Bank, 2021).

Theoretical Review

Sustainable Livelihoods Theory (SLT)

Sustainable Livelihoods Theory (SLT)**,** which emphasizes how individuals and households utilize available assets such as human, natural, financial, physical, and social capital to pursue livelihood strategies that improve their well-being and resilience. The theory is particularly applicable to rural development and agricultural interventions, as it provides a holistic lens for analyzing how programs like the ALDDN initiative influence income generation, food security, and social inclusion in rural communities. Within the context of dairy farming in Nigeria, SLT helps explain how access to improved livestock, training, credit facilities, and market linkages can enhance the livelihood outcomes of smallholder farmers. It also highlights the role of institutional support and policy environments in shaping the sustainability of these outcomes. By focusing on both economic and social dimensions, the theory aligns closely with the study's objective of evaluating the socioeconomic impact of dairy farming, as it captures how agricultural development initiatives translate into improved living standards and reduced vulnerability among rural populations (Chambers & Conway, 1992; Scoones, 1998).

Empirical Review

Adigun and Adeniyi-Oso (2023) conducted a study titled "Cost-Benefit Analysis of Dairy Farming in South West Nigeria." The study adopted a quantitative research design using a structured questionnaire administered to 150 dairy farmers selected through a multistage sampling technique, and data were analyzed using descriptive statistics and budgetary analysis. The findings revealed that dairy farming is a profitable venture with significant contributions to household income, food security, and self-sufficiency among rural farmers. However, challenges such as high production costs and inadequate infrastructure were identified. The study recommended increased government support, access to credit facilities, and improved dairy technologies to enhance productivity and profitability.

Adigun, et all (2023) carried out a study titled *"*Determinants of Profitability of Dairy Farming Enterprises among Smallholder Dairy Farmers in South-West Nigeria." The study used a survey methodology with structured questionnaires administered to smallholder farmers, and data were analyzed using regression analysis. The findings showed that factors such as herd size, feed quality, and access to veterinary services significantly influenced profitability. The study further established that dairy farming contributes positively to employment and income generation in rural areas. It recommended improved extension services and access to modern inputs to boost productivity.

Salman, et all (2025) conducted a study titled "Market Participation among Smallholder Dairy Farmers in Oyo State, Nigeria." The study employed a multistage sampling technique to select 132 respondents and used descriptive statistics alongside the Heckman two-stage regression model for analysis. Findings revealed that herd size, farming experience, and land ownership significantly influenced farmers' participation in dairy markets, while constraints such as fluctuating milk prices and poor government support limited participation. The study recommended strengthening extension services, improving market access, and stabilizing milk prices to enhance rural livelihoods.

Shamsudeen, et all (2024) conducted a study titled "Socioeconomic Characteristics and Constraints Affecting Dairy Cattle Production in Kano State." The study used survey research methods with questionnaires administered to dairy farmers, and data were analyzed using descriptive statistics. The findings indicated that low education levels, poor access to veterinary services, and inadequate infrastructure significantly constrained dairy production. The study also revealed that dairy farming remains a key livelihood activity among rural households. It recommended improved policy support, farmer education, and investment in rural infrastructure to enhance productivity.

Adeleye, O. R., and Kovács, K. (2022) conducted a study titled "Technical Efficiency of Dairy Farms in Rural Nigeria." The study utilized secondary data from the General Household Survey and applied Data Envelopment Analysis (DEA) alongside descriptive statistics. The findings showed that dairy farms operated below optimal efficiency levels, with an average efficiency of 83%, indicating the potential for increased production without additional resources. The study concluded that improved resource utilization and adoption of modern technologies could significantly enhance productivity and income. It recommended policy interventions focused on capacity building and technological adoption.

Ojo, et all (2022) conducted a study titled "Evidence-Based Design Process for Nutrition-Sensitive Agriculture Interventions: A Case Study of the Advancing Local Dairy Development Programme in Nigeria." The study adopted a mixed-methods approach, combining field surveys and program evaluation techniques. Findings showed that the dairy development program improved household nutrition, increased milk production, and enhanced income among participating farmers. The study emphasized the importance of integrating nutrition-sensitive approaches into agricultural programs and recommended scaling up such interventions to reach more rural communities.

Amolegbe, and Adewumi (2022) conducted a study titled "Agribusiness Firms and Rural Dairy Development: A Case of FrieslandCampina Dairy Development Programme in Nigeria." The study employed a case study approach using survey data and interviews with dairy farmers. The findings revealed that participation in the dairy development program improved farmers' access to markets, increased income levels, and enhanced overall welfare. However, concerns

about dependency on private firms and unequal benefit distribution were noted. The study recommended stronger regulatory frameworks and inclusive policies to ensure equitable benefits for rural farmers.

Gap in the Literature

A critical review of the above empirical studies reveals a notable research gap in the comprehensive evaluation of the socioeconomic impact of dairy development programs within rural communities in Nigeria. While studies such as Adigun et al. (2023) and Adeleye and Kovács (2022) primarily focused on profitability and technical efficiency of dairy farming, they paid limited attention to the broader social outcomes such as gender empowerment, social inclusion, and community welfare. Similarly, Salman et al. (2025) and Shamsudeen et al. (2024) examined market participation and production constraints but did not holistically assess how these factors translate into improved livelihoods at the household and community levels. Although Ojo et al. (2022) and Amolegbe and Adewumi (2022) explored dairy development programs, their analyses were either nutrition-focused or centered on private sector involvement, without an in-depth, localized assessment of specific interventions like the ALDDN Program. Furthermore, most of the reviewed studies adopted quantitative approaches with limited integration of qualitative insights that capture beneficiaries' lived experiences. Therefore, this study seeks to bridge this gap by providing a comprehensive, mixed-methods evaluation of the socioeconomic impacts of dairy farming, with particular emphasis on the ALDDN Program and its influence on income, employment, and social well-being in rural Nigerian communities.

Methodology

Research Design

This study will employ a descriptive survey and case study approach to gain in-depth insights into the socioeconomic impact of the ALDDN program on smallholder dairy farmers in Nigeria. This incorporates a mixed-methods research design, which combines both quantitative or descriptive surveys and qualitative or case study approach. This design is suitable for gaining a comprehensive understanding of the socioeconomic dimensions of dairy farming within rural settings. The case study approach is used to explore the context-specific impact of the ALDDN program, allowing for a focused examination of the experiences, livelihoods, and economic changes among targeted rural communities.

The mixed methods approach facilitates:

i. Quantitative measurement of changes in household income, expenditure, and welfare indicators, through surveys and structured interviews to collect measurable data on income levels, employment, and productivity.

ii. Qualitative insights into community perceptions, gender dynamics, and institutional engagement with the dairy value chains through questionnaires and key informant interviews (KIIs) to gather in-depth insights into perceptions, challenges, and benefits.

Study Area

The research will be conducted in selected rural communities located within ALDDN program intervention areas. The ALDDN program operates in states such as Jigawa, Bauchi, Taraba, Kaduna, Kano, Plateau and Adamawa, and their contribution to Nigeria's Dairy production cannot be overlooked. Within these states, specific Local Government Areas (LGAs) and communities where ALDDN activities (training, input provision, milk collection centers) are ongoing will be purposely selected.

Population of the Study and Sampling Techniques

Definition of Study Population

The study population comprises rural dairy farmers, particularly those participating in ALDDN. Random sampling techniques will be used to select farmers directly involved in the program, and the same sampling method will be applied to include relevant stakeholders in the local dairy value chain. The study population includes:

i. ALDDN-beneficiary households
ii. Non-beneficiary households (for comparison)
iii. Local dairy cooperatives and farmer associations
iv. Extension agents and program facilitators
v. Traditional leaders and key community stakeholders

Sampling Technique

Two major sampling techniques will be employed:

i. Purposive Sampling: Used to characteristics or traits that align with the purpose of this research, such as; ALDDN-implementing states, participating LGAs within them and beneficiaries of the initiative.
ii. Random sampling: To obtain data on impact at household level and obtain valid statistical testing to give data for accurate comparison and conclusion.

Sample Size

Using Cochran's formula for sample size determination at a 95% confidence level and an assumed response rate of 90%, the proposed sample size is approximately 1000 households, distributed as follows:

i. 500 ALDDN beneficiaries
ii. 500 non-beneficiary households (control group)

In addition, 10 focus group discussions (FGDs) and 20 key informant interviews (KIIs) will be conducted across the two states.

Sources and Methods of Data Collection

Primary Data

i. Structured Questionnaires: Used to collect quantitative data on income, food security, access to healthcare and education, milk production volumes, market participation, and household expenditures.
ii. Key Informant Interviews (KIIs): Conducted with ALDDN program coordinators, agricultural officers, cooperative leaders, and extension agents to understand program implementation, challenges, and community engagement.
iii. Focus Group Discussions (FGDs): Held separately with men, women, and youth groups in beneficiary communities to explore qualitative aspects such as gender roles, empowerment, knowledge transfer, and cultural barriers.

Secondary Data

i. ALDDN annual and technical reports
ii. Nigeria's National Bureau of Statistics (NBS) household survey data
iii. FAO and ILRI reports on dairy development
iv. Published academic and policy literature

Data Collection Methods

The following data collection methods will be used:

i. Questionnaire Schedule (pre-tested and translated into local languages where necessary)
ii. Interview Guides for KIIs and FGDs
iii. Observation Checklist to capture non-verbal data, dairy infrastructure, and community interactions with ALDDN facilities (e.g., milk collection centers)

Data Analysis Techniques

1. Statistical Tools

Data is analyzed using statistical software such as:

a. SPSS: For descriptive and inferential statistics.
b. Excel: For data organization and visualization.
c. STATA: For advanced statistical analysis, including regression modeling.

2. Descriptive Statistics

Descriptive statistics are used to summarize the data, including:

a. Frequencies and Percentages: To describe the distribution of responses.
b. Means and Standard Deviations: To summarize continuous variables (e.g., milk production levels).

3. Inferential Statistics

Inferential statistics are used to test hypotheses and examine relationships, including:

a. Regression Analysis: To identify factors influencing milk production and farmers' income.
b. Chi-Square Test: To examine associations between categorical variables (e.g., participation in the ALDDN program and income levels).

Results and Data Analysis

SAMPLE SIZE

Overall, a total of 577 Dairy Households were reached, as the initial target for data collection was 577 households, with two respondents per household (one male and one female), totaling 1,154 respondents. However, the final dataset includes 899 respondents in 54 Communities across 18 LGAs in Adamawa, Jigawa, Kano, Kaduna (plus Zaria) and Plateau States.

The reason for the shortfall is due to various challenges encountered during the survey. A key factor was respondent availability in multiple locations, only one respondent was present per household at the time of data collection. Additionally, in Plateau State, security concerns significantly hindered data collection. Due to escalating security threats, enumerators were unable to access certain areas, particularly Bokkos LGA, where a bandit attack resulted in

the death of a community member.

DATA COLLECTION AND ANALYSIS

DATA COLLECTION

Similarly, qualitative data collection included review of relevant ALDDN program documents, conduct of 19 Focused Group Discussions with approximately 150 respondents (68 persons per FGD) and 16 Key Informant Interviews targeted at respondents including community traditional and religious leaders, state actors in the Ministry of Agriculture and Rural Development, Nutrition and Dairy desk officers, Dairy Processors, implementing partner and program staffs

across six (6) implementation sites of the ALDDN program. A multi-staged sampling method was used to select target locations based on the ALDDN program sites. Within each state/site, a simple random sampling was adopted to select ALDDN farmers and other participants for this assessment, taking into consideration the respondents' selection criteria.

Site	LGA	Community	Dairy Households	Focus Group Discussions		Key Informant Interviews	
				Female	Male	Govt	Gatekeepers
Adamawa	5	15	150	3	2	1	3
Jigawa	3	9	90	2	1	1	2
Kaduna	1	3	30	1	1	-	-
Zaria	3	9	90	2	1	1	2
Kano	3	9	90	2	1	1	2
Plateau	3	9	90	2	1	1	2
Total	18	54	540	19		16	

Fig 1 Showing the distribution of the sample population

DATA ANALYSIS

The study analyzed data using an adapted Women's Empowerment in Agriculture Index (WEAI), focusing on women's empowerment in the dairy value chain through indicators such as access to resources, decision-making, workload distribution, and income control. Quantitative analysis assessed ten indicators across the five domains of empowerment—production, resources, income, leadership, and time—resulting in the computation of the Five Domains of Empowerment (5DE) and the Gender Parity Index (GPI), which together form the WEAI. This provided a comprehensive measure of women's empowerment, including both the extent and depth of disempowerment relative to men within households. Complementing this, qualitative analysis employed content, gap, and comparative approaches, involving systematic coding, categorization, and interpretation of transcribed data to capture diverse stakeholder perspectives. Descriptive methods, tally sheets, and a Findings, Conclusions, and Recommendations (FCR) matrix were used to ensure consistency and depth in analysis, while accounting for regional and socioeconomic variations, with data managed through digital tools such as ODK/Kobo Collect for accuracy and efficiency.

DATA MANAGEMENT

The data management process involved the systematic storage, organization, and protection of all collected data to ensure integrity, accessibility, and confidentiality. Data obtained through ODK/Kobo Collect were securely stored in a cloud-based system, while interview recordings and transcriptions were maintained on a dedicated Google Drive to enable centralized access and efficient collaboration among team members. Each dataset was properly labeled and categorized based on the assessment tools used, allowing for easy identification and tracking throughout the research process. Regular backups were conducted to prevent data loss, and access was restricted to authorized personnel to safeguard sensitive information. Additionally, routine audits and quality checks were carried out to ensure the accuracy, completeness, and reliability of the data, thereby supporting effective analysis and informed decision-making.

DATA FINDINGS AND ANALYSIS RESULTS

The findings integrate insights from the WEAI Household Survey and Focus Group Discussions conducted across Kano, Jigawa, Plateau, Adamawa, Zaria, and Kaduna, alongside a desk review of program and organizational documents to assess the implementation and outcomes of key project activities. The analysis focuses on thematic areas including inclusivity, access to resources, decision-making, market participation, and beneficiary challenges, providing a comprehensive understanding of the project's impact on gender relations, community engagement, and economic empowerment. By combining participant perspectives with thematic analysis, the study highlights both achievements and areas needing improvement to strengthen effectiveness and sustainability. It also identifies variations in performance across locations, considering cultural, economic, and infrastructural influences, and offers actionable insights for targeted interventions while outlining pathways for promoting long-term and equitable development in the communities.

Inclusive Participation in Production Decisions

The two indicators under the production domain are input in productive decisions and autonomy in production. The indicator about "input in productive decisions" is concerned with the level of input women have in making decisions about (food crop farming, cash crop farming, livestock raising, fish culture); the extent to which a woman feel she could make her own personal decisions regarding some aspects of household life if she wants to; such as agriculture production, what inputs to buy, what types of crops to grow for agricultural production, when or who would take crops to market and raising livestock. Women who achieve at least two out of the listed activities are considered empowered.

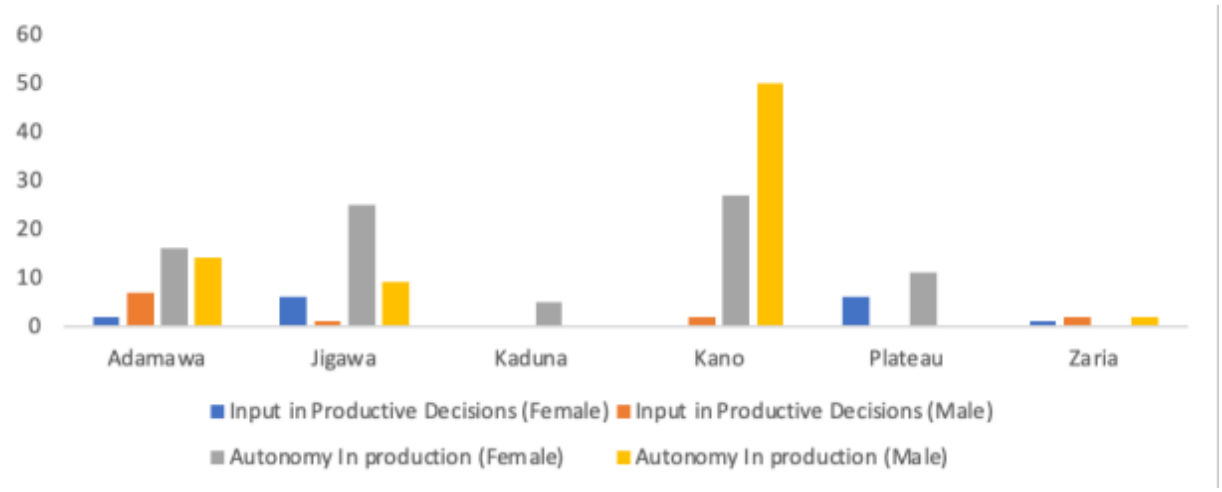

Fig 2 Chart showing the distribution of Productive decisions between men and women in the different ALDDN states.

The findings from the WEAI survey indicate a high level of women's empowerment in input into productive decisions among ALDDN program participants, with an overall rate of 96.3%. State-level variations show near-universal empowerment in Kaduna and Kano (100%), followed by Zaria (99%) and Adamawa (98%), while Jigawa (93%) and Plateau (88%) recorded slightly lower levels, reflecting pockets of disempowerment, particularly in Plateau. Male respondents also exhibited high empowerment levels, though disparities exist in certain locations. However, in terms of autonomy in production, a different pattern emerges, with notable levels of disempowerment among women in Kano (32%), Jigawa (28%), and Plateau (21%), while Zaria recorded none. Male disempowerment was generally lower except in Kano, where it reached 60%, indicating gendered and location-specific differences. Qualitative findings from FGDs and KIIs reveal gender-based division of labor, where women are primarily engaged in milk processing and hygiene, while men dominate herding and market interactions. Participation levels varied significantly across states, with strong engagement in Jigawa and Plateau attributed to effective sensitization and community cohesion, whereas Adamawa recorded lower female participation (35%), highlighting regional disparities. Additionally, sociocultural norms shape roles of men, women, and youth differently across communities. A critical gap identified is the exclusion of marginalized groups, particularly persons with disabilities, whose absence in program activities reflects limited inclusivity and the need for targeted interventions to ensure broader participation and equitable impact.

State	Inclusive Participation (%)	Key Observations	Community Claims	Program Efforts
Kano	75 %	Broad community participation, with gendered roles well-defined.	"The project has brought knowledge on how to manage	Training sessions were provided, though PWD
		Limited focus on PWD inclusion.	livestock is better."	inclusion strategies were not emphasized.
Jigawa	80%	Strong engagement, including families and youth, driven by cohesive community structures.	"Everyone, including men, women, and children, has benefited from water facilities."	Infrastructure, like water points, significantly enhanced participation.
Plateau	85%	Highest inclusivity, with significant roles for women and youth in farming and livestock activities.	"Women are now contributing actively in livestock management."	Community dialogues targeted equitable role distribution.
Adama wa	60%	Minimal inclusion of PWDs. Participation is mainly restricted to men and youth.	"We don't have disabled women/girls in this community."	Limited specific efforts were made to engage marginalized groups like PWDs.
Kaduna	70%	Moderately inclusive, with women active in milk processing.	"The project helped us understand better ways to process milk for sale."	Processing training improved womgn's engagement in economic activities.
Zaria	80%	Collaborative participation, including men, women, and youth, with some inclusion of PWDs.	"Women are now working alongside men in new ways."	Inclusion of youth and some marginalized groups improved participation dynamics.

Fig 2.2 Showing individual participation percentage and program efforts to actualize the objective.

Access to Resources

The domain of resources comprises three indicators namely, ownership of assets; purchase, sale, or transfer of assets; and access to and decisions on credit. Women who do not own at least one of agricultural land; large livestock; small livestock; fish pond/equipment; non-mechanized farm equipment; mechanized farm equipment; non-farm business equipment; House; large durables; small durables; cell phone; non-agriculture land; and means of transport are considered disempowered.

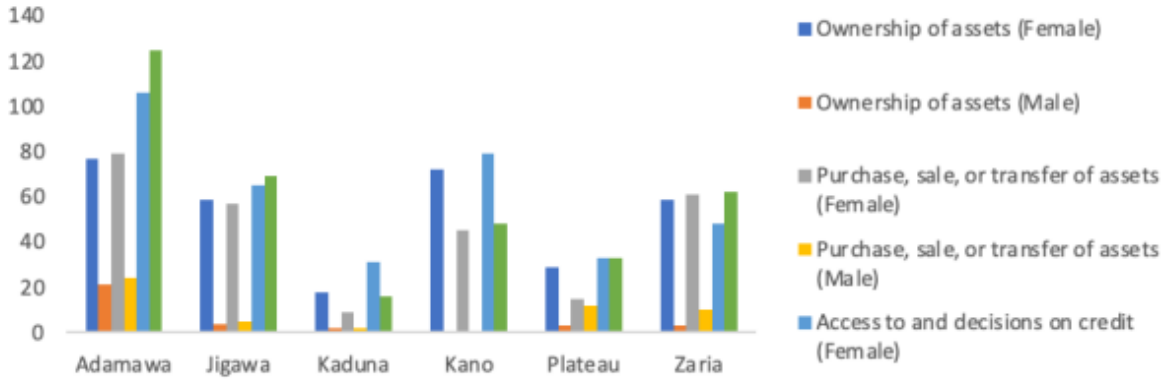

Figure 3 showing Indicators of Access to Resources across the different ALDDN states.

The survey findings reveal persistently low levels of women's empowerment in asset ownership, control, and access to credit across all six ALDDN program sites, with notable variations between locations. Women's disempowerment in asset ownership is highest in Zaria (88%) and Kano (86%), followed by Adamawa (71%), Jigawa (66%), Plateau (56%), and Kaduna (51%), while men consistently demonstrate higher empowerment with minimal disempowerment across all sites, including none in Kano. A similar gender gap exists in asset control, where women remain significantly disadvantaged, particularly in Zaria (91%) and Adamawa (73%), while men show stronger empowerment overall. Access to credit is also a major constraint, with over 70% of women disempowered across most locations, peaking at 94% in Adamawa and Kano, while men also face challenges but at comparatively lower levels. Overall, the results highlight persistent and systemic gender disparities in economic empowerment within the ALDDN program, with women consistently more excluded than men despite regional differences.

STATE	ACCESS TO RESOURCES (%)	MARKET ACCESS (%)	KEY OBSERVATIONS	COMMUNITY CLAIMS	PROGRAM EFFORTS
Kano	65%	60%	Women have access to training but rely on men for market information.	"Men control access to markets due to their mobility advantages."	Training provided, but women's market access remains constrained.
Jigawa	70%	65%	Structured markets (e.g., milk collection centers) improve women's participation and earnings.	"The milk centers made it easier for women to sell without hawking."	Established collection centers provided reliable income channels.
Plateau	80%	75%	Equal access to resources and markets; deliberate efforts to engage women in decision making.	"We now know how to use better tools and sell milk at fair prices."	Women's training and market sensitization workshops strengthened participation.
Adamawa	50%	50%	Minimal project impact on resource and	"We don't have enough resources to	Minimal interventions to improve women's access to resources or market systems.
			reliance on informal networks remains high.	compete or expand."	
Kaduna	60%	55%	Moderate access to training and resources; women face challenges in market mobility due to cultural norms.	"Women still struggle to get fair prices or information on buyers."	Sensitization efforts began but were insufficient to address entrenched barriers.

Fig 3.2 Showing percentage of participation per state and the program efforts

Market Access and Income

Sometimes when women participate in economic activities, they do not necessarily take part in the decisions on how the income generated is spent. This is disempowerment in "control over use of income". The results of the survey revealed that 31% of women who participated in the survey are disempowered in Adamawa while 26% are disempowered in Jigawa, 12% and 9% are disempowered in Zaria and Kaduna respectively whereas for Kano and Plateau, no woman reported is empowered in terms of control over use of income. On the side of the men, empowerment in control over use of income is higher across the sites. All the men in Jigawa, Kaduna, Plateau and Zaria achieve 100% empowerment in the control over use of income. Only 2% and 14% men reported disempowered in Adamawa and Kano respectively.

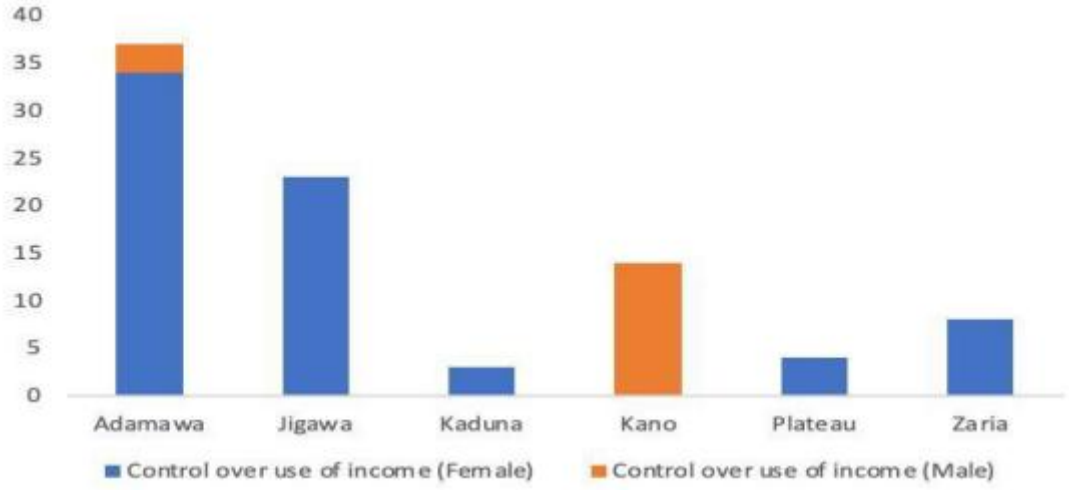

Fig 4 Showing Access and control over use of Income

Findings from FGD/KIIs also reveal that Men generally dominate market interactions due to greater mobility and access to market information. Women often rely on informal networks or their male counterparts for updates, limiting their ability to negotiate better prices or expand their reach. A male FGD Kano respondent noted that "men tend to have more access to phones and social media, thus gaining more market information,". However, the establishment of milk collection centers in Plateau and Jigawa has improved women's access to structured markets, reducing the need for hawking and providing more stable income sources. These centers have been particularly transformative, enabling women to participate more confidently in formal economic activities.

Leadership and Joint Decision Making

Findings from the survey showed that men participate more in social and economic groups more than women across the ALDDN program sites. Women disempowerment in group membership is actually low in Plateau, Zaria and Kaduna with 2 – 3 % disempowerment. The case is different in Adamawa, Jigawa and Kano where an average of 20% of the women are disempowered in group membership. None of the men in Kaduna, Kano and Plateau is disempowered in group membership. For Adamawa, 8%, Zaria, 9% and Jigawa 13% are disempowered in group membership. In Kaduna, the proportion of women who achieved empowerment in group membership is higher than that of their male counterparts.

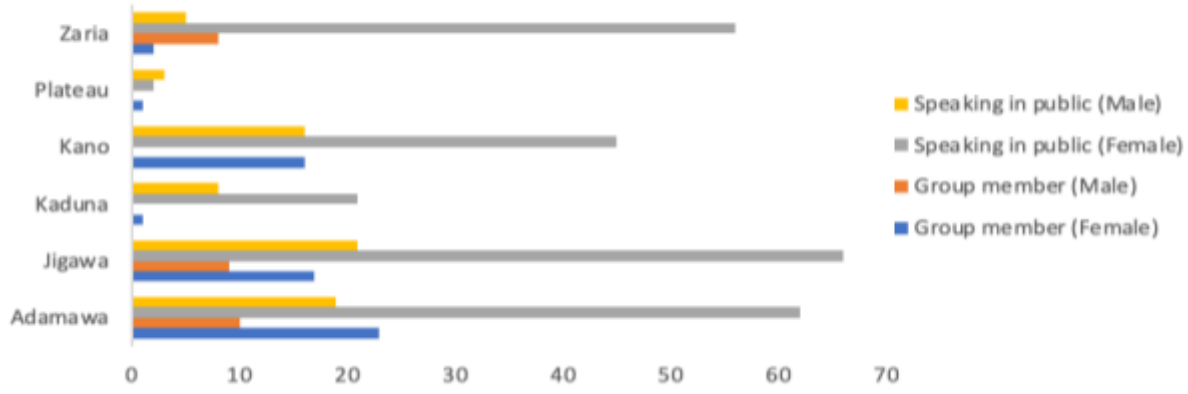

Fig 5. Showing indicators of Leadership and decision making across the different ALDDN stat

STATE	JOINT DECISION -Making (%)	KEY OBSERVATIONS	COMMUNITY CLAIMS	PROGRAM EFFORTS
Kano	50%	Men dominate income decisions; women participate in household-level decisions with limited autonomy.	"Men and women both give input, but men decide most major matters."	Efforts were made to encourage joint decision-making but cultural barriers persist.
Jigawa	55%	Men lead decisions, but some women influence asset management.	"Women are consulted more now than before."	Sensitization programs introduced to improve intrahousehold decision-making.
Plateau	70%	Highest level of collaboration; men and women jointly decide household and business matters.	"Now we discuss and plan together, especially about income."	Capacity-building workshops strengthened shared decision making frameworks.
Adamawa	40%	Limited collaboration; male authority is deeply ingrained in decision making processes.	"Men make decisions without much input from women."	Minimal efforts to address deeply entrenched cultural norms affecting collaboration.
Kaduna	Moderate	Contributes through milk processing sales.	Women rely on men for market information .	"We need more connections to bigger buyers."	Training included some market sensitization but lacked broader market linkages.
Zaria	Low	Active in soap and cream production markets.	Women diversify income through non-dairy activities.	"Learning to make and sell new products has helped us greatly."	Diversification training programs expanded women's market options.

Fig 5.2 Showing decision making and leadership per state participation

Time Allocation

Workload and leisure indicators are two important aspects that examine how much time women engage in work related activities and how satisfied they are with available time for leisure. Women who work more than 10.5 hours per day are considered disempowered. Findings from the WEAI survey reveals that almost every woman worked more than 10.5 hours in the previous 24 hours. This is similar for men.

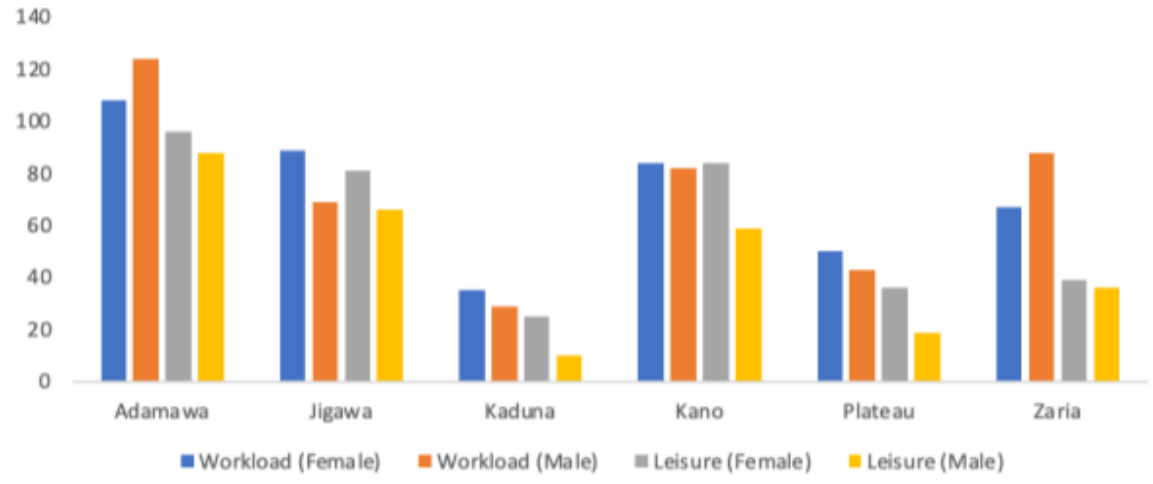

Fig 6, Showing indicators of time allocation between genders in ALDDN states

The findings on time use and leisure satisfaction across Zaria, Plateau, and Adamawa indicate that most respondents, particularly women, experience long working hours and limited leisure time. In Zaria, all male and female respondents reported working more than 10.5 hours in the previous 24 hours, with 75% expressing dissatisfaction with their available leisure time; this dissatisfaction was more pronounced among females (52%), while males were more represented among those satisfied (65%). Similarly, in Plateau, only a small proportion (2%) worked less than 10.5 hours, while 58% of respondents reported dissatisfaction with leisure time, with males again more likely to report satisfaction (60%) compared to females (40%). In Adamawa, all female respondents worked more than 10.5 hours, while only a few males reported shorter working hours; the majority of respondents (195) were dissatisfied with their leisure time, with nearly equal contributions from both genders, although satisfaction levels were higher among males (74%) than females (26%). Overall, the results highlight a consistent pattern of heavy workload and limited leisure across the study areas, with women disproportionately experiencing time poverty and lower satisfaction compared to men.

WEAI TOOL ANALYSIS

WEAI TOOL ANALYSIS FOR ADAMAWA STATE

Using the data obtained from the field across five local government areas in thirteen communities, we examined the position of Adamawa in the five domains of empowerment. A total of 253 respondents were interviewed in 153 households. Female and male respondents amounted to 108 and 126 respectively with 185 respondents from households with female and male adults while only 49 respondents are from female adult only household.

WEAI score: 0.49
5DE score: 0.45
GPI score: 0.82

Key constraints: Work burden; Leisure; Control over use of income; and Access to and decision on credit

Indicator	Female	Male
5DE score	**0.45**	**0.67**
Disempowerment score (1–5DE)	0.55	0.33
N (number of observations)	108	116
% of women achieving empowerment	2.78	32.76
% of women not achieving empowerment	97.22	67.24
Mean 5DE score for not yet empowered women	0.43	0.61
Mean disempowerment score (1– 5DE) for not yet empowered women	0.57	0.39
GPI score	**0.822**	
N (number of dual adult households)	145	
% of women achieving gender parity	25.71	
% of women not achieving gender parity	74.29	
Average empowerment gap	0.24	
WEAI score	**0.487**	

Table 1 showing GPI and WEAI scores

The table above compares male and female disempowerment and illustrates the contribution of each indicator to disempowerment among the respondents in Adamawa. Across all 10 indicators, men fare better than women. Women are about two times as disempowered as men. The indicator that contributes the most to both female and male disempowerment, and thus presents the greatest constraints, is the work burden; leisure; and access to and decisions on credit; women face additional constraint with regard to control over use of income; ownership of assets; speaking in public and purchase, sale or transfer of assets. For women, the indicators that contribute least to disempowerment are input in productive decisions and autonomy in production. For men, the indicators that contribute least to disempowerment are control over use of income, input in productive decisions, and group membership. The indicators exhibiting the greatest gap in male versus female achievement are control over use of income, purchase, sale or transfer of assets and speaking in public with men's achievements greater than women's for all three indicators.

WEAI TOOL ANALYSIS FOR JIGAWA STATE

Using the data obtained from the field across three local government areas in nine communities, we examined the position of Jigawa in the five domains of empowerment. A total of 160 respondents were interviewed in 110 households. Female and male respondents amounted to 89 and 71 respectively with 120 respondents from households with female and male adults while only 40 respondents are from female adult only household.

WEAI score: 0.48
5DE score:0.45 GPI score: 0.76

Key constraints: Work burden; Leisure; Speaking in public; and Control over use of Income.

Indicator	Female	Male
5DE score	**0.45**	**0.65**
Disempowerment score (1 – 5DE)	0.55	0.35
N (number of observations)	89	63
% of women achieving empowerment	2.25	4.76
% of women not achieving empowerment	97.75	95.24
Mean 5DE score for not yet empowered women	0.44	0.64
Mean disempowerment score (1– 5DE) for not yet empowered women	0.56	0.36
GPI score	**0.76**	
N (number of dual adult households)	31	
% of women achieving gender parity	15.38	
% of women not achieving gender parity	84.62	
Average empowerment gap	0.29	
WEAI score	**0.48**	

Table 2 showing the GPI and WEAI score from Jigawa state

The table above compares male and female disempowerment and illustrates the contribution of each indicator to disempowerment. Across 8 of the 10 indicators, men fare better than women. The exceptions are input in productive decisions and access to and decision on credit. The indicators that contribute the most to both female and male disempowerment, and thus present the greatest constraints, are workload and leisure. The indicators contributing least to both female and male disempowerment is input in productive decisions. The indicators exhibiting the greatest gap in male versus female achievement are speaking in public; ownership of assets; and purchase, sale, or transfer of assets; with men's achievements greater than women's for all three indicators.

Weai Tool Analysis for Kaduna State

Using the data obtained from the field across three communities in Igabi local government area, we examined the position of Kaduna in the five domains of empowerment. A total of 65 respondents were interviewed in 37 households. Female and male respondents amounted to 35 and 30 respectively with 62 respondents from households with female and male adults while only 3 respondents were from female adult only households.

WEAI score:0.61
5DE score: 0.58
GPI score: 0.84

Key constraints: Work burden; Leisure; Speaking in public; and Ownership of Assets.

Indicator	Female	Male
5DE score	**0.58**	**0.79**
Disempowerment score (1- 5DE)	0.42	0.21
N (number of observations)	35	29
% of women achieving empowerment	5.71	68.97
% of women not achieving empowerment	94.29	31.03
Mean 5DE score for not yet empowered women	0.56	0.68
Mean disempowerment score (1- 5DE) for not yet empowered women	0.44	0.32
GPI score	**0.84**	
N (number of dual adult households)	37	
% of women achieving gender parity	16.67	
% of women not achieving gender parity	83.33	
Average empowerment gap	0.19	
WEAI score	**0.61**	

Table 3 Showing the GPI score and WEAI score from Kaduna State

The table above compares male and female disempowerment and illustrates the contribution of each indicator to disempowerment among the respondents in Kaduna. Across all 10 indicators, men fare better than women. Women are almost two times as disempowered as men. The indicator that contributes the most to both female and male disempowerment, and thus presents the greatest constraints, is the work burden; leisure; and access to and decisions on credit; women face additional constraint with regard to speaking in public; and ownership of assets. For women, the indicators that contribute least to disempowerment are input in productive decisions and group membership. For men, the indicators that contribute least to disempowerment are input in productive decisions, autonomy in production, control over use of income and group membership. The indicators exhibiting the greatest gap in male versus female achievement are ownership of assets, control over use of income, and autonomy in production. with men's achievements greater than women's for all three indicators.

Weai Tool Analysis for Kano State

Using the data obtained from the field across three local government areas in nine communities, we examined the position of the Kano in the five domains of empowerment. A total of 163 respondents were interviewed in 110 households. Female and male respondents amounted to 84 and 84 respectively with all the 168 respondents from households with female and male adults.

WEAI score:0.49
5DE score: 0.45
GPI score: 0.82

Key constraints:Work burden; Leisure; Speaking in public; and Access to and decision on credit.

Indicator	Female	Male
5DE score	**0.45**	**0.69**
Disempowerment sore (1– 5DE)	0.55	0.31
N (number of observations)	84	84
% of women achieving empowerment	1.19	19.05
% of women not achieving empowerment	98.81	80.95
Mean 5DE score for not yet empowered women	0.44	0.67
Mean disempowerment score (1– 5DE) for not yet empowered women	0.56	0.33
GPI score	**0.82**	
N (number of dual adult households)	88	
% of women achieving gender parity	21.43	
% of women not achieving gender parity	78.57	
Average empowerment gap	0.23	
WEAI score	**0.49**	

Table 4 showing scores from Kano state

The table above compares male and female disempowerment and illustrates the contribution of each indicator to disempowerment. The figure shows that overall women are more disempowered than men. For 7 of the 10 indicators, men fare better than women. The exceptions are control over use of income, autonomy in production and input in productive decisions. The indicators that make a major contribution to disempowerment for both women and men are workload and leisure. For the men, autonomy in production is also one of the primary contributors to disempowerment. For both men and women, input in productive decisions contribute the least to disempowerment. The indicators displaying the largest gap between male and female disempowerment are speaking in public and purchase, sale, or transfer of assets, with men's achievements being greater than women's for all three.

Weai Tool Analysis for Plateau State

Using the data obtained from the field across three local government areas in five communities, we examined the position of Plateau in the five domains of empowerment. A total of 95 respondents were interviewed in 78 households. Female and male respondents amounted to 52 and 43 respectively with 80 respondents from households with female and male adults while only 15 respondents were from female adult only households.

WEAI score:0.67
5DE score:0.64
GPI score:0.96

Key constraints: Work burden; Leisure; Access to and decision on credit; and Ownership of assets

Indicator	Female	Male
5DE score	**0.64**	**0.74**
Disempowerment score (1-5DE)	0.36	0.26
N (number of observations)	52	42
% of women achieving empowerment	17.31	47.62
% of women not achieving empowerment	82.69	52.38
Mean 5DE score for not yet empowered women	0.6	0.68
Mean disempowerment score (1-5DE) for not yet empowered women	0.4	0.32
GPI score	**0.96**	
N (number of dual-adult households)	26	
% of women achieving gender parity	37.5	
% of women not achieving gender parity	62.5	
Average empowerment gap	0.07	
WEAI score	**0.67**	

Table 5 showing GPI and WEAI score from Plateau state

The table above compares male and female disempowerment and illustrates the contribution of each indicator to disempowerment among the respondents in Plateau. For 8 of the 10 indicators, men fare better than women. The exceptions are speaking in public and access to and decision on credit. Generally, Women are more disempowered than men. The indicator that contributes the most to both female and male disempowerment, and thus presents the greatest constraints, is the work burden. For women, the indicators that contribute least to disempowerment are speaking in public and group membership. For men, the indicators that contribute least to disempowerment are input in productive decisions, group membership and autonomy in production. The indicators exhibiting the greatest gap in male versus female achievement are ownership of assets, autonomy in production and control over use of income, with men's achievements greater than women's for all three indicators.

Conclusion and Recommendations

The study concludes that the ALDDN programme has contributed meaningfully to improving women's participation in dairy-related activities, household decision-making, and income-generating opportunities across the six states of Adamawa, Jigawa, Kaduna, Kano, Plateau, and Zaria. However, the Women's Empowerment in Agriculture Index (WEAI)-based analysis reveals persistent gender disparities in access to productive assets, credit, leadership roles, and time allocation. While women's involvement in production and processing has increased, their control over key resources and strategic decisions remains limited due to entrenched socio-cultural norms and structural inequalities. The programme has also enhanced livelihood diversification, financial inclusion, and community cohesion in some locations, particularly Jigawa and Plateau, yet disparities in awareness, inclusion of vulnerable groups, and equitable resource distribution remain evident. Overall, the ALDDN programme demonstrates positive but uneven progress toward gender-inclusive rural transformation, with significant gaps still existing in asset ownership, autonomy, and leadership participation that must be addressed for sustainable impact.

The study recommends that ALDDN and relevant stakeholders strengthen inclusive participation by deliberately targeting women, youth, and persons with disabilities through accessible training, tailored extension services, and inclusive infrastructure. Gender empowerment should be enhanced through leadership development programmes, financial literacy training, and increased access to credit and productive assets for women dairy farmers. In addition, household-level sensitisation and male engagement

initiatives should be expanded to promote shared decision-making, reduce gender inequality, and redistribute unpaid care work. The programme should also improve access to resources and markets through mobile veterinary and extension services, digital market platforms, expanded milk collection centres, and transparent pricing systems. Furthermore, participatory monitoring and evaluation systems should be institutionalised to enhance accountability, while stronger partnerships with local institutions, cooperatives, and traditional leaders should be pursued to ensure sustainability. Finally, policy advocacy efforts should be intensified to strengthen gender-responsive agricultural frameworks, while social and behaviour change communication strategies should be expanded to transform harmful socio-cultural norms and promote long-term gender equity in the dairy value chain.

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