



Assessing Youth Engagement in Irrigation Farming in Adamawa State, Nigeria

Abstract

This study investigates youth participation in irrigation farming within the fertile agricultural landscapes of Adamawa State, Nigeria. With an expansive study area covering nearly 40,000 square kilometres and a diverse range of agricultural zones, Adamawa State provides an ideal backdrop for examining the dynamics of youth engagement in irrigation farming. The primary objective of this research is to assess the extent of youth participation in irrigation farming in Adamawa State. A sample size of 382 participants was selected using a purposive and multistage sampling approach, along with snowball sampling techniques. The findings reveal substantial youth participation in irrigation farming, reflecting the sector's potential to offer livelihood opportunities and enhance agricultural productivity. The study highlights gender dynamics within agriculture, with a predominantly male presence but significant female participation, emphasizing the evolving inclusivity in the sector. Variability in start-up capital among youth participants underscores the need for targeted financial support mechanisms, including access to credit facilities and financial literacy programs. The study recommends for initiatives such as training programs, mentorship opportunities, and extension services to empower young farmers with the necessary expertise. Moreover, sustainable land use practices and efficient resource utilization are recommended to optimize yields within limited land areas.

Keywords: Youth Participation, Irrigation Farming, Agriculture, Adamawa State

Introduction

Youth engagement in agriculture is a pivotal component of rural development, particularly in agrarian nations like Nigeria. According to the United Nations (UN, 2018), youth typically encompass individuals aged 15 to 30, although definitions can vary across countries. In Adamawa State, Nigeria, this age group represents a significant resource that holds the potential to surmount challenges and contribute to food security (Food and Agricultural Organization, 2014). However, there is a concerning trend of low youth involvement in irrigation farming in the state, despite the critical role of irrigation in stabilizing food production and agricultural growth (Eisenhaber et al., 2021).

Irrigation, the artificial application of water to land, serves as a vital tool for sustaining agriculture in regions with erratic rainfall patterns (FAO, 2021).

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It enhances crop yields, expands agricultural opportunities, and reduces the risks associated with unpredictable rainfall (USDA, 2019).

In Adamawa State, the practice of irrigated agriculture is prevalent among riverine communities due to the variability and seasonality in rainfall distribution (Naamwintome dan Bagson, 2013). Despite its potential, there appears to be a stark disconnect between the importance of irrigation farming and the level of youth involvement.

Irrigation is a critical practice worldwide, playing a pivotal role in achieving sustainable development goals related to food security, socio-economic progress, and rural development. Over the past five decades, irrigation has significantly increased food security and elevated living standards across various regions. It is widely acknowledged that irrigation expands the feasible land base for agriculture, resulting in increased productivity. Additionally, the development of irrigation systems has led to the creation of employment opportunities and enabled farmers to plan their cropping patterns more effectively by providing predictable water supplies. However, despite the abundant land and water resources in Adamawa State, Nigeria, the irrigation sector has not yet realized its full potential in bridging the gap between food demand and supply, particularly for the benefit of farmers and the engagement of the youth (Lebdi, 2016).

Youth represent not only the future but also the present of food security (Vhikezie et al., 2012). They possess the energy, innovation, and capacity to overcome barriers in agriculture and contribute significantly to the sector's growth.

Given the importance of irrigation for national food security, coupled with the declining performance of aging farmers, there is a pressing need for active youth participation in irrigation farming. The extent of youth engagement in irrigation farming in Adamawa State remains uncertain, highlighting the need for a thorough assessment. As older subsistence farmers, who make up a significant portion of the farming demographic, grapple with age-related limitations, their capacity to meet the demands of a burgeoning population may be insufficient. This situation underscores the imperative for a comprehensive examination of youth participation in irrigation farming. This research aims to address this gap by conducting a thorough examination of youth participation in irrigation farming in Adamawa State, Nigeria.

In light of the uncertainty surrounding the extent of youth engagement in irrigation farming in Adamawa State, the research question for this study is, "To what extent are young individuals in Adamawa State actively participating in irrigation farming?" The primary objective of this study is to address this question comprehensively by assessing the level of youth participation in irrigation farming in Adamawa State, Nigeria, with the overarching goal of formulating effective strategies to enhance their involvement in this critical sector.

The paper is structured into five sections. The Introduction introduces the research question and emphasizes the importance of youth engagement in irrigation farming. The Literature Review analyses existing research on youth involvement in this sector. Methodology outlines the research approach, data collection, and analysis methods. Results and Discussion present and interpret the research findings. Finally, the Conclusion and Recommendations section summarizes findings and offers actionable

recommendations for enhancing youth participation in irrigation farming in Adamawa State for improved food security and sustainable agricultural development.

2.1 Literature Review

Youth participation in agriculture encompasses the active engagement and influence of young people in agricultural activities. This goes beyond their mere presence or token roles in adult agencies; it involves meaningful contributions that impact processes, decisions, and outcomes. Youth participation assumes that young individuals are competent citizens rather than passive recipients of services, integrating them into institutions and decisions that shape their lives (Checkoway, 2011). In essence, it involves youth engagement in entrepreneurial activities, value-chain participation, policy formulation, and advocacy within the structures and systems related to the food system.

Various models and theories exist to guide strategies for involving youth in transformative activities, with Mibey (2015) suggesting multiple approaches. However, this study adopts the Theory of Reasoned Action, as posited by Fishbein and Ajzen (1967). This theory focuses on identifying the determinants underlying behavioural intent, with a focus on factors that shape the formation and alteration of intent, as noted by Kimaro et al. (2015), as cited in Kising'u (2016). According to the Theory of Reasoned Action, behavioural intention plays a central role in predicting behavior, as it reflects an individual's plans to engage in a specific behavior. The stronger the intention to perform a particular behavior, the greater the likelihood of that behavior being carried out. This theory asserts that behavioural intention hinges on an individual's attitude toward the behavior and their perception of the subjective norm associated with it. It operates on the premise that individuals typically act rationally, considering available information when forming their intentions. A person's intention to engage in or abstain from a behavior is a crucial predictor of their actions, and in most cases, individuals act in line with their intentions (Fishbein & Ajzen, 1975). Thus, this theory will be instrumental in gauging the disparity between youth attitudes and their actual participation in irrigation farming, as well as in understanding the correlation between youth behaviours, actions, and their perceptions of government policies and regulations governing agricultural activities.

The concept of "youth" lacks a uniform definition and can vary between countries and agencies depending on contextual factors. For instance, Ghana, Tanzania, and South Africa define youths as individuals aged 15 to 29 (UNECA, 2009), while the UN classifies youth as those aged 15 to 24. In this study, the definition of youth encompasses individuals aged 15 to 35. The Islamic Development Bank (IDB, 2019) considers Nigerian youth as citizens within the age bracket of 18-35. Meanwhile, statistical purposes adopt an age range of 15-24 for youth according to Nigerian Bureau for Statistics, the United Nations, the African Development Bank, and the World Bank. Regardless of the specific age range, youth are widely recognized as pivotal to sustainable development, particularly in developing nations, where a majority reside, often in rural areas. The youth demographic presents an untapped reservoir of employment opportunities within the agri-food sector, but they also face contemporary crises such as climate change, global food security disparities, and employment inequality. Therefore, it is imperative to make agriculture and food systems more appealing to young people to secure the future, as investing in youth holds vast potential for food security, poverty alleviation, employment generation, and political stability.

Irrigation farming, the artificial application of water to soil for plant growth, serves various purposes, including drought insurance, soil and atmosphere cooling, and the application of fertilizers. It creates an optimal environment for plant growth, reduces soil salinity, mitigates soil compaction, and enhances crop production (Ajadi, Idowu, & Oladoke, 2019). Nwa (1987) defines irrigation farming as the supplementation of soil moisture with applied water to meet crop water requirements. Irrigation is justified in regions with inadequate rainfall (arid areas), land scarcity, and unpredictable rainfall patterns. Adequate water supply is essential for plant growth, particularly when rainfall is insufficient. Irrigation involves the artificial application of water to soil through systems comprising tubes, pumps, and sprays (cdc.gov, 2022). It is employed in regions with irregular rainfall or drought expectations. While manual methods, such as bucket or watering can irrigation, are suitable for small plots near water sources, larger areas require more sophisticated irrigation systems drawing water from various sources, including groundwater, surface water, and treated wastewater. Approximately 90% of Nigeria's food is produced by small-scale rain-fed farmers, with irrigation systems playing a vital role in increasing agricultural productivity and addressing food security (Annon, 2008). Worldwide, irrigation farming contributes to over half of global food production (FAO, 2002), demonstrating its significance in ensuring food security.

Irrigation in Nigeria can be categorized into three main types: public irrigation projects under government control (formal irrigation), farmer-owned projects receiving government subsidies (informal irrigation), and traditional flood plain irrigation systems known as Fadamas (Musa, 2001). The development of water resources for irrigation dates back to the pre-colonial era, particularly in northern Nigeria, where irrigation was essential for dry-season farming due to unreliable rainfall patterns, recurrent droughts, and rapid population growth (Musa, 2001). Currently, Nigeria boasts approximately 264 dams with a collective storage capacity of 33 billion cubic meters for multiple uses, including irrigation (FMWR, 2017). These dams offer substantial potential for irrigable land, creating opportunities for sustainable agriculture and economic benefits. Globally, investments in irrigation schemes have been significant, with Nigeria possessing substantial potential for irrigated agriculture, although water availability constraints exist. Irrigation not only ensures food supply but also provides income and employment opportunities during periods of low rainfall (Dauda, Asiribo, Akinbode, Saka, & Salahu, 2009). It has the potential to lift farming households above the poverty threshold by increasing agricultural efficiency and yields. Furthermore, irrigation farming is considered a profitable venture, as farmers can achieve substantial net income through irrigation activities (Dauda et al., 2009). Ultimately, irrigation plays a critical role in increasing agricultural productivity, food security, poverty reduction, and overall socioeconomic development.

2.2 Empirical Review

Several studies have shed light on the dynamics of youth participation in agriculture. Dauda et al. (2009) highlighted the income-generating potential of irrigation farming, emphasizing its role in poverty reduction and achieving Millennium Development Goals. Their research emphasized the profitability of irrigation farming in Nigeria. Ajadi et al. (2019) explored the impact of irrigation systems on crop production and socioeconomic well-being. They found that irrigation increased land cultivation, yields, income, and reduced stress in crop production. However, challenges included farmers' norms, values, limited training, and capital constraints.

Dolma (2020) investigated the factors influencing youth participation in agribusiness. Results showed that interest, training, market availability, perceived returns, experience, and land access significantly influenced youth engagement in agribusiness. Geza et al. (2021) conducted a scoping review of opportunities and challenges for youth in agriculture and food systems in Africa. They found that existing interventions mainly focus on production and offer limited income and social protection. Youth hold pessimistic views about agriculture's potential to improve their livelihoods, indicating the need for context-specific policies and meaningful youth participation in shaping future food systems.

Adekunle et al. (2015) examined factors affecting farmers' participation in irrigated agriculture. They identified challenges such as poor knowledge of irrigation techniques, insufficient water during the dry season, high labor costs, limited access to credit, inadequate response to farmers' needs, and irregular water pumping. These studies collectively illuminate the complex landscape of youth engagement in agriculture and the critical role of irrigation farming in sustainable agricultural development.

3.1 Research Methodology

This section outlines the study area, sampling techniques, sample size determination, data collection methods, and data analysis techniques.

3.2 Study Area

The research took place in Adamawa State, situated in the north-eastern region of Nigeria. It is geographically located between latitude 7° 15' and 10° 58' N and longitude 11° 09' and 13° 47' E. Adamawa State shares borders with Taraba State to the South and West, Gombe State to the Northwest, Borno State to the North, and has an international boundary with the Cameroon Republic to the East. Covering approximately 39,972.3 square kilometres, the state boasts 2,873,000 hectares of arable land, with approximately 250,900 hectares dedicated to irrigation. As of 2022, its population is estimated at 5,055,910 (Wikipedia).

Adamawa State comprises 21 Local Government Areas divided into four Agricultural Zones: Zone I, Zone II, Zone III, and Zone IV. The climate is characterized by distinct wet and dry seasons, with the dry season lasting around five months (November - March) and the wet season from April to October. The movement of the Inter Tropical Discontinuity (ITD) and associated rainfall patterns plays a significant role in determining precipitation levels in the state (Adebayo et al., 2020).

3.3 Sampling Techniques and Sample Size

A purposive and multistage sampling approach was employed for selecting the study areas, while a snowball sampling technique was used for participant selection. Two local government areas were purposively selected from the four Agricultural Zones due to their high engagement in irrigation farming. Within these local government areas, two wards were again purposively chosen based on their substantial involvement in irrigation farming and the extensive land area under cultivation.

3.4 Methods of Data Collection

Primary data was collected through well-structured questionnaires and supplemented with personal interviews. The questionnaires focused on the socio-economic attributes of the youth, their level of

participation in irrigation farming, factors influencing their participation, and challenges they face in irrigation farming activities. Data collection occurred during the 2022/2023 cropping season.

3.5 Methods of Data Analysis

The data analysis employed a descriptive approach, utilizing measures of central tendency such as means and frequency distribution tables to achieve the study's objectives. This analysis aimed to provide insights into the level of youth engagement in irrigation farming in Adamawa State.

4.1 Results and Discussion

Table 4.1 presents the results of the study, focusing on the level of youth participation in irrigation farming in Adamawa State. The variables examined include the main occupation of the youth, their engagement in irrigation farming, years of experience in irrigation farming, farm size, types of crops cultivated, planting methods, hours spent on the farm, farm output, and contact with extension agents.

Table 4.1: Level of Youth Participation in Irrigation Farming in Adamawa State

Variable	Frequency	Percentage	Rank Order
Main Occupation			
Farming	372	97.38	1 st
Teaching	7	1.83	2 nd
Trading	3	0.79	3 rd
Total	382	100	
Irrigation Farming Engagement			
Full time	366	95.81	1 st
Part-time	16	4.19	2 nd
Total	382	100	
Years of Irrigation Farming Experience			
6 - 10 years	204	53.40	1 st
11 - 15 years	90	23.56	2 nd
1 - 5 years	88	23.04	3 rd
15 Years and above	0	0	4 th
Total	382	100	
Farm Size (hectare)			
1-2	191	50.00	1 st
<1	168	43.98	2 nd
3-4	22	5.76	3 rd
5 and above	1	0.26	4 th
Total	382	100	
Types of Crop Cultivated			
Vegetable	234	61.26	1 st
Rice	122	31.94	2 nd
Maize	16	4.19	3 rd

Fruits	9	2.36	4 th
Wheat	1	0.26	5 th
Total	382	100	
Planting Method			
Transplanting	333	87.17	1 st
Dibbling	49	12.83	2 nd
Total	382	100	
Hours Spent on the Farm by the Irrigation Farmer			
56 - 58 hrs/Week	137	35.86	1 st
53-55 hrs/Week	104	27.23	2 nd
50-52 hrs/ Week	88	23.04	3 rd
47 - 49 hrs/Week	53	13.87	4 th
Total	382	100	
Output (KG of Farm Produce)			
4100 and above	221	57.85	1 st
2100 – 3000	80	20.94	2 nd
3100 – 4000	40	10.47	3 rd
1100 – 2000	39	10.21	4 th
100 – 1000	2	0.52	5 th
Total	382	100	
Contact with Extension Agents			
No	369	96.60	1 st
Yes	13	3.40	2 nd
Total	382	100	

Source: Field Survey, 2023.

Main Occupation and Irrigation Farming Engagement

The study reveals that a significant majority (97.38%) of the youth in Adamawa State who participated in the research have farming as their main occupation. This result is consistent with findings from previous studies (Ajadi et al., 2019; Dolma, 2020) that highlight the importance of agriculture as a predominant occupation among young individuals in agricultural regions. Only a small percentage of respondents were involved in teaching (1.83%) and trading (0.79%) as their primary occupations. This emphasizes the central role of agriculture in the livelihoods of the youth in the region.

In terms of irrigation farming engagement, the study shows that 95.81% of the youth are engaged in irrigation farming on a full-time basis. This suggests a high level of commitment among the youth in the region to agricultural activities. Such dedication to full-time irrigation farming can be attributed to the potential profitability of this sector, as indicated in Dauda et al.'s (2009) study, which found irrigation farming to be a profitable venture.

Years of Irrigation Farming Experience

The youth's years of experience in irrigation farming vary, with 53.40% having 6 to 10 years of experience, 23.56% having 11 to 15 years, and 23.04% having 1 to 5 years. This distribution highlights the diversity in the level of experience among youth participants. It aligns with previous studies (Ajadi

et al., 2019; Dolma, 2020) that emphasize the importance of experience in enhancing agricultural practices.

Farm Size and Types of Crop Cultivated

Concerning farm size, the majority (50.00%) of youth respondents operate farms within the 1 to 2-hectare range, while 43.98% have farms smaller than 1 hectare. This finding corresponds with the small-scale nature of farming among youth participants in the region (Geza et al., 2021). Additionally, the types of crops cultivated reveal that vegetables (61.26%) and rice (31.94%) are the predominant crops, followed by maize (4.19%) and fruits (2.36%). This diversification in crop types aligns with recommendations in the literature (Adekunle et al., 2015; Geza et al., 2021) for diversified agricultural production.

Planting Method and Hours Spent on the Farm

The majority (87.17%) of youth respondents employ the transplanting method, while 12.83% use the dibbling method for planting. This preference for transplanting is in line with traditional agricultural practices in the region (Nwa, 1987). Regarding the hours spent on the farm, most youth (35.86%) dedicate 56 to 58 hours per week, reflecting their commitment to agricultural activities. This aligns with previous studies (Ajadi et al., 2019; Dolma, 2020) emphasizing the substantial time investment required in agriculture.

Farm Output and Contact with Extension Agents

The study shows that 57.85% of youth participants yield 4100 kilograms and above of farm produce. This indicates a relatively high level of productivity among the youth in irrigation farming. Conversely, 96.60% of respondents reported no contact with extension agents, suggesting limited access to agricultural extension services. This lack of contact may hinder knowledge sharing and skill enhancement, as highlighted in Dolma's study (2020), emphasizing the significance of professional guidance for sustainable agricultural practices.

In conclusion, the findings from Table 4.2 underscore the significance of agriculture as the main occupation among youth in Adamawa State. They exhibit a strong commitment to irrigation farming, diverse levels of experience, and varying farm sizes. The predominance of vegetables and rice as cultivated crops aligns with regional agricultural practices. Additionally, the study highlights the importance of extension services to enhance agricultural productivity among youth participants.

These results provide valuable insights for policymakers and stakeholders seeking to formulate strategies to optimize youth participation in irrigation farming, ultimately contributing to enhanced agricultural productivity and rural development in Adamawa State.

4.2 Average Level of Youth Participation in Irrigation Farming

Table 4.2 presents a detailed analysis of youth participation in irrigation farming in Adamawa State, encompassing several key variables. These findings provide valuable insights into the dynamics of youth engagement in agriculture, shedding light on various aspects of their participation.

Table 4.2: Average Level of Youth Participation in Irrigation Farming in Adamawa State

Variable	Observations	Mean
Gender of the respondents	382	0.987 (0.114)
Engagement type in irrigation	382	0.958 (0.201)
Start-up capital for irrigation farming	382	155800 (93831.205)
Years of experience in irrigation farming	382	8.026 (3.417)
Farm size in hectare	382	1.404 (0.603)
Hours provided by the owners	382	53.552 (3.181)
Output of irrigation produce in kg	382	7076.702 (6450.193)
Total Revenue	382	417842.9 (323177.3)
Total Cost of Production	382	146603.7 (102982.8)
Profit Margin	382	271239.3 (269997.7)

Source: Field Survey, 2023. Note: the values in parenthesis are the standard deviations.

Firstly, the data reveals that the majority of participants in irrigation farming are male, with a mean gender value of 0.987. This aligns with existing literature, particularly Ajadi et al. (2019), who have highlighted the predominant male presence in agricultural practices. However, it is important to note that female participation is also notable, suggesting an evolving inclusivity within the agricultural sector. This observation is in line with the broader societal trend of increasing female involvement in traditionally male-dominated fields.

Furthermore, the variable "Engagement type in irrigation" demonstrates that a significant proportion of surveyed youth are actively engaged in irrigation farming, with a mean approaching the high end of the scale (mean of 0.958). This robust participation echoes the findings of Dauda et al. (2009), emphasizing the economic viability of irrigation farming as a livelihood option for young individuals. It underscores the potential of agriculture to serve as a profitable venture for youth, contributing to their economic well-being.

Another critical aspect revealed in the data is the substantial disparity in start-up capital among youth participants, with a mean start-up capital of 155,800. The wide standard deviation accompanying this variable underscores the varying financial capacities of the youth. This finding underscores the need for targeted interventions to facilitate access to financial resources for those with limited capital, aligning with the recommendations of Adekunle et al. (2015) who advocate for improved access to credit facilities for aspiring youth farmers.

Moreover, the data indicates a moderate level of experience among surveyed youth in irrigation farming, with a mean of 8.026 years. This finding emphasizes the importance of knowledge transfer and skill development in enhancing agricultural engagement among the youth, echoing the insights of Geza et al.

(2021). It also underscores the need for mentorship and training programs to nurture the next generation of proficient farmers.

Regarding farm size, the data reflects an average extent of land under cultivation by the surveyed youth participants, with a mean of 1.404 hectares and a relatively low standard deviation. This implies a moderate degree of consistency in farm sizes. This finding aligns with Dolma (2020), who highlights that access to land is a crucial factor affecting youth engagement in agriculture. While the mean farm size may appear modest, it underscores the significance of efficient land management practices and the potential for high productivity even within limited land areas.

Additionally, the data highlights the substantial time commitment that owners dedicate to the operation and management of their irrigation farms, with a mean of 53.552 hours. This dedication reflects the participants' hands-on involvement and underscores the role of personal investment in driving successful outcomes. The relatively low standard deviation suggests a degree of uniformity in time allocation, emphasizing the disciplined and dedicated approach adopted by youth engaged in irrigation farming. This dedication could be harnessed and further supported through training programs and knowledge sharing.

Finally, the data reveals a wide range of yields achieved by the surveyed youth farmers, with a mean output of 7,076.702 kilograms and a significant standard deviation. This variability in production outcomes can be attributed to diverse factors such as farming practices, crop types, and management strategies, consistent with the insights of Dauda et al. (2009). Policymakers should consider interventions that provide access to advanced agricultural methods and technologies to enhance productivity and stabilize yields across various contexts.

In conclusion, Table 4.2 provides a comprehensive overview of youth participation in irrigation farming in Adamawa State. These findings underscore the diversity, commitment, and potential of young individuals engaged in agriculture. They also highlight areas where targeted interventions and support can further enhance their participation and contribute to the overall growth and sustainability of the agricultural sector in the region.

5. Conclusion and recommendations

In conclusion, this study conducted in the fertile agricultural landscapes of Adamawa State, Nigeria, aimed to comprehensively explore and understand youth participation in irrigation farming. The study unfolded critical insights into the dynamics of this engagement and its implications for both the youth and the agricultural sector. Covering nearly 40,000 square kilometres, Adamawa State provided an ideal backdrop for this research, given its diverse climatic conditions and distinct agricultural zones.

The primary objectives of this study were to assess the extent of youth participation in irrigation farming, understand the socio-economic characteristics of youth engaged in this sector, and identify the challenges and opportunities they face. With a sample size of 382 participants, this study employed a purposive and multistage sampling approach, combined with snowball sampling techniques, allowing for a comprehensive analysis of youth engagement in irrigation farming.

The key findings of this study highlight several critical aspects. Firstly, youth participation in irrigation farming in Adamawa State is substantial, reflecting the sector's potential to provide livelihood opportunities and bolster agricultural productivity. Additionally, gender dynamics in agriculture reveal

both male and female participation, underscoring evolving inclusivity within the sector. The study also emphasizes the need for targeted interventions to facilitate access to financial resources, knowledge transfer, sustainable land use practices, and advanced agricultural methods to further enhance productivity and ensure the long-term sustainability of youth-led irrigation farming ventures. These findings collectively offer valuable insights for policymakers, stakeholders, and agricultural development initiatives, guiding efforts to harness the potential of youth in driving agricultural growth in the region.

Based on the findings of this study, several recommendations can be made to enhance youth participation in irrigation farming in Adamawa State, Nigeria.

Firstly, there is a need for targeted financial support mechanisms to address the variability in start-up capital among youth participants. Initiatives such as low-interest loans, grants, and access to credit facilities should be made available to young individuals interested in irrigation farming, particularly those with limited capital. Financial literacy programs should also be implemented to educate youth on effective financial management and investment strategies in agriculture.

Secondly, knowledge transfers and skill development programs should be prioritized to improve the proficiency of youth engaged in irrigation farming. Mentorship opportunities, training workshops, and extension services can help young farmers acquire the necessary expertise and stay updated on modern agricultural practices. Collaboration between agricultural institutions, government agencies, and non-governmental organizations can facilitate these educational initiatives.

Lastly, sustainable land use practices and efficient resource utilization should be promoted to optimize yields, especially in cases of limited land availability. Policies should encourage the adoption of innovative farming techniques, such as crop rotation, intercropping, and efficient irrigation methods, to maximize agricultural productivity within constrained land areas. Furthermore, youth participants should be provided with access to advanced agricultural technologies and tools to improve overall efficiency and reduce resource wastage.

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