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MECHANIZING AND DIGITALIZATION OF AGRICULTURAL ACTIVITIES FOR WOMEN EFFICIENCIES AND SUSTAINABLE COMMUNITY DEVELOPMENT IN JIGAWA STATE, NIGERIA

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Abstract

The study examined the mechanizing and digitalization of agricultural activities for women efficiencies and sustainable community development in Jigawa State, Nigeria. Descriptive Survey Research Design was adopted. The population of women Jigawa State Agency for Mass Education numbered 3,782 (JSAME, 2025). The data was collected from a sample size of 357 respondents based on Research Advisor (2006) sample size table. Simple Random sampling Techniques was used, the data was collected from primary sources through designed structured questionnaires as an instrument. Data was analyzed using Mean and standard deviation. What are the existing agricultural technology for mechanizing and digitalization of agricultural activities for women efficiencies in and sustainable community development in Jigawa State, Nigeria? And, in what way can enhance mechanize and digitalization of agricultural activities for women efficiencies in and sustainable community development in Jigawa State, Nigeria? As the research questions of the study. The findings of the study indicated that mobile applications and mFarmer, Tillers for preparing, sowing and planting seed machine, Tractor and trucks, Processing, preventing and storage resources techniques and Spraying fertilizer, herbicide and pumping water machine as the existing agricultural technology for women efficiencies in Jigawa State, Nigeria and the way can enhance agricultural activities for women efficiencies and sustainable community development in Jigawa State, Nigeria: Increase crop productivity and income generation, Diminish damage and risk, Intensification food security, Improve poultry and livestock production, Easy and enhanced work. the study provide some recommendations among others: Stakeholders, NGOS, Philanthropist should fully intervene on mechanizing and digitalization agricultural technology, agricultural Research Institutions should collaborate with union of farmers in providing solutions to mechanizing and digitalization agricultural technology for women efficiencies and sustainable community development in Jigawa State, Nigeria.

Keyword: Mechanizing, digitalization, agricultural activities, women efficiencies, sustainable community development

Introduction

It is agreed as popular proverb agriculture/farming is the oldest profession after hunting, who ever being in a world meets it there. Likewise, the women play a great roles in everyone's life without whom men's cannot imagine their success of life, popular axiom says behind every successful man there's a women, meant that men needed a supportive women for their adoring helpmates. Women play very significant roles in any given society from cradle till the grave, they play a great roles in the growth and development of

the community without women nothing is possible for men. The role of women in sustainable community development is multidimensional and their efforts need to be boosted at every forefront, they are first responders to any given family, they play many immeasurable protagonists in sustainable community development includes economic, social, political, environmental and agricultural productivity. Mechanization is the process of changing from working largely or exclusively by hand or with animals to doing that work with machinery. Agricultural mechanization is broadly defined to operation, the maintenance (on farm and off-farm) of all types of tools, implements, machinery, and equipment for agricultural production (i.e. land clearing, land levelling, tillage activities, planting and crop management etc.), harvesting, crop processing and Irrigation activities. Mechanization was one of the great aspects responsible for urbanization and industrial economies. Besides improving production efficiency, mechanization encourages large scale production and sometimes can improve the quality of farm produce. Agricultural mechanization can be described as a process by which human labour along the entire agricultural value chain is replaced by other sources of energy, such as animal power (Malabo Montpellier Panel 2018).

The agricultural mechanization devices may be powered by human energy (hand-tool technology) draught animals (animal traction power) and mechanical devices (internal combustion engines) or a combination of two or all three. Mechanization is needed to reduce or eliminate drudgery, make farming creative, reduce rural-urban migration, increase timeliness of performing field operations (planting, weeding and harvesting), increase cropping intensity, increase the productivity of labour and expand the area under cultivation, with the aimed at producing more food and raw materials to feed the ever increasing population. Agricultural mechanization inputs tend to be quite expensive in comparison to the biochemical inputs (improved seeds, fertilizers and pesticides). This has made it difficult for farmers to acquire machinery inputs (Mabayaji, (2017). Digitalization is the process of converting analog materials into digital formats, in agriculture is the use of digital technologies to collect, store, analyze, and share information in the agricultural sector. In other word Digital agriculture is the integration of various sciences and technologies to improve agricultural practices. In Nigeria, the digitalization of agriculture can help small holder farmers by providing access to resources and markets. Mechanization and Digitalization of agricultural activities has reduced food insecurity and provided opportunities for farmers to expand their markets, and improved productivity and livelihood of small-scale farmers. Challenges of mechanization and digitalization of agriculture were lack of technical skill, poor infrastructure and high cost of purchase and maintenance (World Bank, 2021).

Sustainable community development might be define as the improvement of the general wellbeing of the community in an ongoing manner in terms of economic, environmental and social issues. The variables of economic, social and environmental dimensions should improve to benefit the present members of the community without compromising the ability of the future generation to benefit from the development of the community (Benfield, 2011). Sustainable community development is the development that meets the needs of the present members of the community without compromising the ability of the future members or generation to meet their own needs, when this happens, we have sustainable community that is economically, socially and environmentally healthy and resilient (Schackwyk, Schoeman & Cilliers, 2013). Therefore, sustainable community development is imperative in order to create a more integrated and sustainable communities with an improved rural and urban

environment and a better quality of lives for citizenry. A sustainable community should encompass the interdependence of economic, environmental and social issues by ensuring that regions, cities, towns and rural lands should continue into the future without diminishing the land, water, air, natural and cultural resources that support them (Benfield, 2011). Consequently, sustainable community development in Nigeria is a construct that should aim at benefiting all in the present and the future generations. For the Nigerian communities to achieve sustainable development there should be improvement in the economic, social and environmental levels of members of the community. Again, peace, security, prosperity and secured future for citizens, access to quality education, healthcare environmental protection should be guaranteed by the leadership of the communities and the government (Schalkwyj, Schoeman & Cilliers, 2013).

Henceforth, community development must reflect the people and all aspects of the communities sectors; energy and power, clean water, safe and secured environment, adequate transportation system, health and educational facilities, security of lives and property etc. These variables should be guaranteed on a sustainable manner and Nigerian women and girls have future prominently through their various organizations and institutions in providing these social, economic and environmental opportunities for their various communities in Nigeria (Unongu, 2022). According to Winston (2021), sustainable community development is the integration of economic, social and environmental sustainability in order to achieve sustainable housing, education, energy, water, and healthcare, transportation to benefit the present and future generations of the community. This means while society work hand to meet the needs of the present by exploiting the resources of the land, we should manage situations in a way that we do not compromise the benefits the future generations will enjoy environmentally, economically, socially in the communities (Winston, 2021). Thus, sustainable community development has transitioned various developmental phases since its inception. The historical development and perspectives of the construct witnessed various scholars, institutions and actors, as they work to ensure the implementation of the goals and objectives of sustainable development, as well as its acceptability around the world by institutions and government as the most prominent way to meet the needs of the present and the future needs of extended generations (Klarin, 2018).

The United Nations members in 2015 embarked embraced the 17 Sustainable Development Goals (SDGs) as an international term to terminate inequality, hunger and poverty as well as guarantee sustainable peace by 2030 (International Telecommunication Union –ITU, 2020). These goals are critical and interrelated as they influence the outcome of one another. Given this, mechanizing, digitalization and agriculture are essential facilitators of these goals. Although reports from World Health Organization WHO (2022) The concept of digital agriculture includes both mechanizing and digitalization. While digitization is the non-theoretical procedure of changing analogue messages into digital practices, digitalization involves the social, mental and economic process of adopting improved technologies (Rolandi et al, 2021; Brennen and Kreiss, 2021). Malabo Montpellier Panel Report (MMPR) (2019) has reported that Nigeria has a prospective supporting sphere for digitalization in agriculture with a score of 4.5 out of 9 in the World Banks' Ease of Business in Agriculture (EBA), Information and 49 Communications Technology (ICT) (World Bank, 2019) as well as ensuring affordable phones and mobile-specific taxation (Global System for Mobile Communications (GSMC), 2019). Notwithstanding, the utilization of digital

agriculture is at its early stage (Farayola, et al, 2020), hence, existing literature on digital agriculture is not vast when compared to other developed countries.

There are some factors affecting mechanization and digitalization of agricultural activities for women efficiencies and sustainable development in Nigeria. Izuagu, et al (2023) and Gyata, (2019) started that Mechanizing and Digitalization of agriculture in Nigeria is affected by several factors, these factors were classified into individual, institutional and technological factors. Individual factors are unique characteristics that influence women's performance or behavior in other word elements that relate to the user of the digital tools such as the women farmers, extension officers and other active player in the agricultural sector. Muslem et al. (2018), Hailegebreal et al. (2022) and Marston et al. (2019) had identified household attitude and income, previous ICT experience and perception towards ICTs as essential factors that should not be ignored in the mechanizing and digitalization process. Ajena (2018) established a significant and positive relationship between individual factors such as age and personal income and utilization of digital tools. Some of ideas may arise from interactions with peers and colleagues as Ugwu et al. (2020) and Solomon and vanKlyton (2020) identified peers and social network as major demographic factors affecting the use of digital technologies. Furthermore, gender, educational level, level of employment and farm size (Okeet et al., 2019), personal innovativeness, prior experience (Albaom et al., 2022) , are other individual factors affecting utilization of digital tools in agriculture in Nigeria.

Technological factors involve considerations about the digital technologies. Such factors include compatibility, cost and cost effectiveness (Fielke et al., 2020) and speed of information transfer (Abdullahi et al., 2021), relative advantage and relevant content (Gyata, 2019). Small scale farmers in Nigeria usually do not have effective agricultural training as well as extension services (Oyegbami, 2018). This had led to their inability to utilize such farm practices that can improve their yield, ensure soil conservation as well as guarantee adequate use of farm tools (MMPR, 2019). Farmers' capability in terms of securing essential and modern ideas, assimilating such ideas and its utilization is subject to their level of training (Nyarko and Kozári, 2021). Gbughemobi et al. (2021) and Muhammad et al. (2018) reported that farmers in Nigeria do not possess adequate knowledge on the utilization of ICTs and other digital tools, hence, the need to train them on ICT utilization. For mechanizing and digitalization to efficiently improve women farmer's knowledge through modern approaches to agricultural extension service there is need for systematic training and re-training of extension staff as well as farmers. Such trainings should focus on production threats and emergencies including climatic changes, natural disasters, price fluctuations, household risks and policy alterations (Muhammad et al.2018).

Digitalization of the agricultural sector in Nigeria has enhanced the transfer of information and ideas especially as it relates to market information. This has facilitated profit maximization for the farmers (Oke et al, 2019). Farmers need real time information dissemination for efficient agronomic practices. This can also assist remarkably in reducing production cost and risk as farmers are authorized to make healthy decisions (Pesce et al., 2019; Ibukun et al., 2021). Digitalization of the agricultural sector will essentially assist in bridging knowledge gaps, implying that majority of the farmers can access advisory services irrespective of the insufficient number of extension staff (Olagunju et al., 2021). Utilization of digital tools will increase the adoption of innovations through improving the ability of the farmers to take up new

challenges, as well as guarantee access to beneficial sales outlet for their farm produce (Yousaf, et al., 2021; Green, et al., 2021). Digitalization has led to an increase in food security while reducing agricultural environmental footprint (Fraser and Campbell 2019; Basso and Antle, 2020). According to Fabregas, et al. (2022) digital tools improve productivity, enhances the standard of living of the rural poor while supplementing the indigenous extension approaches. The digitalization of the agricultural sector may increase the level of unemployment in the rural areas. Trendov, et al. (2019), Beirne and Fernandez (2022), Olomola and Nwafor (2018) and Osabohien et al. (2019) opined that the reduction in the cost of labour as a result of digitalization of the agricultural sector will invariably augment for the unemployment.

Globally, women are instrumental in ensuring national environmental resilience, food security as well as in the future of sustainable agriculture, they are also responsible for maintaining many natural resources, such as forests and fisheries, and thus teaching them sustainable management practices and empowering them economically, socially, politically to make decisions related to their land can strengthen agricultural resilience and sustainability (Nat Kelly (2024). The role of women in sustainable development is multidimensional and their voices need to be included at every forefront, they are often the first responders to their families, have unique ideas and perspectives, and often drive change at various levels, they play many uncountable roles in sustainable community development including in economic, social and environmental areas Women as the key factor in a society's economic growth, innovations, and social cohesion. It can also reduce poverty, improve health and promote gender equality, help to develop skills and knowledge. Their agricultural efficiency help to empowers them, improve their health, economic status, build better future for the families, strengthen their decision-making, help in reduce inequality and improve the lives of their families and communities. Despite global efforts UNESCO (2024) reported that 754 million adults (over 15 years old) are illiterate, and 250 million children are out of school in Nigeria, literacy rate stands at 59.57%. The poverty rate estimated between 38.8% and 40.7% due to inflation, poor economic management, weak job creation, corruption, limited access to sound education and health, climate change, irregular rainfall pattern, fuel price increases and poor government policies that lead to some challenges in the nation such as massive and higher rate of unemployment among youth and women, hardship, hunger, poverty, insecurity, low agricultural productivities, poor child school enrollment (World Bank, 2024). Nigeria is facing a serious hunger crises in 2024, millions of people at risk of going hunger with severe child food poverty, around 11 million children in Nigeria are experiencing severe child food poverty, up to 50% suffer from life-threatening malnutrition, over 56% of Nigerians are living below the national poverty line (UNICEF, 2024). In view of the above mentioned, mechanizing and digitalization of agricultural activities should be stimulated to ensure that the economy grows on women efficiencies and sustainable development for national food sufficiency.in Jigawa State, Nigeria.

Statement of the Problem

Women as primary caregiver, house manager, community leaders, and backbone of the community sustainable development, play integral as well as crucial roles in the socio-economic, political development of any given society. As a popular proverbs say the wisest of women build her house, but folly with her own hands tears it down, the wife of the mother, if you don't have a house. Women sustainability levels can be determine the level of development of any given society. They are the key factor in a society's economic growth, innovations, and social cohesion. It can also reduce poverty, improve health and

promote gender equality, help to develop skills and knowledge. Their agricultural efficiency help to empowers them, improve their health, economic status, build better future for the families, strengthen their decision-making, help in reduce inequality and improve the lives of their families and communities. Despite the importance of women in the community there are higher rate of poverty and illiteracy among women due to poor efficiency in agricultural productivity. Therefore, due to the aforementioned this paper seeks to highlight mechanizing and digitalization of agricultural activities for women efficiencies and sustainable community development in Jigawa State, Nigeria

Purpose of the study

The general objective of this study is to evaluate the mechanizing and digitalization of agricultural activities for women efficiencies and sustainable community development in Jigawa State, Nigeria. The specific objectives: to

1. Identified the existing agricultural technology for mechanizing and digitalization of agricultural activities for women efficiencies in and sustainable community development in Jigawa State, Nigeria, and
2. Determine the way can enhance mechanize and digitalization of agricultural activities for women efficiencies in and sustainable community development in Jigawa State, Nigeria.

Methods

This research adopted Descriptive Survey Research Design. The population of the study comprised the population of women Jigawa State Agency for Mass Education numbered 3,782 (JSAME, 2025). The data was collected from a sample size of 357 respondents based on Research Advisor (2006) sample size table. Simple Random Sampling Procedure was used; the respondents probably drawn at random, each member has an equal chance, the data was collected from primary sources through designed structured questionnaires as an instrument. SPSS statistics software version 21 was used for data processing. Mean and standard deviation were used to describe and summarized the data. The decision rule was determined by the use of criterion Mean score of 2.50. Mean of 2.50 and above, suggests an agreement with the statement under investigation. Similarly, any variable that score less than average mean of 2.50 indicated disagreement. This decision rule criteria were adopted from (Yusuf, et al, 2017).

Result

Table 1: Mean and Standard Deviation of the respondents on existing agricultural technology for mechanizing and digitalization of agricultural activities for women efficiencies and sustainable community development in Jigawa State, Nigeria

Activities	Mean	Standard Deviation
Mobile applications and mFarmer	1.61	0.18
Tillers for preparing, sowing and planting seed machine	1.70	0.19
Tractor and trucks	2.84	0.88
Processing, preventing and storage resources techniques	2.98	0.92
Spraying fertilizer, herbicide and pumping water machine	2.84	0.83

Source (field survey, 2025)

The above table presents the result of existing agricultural technology for mechanizing and digitalization of agricultural activities for women efficiencies and sustainable community development in Jigawa State, Nigeria**.** The table revealed that Mobile applications and mFarmer with mean score of 1.61 (0.18 SD). Tillers for preparing, sowing and planting

seed machine with 1.70 mean score (0.19SD). Tractor and trucks with 2.84 mean score (0.88 SD). Processing, preventing and storage resources techniques scored 2.98 mean score (0.92 SD). Spraying fertilizer, herbicide and pumping water machine with 2.84 mean (0.83 SD).

Table 2: Mean and Standard Deviation of the respondents on the way can enhance mechanize and digitalization of agricultural activities for women efficiencies in and sustainable community development in Jigawa State, Nigeria

Impact	Mean	Standard Deviation
Increase crop productivity and income generation	2.51	0.53
Diminish damage and risk	2.54	0.57
Intensification food security	3.12	0.85
Improve poultry and livestock production	2.70	0.70
Easy and enhanced work	2.81	0.81

Source (field survey, 2025)

The above table indicates the impacts of agricultural activities for women efficiencies and sustainable community development in Jigawa State, Nigeria**:** It also discovered that responses agreed with mean score 2.51 (0.53 SD) Increase crop productivity and income generation. 2.54 mean score (0.57 SD) also agreed that diminish damage and risk. 3.12 mean score (0.85 SD) agreed that Intensification food security. 2.70 mean score (0.70 DS) agreed with Improve poultry and livestock production and 2.81 mean score (0.81 SD) agreed that Easy and enhanced work

Discussion

Considering the roles and importance of women in any given society, this research work indicates the needs for mechanizing and digitalization of agricultural activities for women efficiencies and sustainable community development in Jigawa state and Nigeria at large. It would help in increasing their productivities, self-reliance, reduce higher rate of unemployment, hardship, hunger and child malnutrition, poverty, insecurity, poor children school enrollment as supported by world Bank, (2024). Thus, the study revealed that Mobile applications and mFarmer, tillers for preparing, sowing and planting seed machine, tractor and trucks, processing, preventing and storage resources techniques, spraying fertilizer, herbicide and pumping water machine as the mechanize and digitalize agricultural activities for women efficiencies in line with Basso & Antle, (2020). Accordingly, respondents agreed that agricultural activities impacting the women efficiencies and sustainable community development in line with Aujara & Giginyu, (2024). Consequently, results revealed that majority of the respondents agreed on the needs of mechanizing and digitalization of agricultural activities for women efficiencies and sustainable community development in Jigawa State i.e. increase crop productivity and income generation, diminish damage and risk, intensification food security, and improve poultry and livestock production and easy and enhanced work as stated by Bosso & Antle (2020).

Conclusion

Consequently, going with what has been revealed on the mechanizing and digitalization of agricultural activities for women efficiencies and sustainable community development in Jigawa State, Nigeria in this study, it is boldly indicated that mechanizing and digitalization of agricultural activities for women need to put more efforts and urgent

consideration by government and other stake holders for women efficiencies and sustainable community development in Jigawa state and Nigeria at large.

Recommendation

Besides, the study provides some recommendations as follows:

1. Stakeholders, NGOS, Philanthropist should fully intervene on mechanizing and digitalization agricultural technology for women efficiencies and sustainable community development in Jigawa State, Nigeria
2. Agricultural Research Institutions should collaborate with union of farmers in providing solutions to mechanizing and digitalization agricultural technology for women efficiencies and sustainable community development in Jigawa State, Nigeria
3. There is need for NGOS, Stakeholders, philanthropist farmers association and commercial extension workers to create more awareness of agricultural mechanizing and digitalization of agricultural activities for women efficiencies and sustainable community development in Nigeria
4. Government policy makers (members of parliament) should constrain policies towards agricultural mechanizing and digitalization of agricultural activities for women efficiencies and sustainable community development in Nigeria include adequate training, provision of enough infrastructure digital tools facilities.
5. It also suggested for further study.

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