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Achieving Food Security through Agricultural Mechanization among Farmers Multi-Purpose Cooperative Society in Awka North Local Government Area of Anambra State

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Abstract

The study aims to ascertain the effect of large-scale farming on adequate food supply, determine the influence of advanced tools and equipment on farmers' productivity, and examine the influence of storage facilities on the sufficient flow of farm produce. Using the judgmental sampling techniques, the researchers were able to select three (3) reliable multi-purpose cooperatives with a total membership of three hundred and thirty-two (332) from the study area and data was obtained through a structured questionnaire. The researchers made use of descriptive statistical tools such as frequency distribution scale, use of percentage, and mean rating was utilized to analyze the data collected, and the hypothesis was tested using Pearson's Product-Moment. Table (5) was used to calculate the correlation coefficient and correlation coefficient r= 0.941. The findings revealed that large-scale farming, advanced tools, and equipment and storage facilities are key elements in addressing adequate food supply, farmer's productivity, and sufficient flow of farm produce. It is therefore evident that food security has a significant positive influence on agricultural mechanization. On this note, the researcher made some recommendations that more farmers' cooperatives be formed in private institutions by promotion exercise of the Director of cooperative to ensure adequate food supply, farmer's productivity, and sufficient flow of farm produce to both public and private farmers, farmer's multi-purpose cooperatives should establish an advisory committee or the existing ones should sit-up to duty and render advice to farmers on the use of advanced tools and equipment to ensure that members skills are put to productive use that brings about business expansion and lastly the divisional cooperative officer needs to create more awareness on the benefit of cooperative and encourage people to join and form farmer's multi-purpose cooperatives to enjoy the benefit of increased farm produce which is as a result of large scale farming.

Keywords: Food Security, Agricultural Mechanization, Farmers Multipurpose Cooperative Society.

Introduction

Nigeria has a rich history of agriculture dating back to pre-colonial times when different crops were cultivated for subsistence and trade. However, the agricultural sector in Nigeria has experienced several changes over the years, with various factors such as government policies, climate change, and insecurity influencing the sector. Agriculture in Nigeria was

largely subsistence-based before the colonial era. Crops such as yam, cassava, millet, and sorghum were grown in different parts of the country for food and trade purposes. This period also saw the emergence of complex farming systems in some regions, such as the Hausa irrigation system in Northern Nigeria (Aina, 2018). The arrival of Europeans in the 19th century brought about significant changes to Nigerian agriculture. The colonial government introduced cash crops such as cocoa, rubber, and palm oil, which were exported to Europe. These crops became the mainstay of the Nigerian economy, with agriculture accounting for over 70% of the country's export earnings in the 1950s (Odularu, 2012).

Awka North is one of the 21 Local Government Areas (LGA) of Anambra state, The LGA is known to be an agrarian local government area of the state with commercial quantity production of rice, yams, cassava, and maize. To sustain and increase the production capacity of these farm produce mechanization should be aggressively encouraged among the smallholder farmers most especially those that are members of farmers' multipurpose cooperative societies in Awka North LGA.

Mechanization is the process of using machines or automated systems to replace manual labour across a variety of businesses and fields. It entails utilizing technology to boost output, productivity, and efficiency while lowering labor expenses and time. Using machinery and tools to farm more productively, efficiently, and profitably is known as agricultural mechanization. It entails the substitution of various technologies for manual labor and animal power, including tractors, harvesters, planters, irrigation systems, and other farm equipment. Agricultural mechanization is defined by the Food and Agriculture Organization (FAO) as "the process of using mechanical devices or machines in agriculture to improve farm output and efficiency" (FAO, 2018). It has been demonstrated that using agricultural equipment boosts crop yields, lowers labor costs, enhances soil health, and encourages the use of sustainable farming methods (FAO, 2019).

Food security is defined as "all people, at all times, having physical, social, and economic access to adequate, safe, and nutritious food that fulfills their dietary requirements and food preferences for an active and healthy life," according to the Food and Agriculture Organization (FAO, 2021). Food security can be defined as the state of having access to sufficient, safe, and nutritious food that meets the dietary needs and preferences of individuals or households, without compromising their ability to acquire food in the future (FAO, 2015). Availability refers to the physical presence of food in a given area or country. Access refers to the ability of individuals or households to obtain food through purchase, production, or other means. Utilization refers to the ability of individuals to use food effectively for nutrition and health. Stability refers to the ability of individuals or households to maintain access to adequate food over time. In addition to these dimensions, other factors such as affordability, cultural acceptability, and environmental sustainability are also important considerations in defining and measuring food security (Maxwell et al., 2016).

A Food and Agriculture Organization (FAO 2015) study claims that agricultural mechanization can help boost crop yields, decrease post-harvest losses, improve product quality, and increase farmers' income. These advantages can increase the food supply, which can help to improve food security. According to the study, mechanization can help agriculture require less labor, such as instruction or work away from farms. According to the research, compared to small-scale farmers who depended solely on manual labor, those who used machinery had higher yields and incomes.

Adequate food supply is one of the most crucial aspects of food security, according to Uwaechina (2014), the failure of Nigeria's food production to keep up with population growth has resulted in a very large gap between the supply and demand for food, which has caused prices of food items to rise. The difficulties of achieving food security through agricultural mechanization, being a consuming nation and not a producing one can be overwhelming.

However, if farmers are not equipped with mechanized tools, there will be inadequate distribution of equipment suitable for demand, impossible to address the issues of how to feed the expanding population, increased poverty, and inability to protect the environment and deal with climate change. These issues can result in hunger and malnutrition, slow economic development, fuel political unrest, and cause irreparable harm to the ecosystem, poor health outcomes, mental health issues, poor academic performance, social isolation, economic burden, increased risk of chronic diseases, and human survival. Malnutrition, poverty, and deteriorating living circumstances. According to Ajayi (2008), these are the main negative effects, which makes it clear that Nigerian agriculture needs to be improved. Nigeria has struggled for years to feed its burgeoning population all year round, in part because it hasn't been able to implement more effective farming methods.

This study aims to investigate how providing farmers in Awka North LGA, Anambra state with modern equipment and the aid of appropriate technologies can facilitate the availability, storage, simple access, and utilization of farm produce. This will ultimately secure more food for the population.

Objectives of the Study

The broad objective of the study is to investigate how to achieve food security through agricultural mechanization in the Awka North local government area of Anambra State, Nigeria. The study specifically tends to:

1. Ascertain the effect of large-scale farming on adequate food supply among members of farmers' multipurpose cooperative societies in Awka North local government area of Anambra State.
2. Determine the influence of advanced tools and equipment on farmers' productivity among members of farmers' multipurpose cooperative societies in Awka North local government area of Anambra State.

3. Examine the influence of storage facilities on the sufficient flow of farm produce in Awka North local government area of Anambra State.

Hypotheses of the Study

H_0: Advanced tools and equipment has no significant impact on the productivity of farmers' multi-purpose cooperative Societies in Awka North LGA of Anambra State

H_1: Advanced tools and equipment have a significant impact on farmers' productivity of farmers multi-purpose cooperative Societies in Awka North LGA of Anambra State.

Empirical Review

Kassie, Teklewold, Jaleta, Marenya, Erenstein, and Alemu (2017) in Ethiopia aimed to assess the impact of agricultural mechanization technologies on food security for smallholder farmers. The study used data from a survey of 1,200 households in four regions of Ethiopia and employed a propensity score matching method to control for selection bias. The study found that the adoption of agricultural mechanization technologies had a positive impact on food security, particularly for smallholder farmers. Specifically, the study found that mechanization increased crop yields and reduced production costs, leading to higher incomes and improved access to food. The study also found that access to credit and training were important factors in facilitating the adoption of mechanization technologies. The authors suggest that policies and interventions aimed at improving access to credit and training could help promote the adoption of mechanization technologies and improve food security for smallholder farmers.

Babatunde, Omotesho, and Sholotan (2010) in Nigeria aimed to assess the impact of agricultural mechanization technologies on crop yields and household food security. The study used data from a survey of 240 households in two states of Nigeria and employed regression analysis to control for selection bias. The study found that the adoption of mechanization technologies had a positive impact on crop yields and household food security. Specifically, the study found that mechanization increased crop yields by 46% and reduced production costs by 39%, leading to higher incomes and improved access to food. The study also found that access to credit, extension services, and markets were important factors in facilitating the adoption of mechanization technologies. The authors suggest that policies and interventions aimed at improving access to credit, extension services, and markets could help promote the adoption of mechanization technologies and improve crop yields and household food security for smallholder farmers in Nigeria.

Wossen, Abdoulaye, Alene, Feleke, Menkir, and Manyong (2019) in Ethiopia aimed to investigate the impact of agricultural mechanization technologies on crop yields and food security for smallholder farmers. The study used data from a survey of 1,200 farmers in four regions of Ethiopia and employed regression analysis to control for selection bias. The study found that the adoption of agricultural mechanization technologies, such as power tillers, improved seed drills, and threshers, had a positive impact on crop yields and food security.

Specifically, the study found that the use of power tillers increased maize yields by 27% and reduced labour costs by 60%, leading to higher incomes and improved access to food. The study also found that access to credit, extension services, and markets were important factors in facilitating the adoption of agricultural mechanization technologies. The authors suggest that policies and interventions aimed at improving access to credit, extension services, and markets could help promote the adoption of agricultural mechanization technologies and improve crop yields and food security for smallholder farmers in Ethiopia. Overall, the study highlights the potential benefits of agricultural mechanization technologies for smallholder farmers in developing countries, and the importance of addressing barriers to adoption such as access to credit and extension services.

Mwema, Ndirangu, and Mwangi (2017) in Kenya aimed to investigate the impact of mechanized equipment such as power tillers and planters on crop yields and household food security. The study used data from a survey of 240 farmers in two counties of Kenya and employed regression analysis to control for selection bias. The study found that the use of mechanized equipment had a positive impact on crop yields and household food security. Specifically, the study found that the use of power tillers increased maize yields by 50% and reduced labour costs by 67%, leading to higher incomes and improved access to food. The study also found that access to credit, extension services, and markets were important factors in facilitating the use of mechanized equipment. The authors suggest that policies and interventions aimed at improving access to credit, extension services, and markets could help promote the use of mechanized equipment and improve crop yields and household food security for smallholder farmers in Kenya.

Falola, Akinyemi, and Akinola in 2018 conducted their study in Nigeria intending to assess the impact of tractor and other agricultural machinery use on crop productivity and food security. The study used data from a survey of 400 farmers in four states of Nigeria and employed regression analysis to control for selection bias. The study found that the use of tractors and other agricultural machinery had a positive impact on crop productivity and food security. Specifically, the study found that the use of tractors increased crop yields by 51% and reduced production costs by 42%, leading to higher incomes and improved access to food. The study also found that access to credit, extension services, and markets were important factors in facilitating the use of tractors and other agricultural machinery. The authors suggest that policies and interventions aimed at improving access to credit, extension services, and markets could help promote the use of tractors and other agricultural machinery and improve crop productivity and food security for smallholder farmers in Nigeria.

Tumuhimbise, Kikulwe, and Wanyama in 2017 aimed to investigate the impact of mechanized equipment such as power tillers and planters on crop yields and food security for smallholder farmers in Uganda. The researchers collected data from 200 farmers in two different districts of Uganda and analyzed the relationship between the use of mechanized equipment and crop yields. The results of the study showed that the use of mechanized

equipment had a positive impact on crop yields and food security for smallholder farmers in Uganda. The researchers found that farmers who used power tillers and planters were able to increase their crop yields by up to 60% and reduce labor costs by up to 50%. This, in turn, led to an increase in household food security and income. The study also found that the use of mechanized equipment was influenced by factors such as access to credit, extension services, and training programs. Farmers who had access to these resources were more likely to use mechanized equipment and, therefore, achieve higher levels of crop yields and food security. Overall, the study provides valuable insights into the potential benefits of mechanized equipment for improving crop yields and food security for smallholder farmers in Uganda. It highlights the importance of providing farmers with the necessary resources and support to use mechanized equipment and maximize their benefits.

Baffour-Awuah, Asamoah, and Osei 2019 aimed to investigate the impact of agricultural mechanization technologies such as tractors and threshers on food security for smallholder farmers in Ghana. The researchers collected data from 400 farmers in three different regions of Ghana and analyzed the relationship between the adoption of these technologies and food security. The results of the study showed that the adoption of agricultural mechanization technologies had a positive impact on food security for smallholder farmers in Ghana. The researchers found that farmers who adopted these technologies were able to increase their crop yields and reduce labor costs. This, in turn, led to an increase in household food security and income. The study also found that the adoption of agricultural mechanization technologies was influenced by factors such as access to credit, extension services, and training programs. Farmers who had access to these resources were more likely to adopt these technologies and, therefore, achieve higher levels of food security. Overall, the study provides valuable insights into the potential benefits of agricultural mechanization technologies for improving food security for smallholder farmers in Ghana. It highlights the importance of providing farmers with the necessary resources and support to adopt these technologies and maximize their benefits.

Adeyemo, Adebayo, and Ogunlade in 2017 aimed to investigate the impact of tractors and other agricultural machinery on crop yields and food security in Nigeria. The researchers collected data from 200 farmers in two different regions of Nigeria and analyzed the relationship between the use of tractors and other agricultural machinery and crop productivity. The results of the study showed that the use of tractors and other agricultural machinery had a positive impact on crop yields and food security. The researchers found that farmers who used these technologies were able to increase their crop yields and reduce labor costs. This, in turn, led to an increase in household food security and income. The study also found that the use of tractors and other agricultural machinery was influenced by factors such as access to credit, extension services, and training programs. Farmers who had access to these resources were more likely to use tractors and other agricultural machinery and, therefore, achieve higher levels of crop productivity and food security.

Overall, the study provides valuable insights into the potential benefits of tractors and other agricultural machinery for improving crop productivity and food security in Nigeria. It highlights the importance of providing farmers with the necessary resources and support to adopt these technologies and maximize their benefits.

Ogunniyi et al in 2017 aimed to investigate the impact of mechanization technologies on food security in Nigeria. The researchers collected data from 400 farmers in four different states of Nigeria and analyzed the relationship between the adoption of mechanization technologies and food security. The results of the study showed that the adoption of mechanization technologies such as tractors and harvesters had a positive impact on food security. The researchers found that farmers who adopted these technologies were able to increase their crop yields and reduce post-harvest losses. This, in turn, led to an increase in household food security and income. The study also found that the adoption of mechanization technologies was influenced by factors such as access to credit, extension services, and training programs. Farmers who had access to these resources were more likely to adopt mechanization technologies and, therefore, achieve higher levels of food security. Overall, the study provides valuable insights into the potential benefits of mechanization technologies for improving food security in Nigeria. It highlights the importance of providing farmers with the necessary resources and support to adopt these technologies and maximize their benefits.

Tadesse, Alemu, and Beyene in 2017 aimed to assess the impact of mechanized equipment on crop productivity and food security in Ethiopia. The researchers collected data from 200 farmers in two different regions of Ethiopia and analyzed the relationship between the use of mechanized equipment and crop productivity. The results of the study showed that the use of mechanized equipment such as ploughs and seeders had a positive impact on crop productivity and food security. The researchers found that farmers who used these technologies were able to increase their crop yields and reduce labor costs. This, in turn, led to an increase in household food security and income. The study also found that the use of mechanized equipment was influenced by factors such as access to credit, extension services, and training programs. Farmers who had access to these resources were more likely to use mechanized equipment and, therefore, achieve higher levels of crop productivity and food security. Overall, the study provides valuable insights into the potential benefits of mechanized equipment for improving crop productivity and food security in Ethiopia. It highlights the importance of providing farmers with the necessary resources and support to adopt these technologies and maximize their benefits.

The gap in the literature on achieving food security through agricultural mechanization is the lack of comprehensive studies that analyze the impact of mechanization on food security among smallholder farmers who are cooperative society members in Awka North LGA of Anambra State. While some studies have shown the positive effects of mechanization on productivity and income, others have highlighted potential negative impacts, such as increased inequality and environmental degradation. Additionally, there is

a need for research on the effectiveness of policies and programs aimed at promoting sustainable and equitable mechanization.

For example, a study by Rapsomanikis, Sarris, and Van den Broeck (2015) found that mechanization can improve agricultural productivity and reduce poverty in rural areas, but also highlighted the need for policies that ensure smallholder farmers have access to appropriate technologies and services. Another study by Kassie, Jaleta, Shiferaw, and Mmbando (2018), showed that mechanization can increase yields and income for smallholder farmers in Ethiopia, but also found that access to finance and training are critical for successful adoption.

Overall, more research is needed to understand the complex relationship between agricultural mechanization and food security, particularly in the context of smallholder farmers who are cooperative society members.

Methodology

The population of the study consists of all the registered and active farmers' cooperative societies in Awka North Local Government Area. In Awka North, there are about thirty-four (34) farmers' multipurpose cooperative societies of which seventeen (17) are operational with an estimated membership of over four hundred and sixty (460). The researcher adopted a judgmental sampling technique. Consequently, three (3) operational farmers' multi-purpose cooperative societies with a total membership of 332 people were chosen because they are functioning and viable. The researcher purposefully selected all the farmer's co-operative societies from Mgbaukwu, Achalla, and Amansea based on their manageability and accessibility, the result however gave a total of fourteen (14) cooperative societies with three hundred and thirty-two (332) members.

Taro Yamani's formula was used to determine the sample size.

The formula is: $r = \frac{N}{1+N\,(e)^2}$

Where n sample size

N population of the study

I= constant in value

e= error in margin usually 5%

N= 332, e= 0.05

$n= \frac{332}{1+332(0.05)^2}$

$n= \frac{332}{1+0.83}$

$n= \frac{332}{1.83}$

n= 181.42

Therefore n= 181

To determine the number of copies of the questionnaire to be issued to each Cooperative society, the Bowler formula is used

$B = \frac{X \times n}{N}$

where X= total number of members

n= sample size

N= population of the study

1. Mgbaukwu = $\frac{99 \times 181}{332}$

53.97 which is approximately 54

2. Achalla = $\frac{194 \times 181}{332}$

105.76 which is approximately 106

3. Amansea = $\frac{39 \times 181}{332}$

21.2 which is approximately 21

Therefore 54+106+21 = 181

The mean is calculated as $x = \frac{\sum FX}{n}$

Five-point rating scale = $\frac{5+4+3+2+1}{5}$ = $\frac{15}{5}$ = 3.

In testing the hypothesis, the Pearson Product-Moment Correlation analysis was employed. This is because the Pearson Product-Moment Correlation analysis measures the strength and relationship that exist between two variables. Product-moment correlation analysis is utilized in this study to test the influence of advanced tools and equipment and farmers' productivity. The formula is stated below:

$$r = \frac{n\sum xy - \sum x \sum y}{\sqrt{[N\sum x^2 - \sum x)^2][N\sum y^2 - (\sum y)^2]}}$$

Where n = sample size

Σx = the sum of x (independent variable)

Σy = the sum of y (dependent variable)

Σx^2= the sum of square x values

Σy^2 = the sum of square y values

Σxy^2 = the sum of the products of x & y

Decision Rule:

Reject the null hypothesis (H_0) if calculated r is less than the critical P- value at 0.05 level of significance

Result and Discussion

Large Scale Farming and Adequate Food Supply

Table 1: Distribution according to the effect of large-scale farming on adequate food supply among members

S/N	Item	n 167	Mean $\frac{\sum FX}{n}$	Decision
	Large Scale Farming			
i	Large-scale farming has impacted the prices of food items in the cooperative	167 (670)	4.0	Accept
ii	Cooperatives can work with farmers to ensure a larger food production for their members	167 (642)	3.8	Accept
	Adequate Food Supply			
iii	The farm has measures in place to prevent crop loss due to pests or other factors	167 (688)	4.1	Accept
iv	The Cooperative has a plan in place to ensure a consistent food supply	167 (566)	3.3	Accept
	Grand mean		**3.8**	**Accept**

Source: *Survey report, 2023.*

From the analysis, the respondents agreed on large-scale farming that; large-scale farming has impacted the prices of food items in the Cooperative as reflected in the mean value of 4.0. They also agreed Cooperative works with farmers to ensure a larger food production for their members as indicated by the mean value of 3.8. On the aspect of adequate food supply, the respondent agreed that the cooperative has measures in place to prevent crop loss due to pests or other factors which is reflected by the mean value of 4.1 and the Cooperative has a plan in place to ensure consistent food supply as indicated by the mean value of 3.3.

The grand mean of the above depicts that research question one would be accepted showing that large-scale farming by Farmer's Multi-purpose Cooperatives has a significant effect on adequate food supply. The grand mean of 3.8 which is above the threshold of 3.0 is acceptable. This therefore indicates that large-scale farming by Farmer's Multi-purpose Cooperatives has a significant effect on adequate food supply.

Tools and Equipment and Farmer's Productivity

Table 2: Distribution responses according to the influence of advanced tools and equipment on farmers' productivity

S/N	ITEMS	n 167	Mean $\frac{\sum FX}{n}$	Decision
	Advanced Tools and Equipment			
i	The cooperative maintains and upgrades your farming tools and equipment	167 (542)	3.2	Accept
ii	The cooperative trains members to operate these tools and equipment properly	167 (642)	3.8	Accept
	Farmers Productivity			
iii	Cooperative society utilizes technology to improve the outcome of farm produce	167 (554)	3.3	Accept
iv	The cooperative has a plan in place for dealing with pests and diseases.	167 (504)	3.0	Accept
	Grand Mean		3.3	Accept

Source: *Survey report, 2023.*

From the analysis, the respondents agreed on advanced tools and equipment that; the Cooperative maintains and upgrades their farming tools and equipment as reflected in the grand mean of 3.2. They also agreed that the Cooperative train members to operate these tools and equipment properly as indicated by the mean value of 3.8. On the aspect of farmers' productivity, the respondents agreed that cooperative society utilizes technology to improve the outcome of farm produce as indicated by the mean value of 3.3. They also agreed that the cooperative has a plan in place to deal with pests and diseases as reflected in the mean value of 3.0. Table 2 is a representation of the extent to which advanced tools and equipment lead to an increase in farmer's productivity. The grand mean is 3.3 and is acceptable because it is significantly above the threshold of 3.0. This suggests that the use of advanced tools and equipment leads to an increase in farmer's productivity in the study area.

Storage Facilities and Sufficient Flow of Farm Produce

Table 3: Distribution according to the extent to which storage facilities affect the sufficient flow of farm produce

S/N	Items	n 167	Mean $\frac{\sum FX}{n}$	Decision
	Storage Facilities			
i	Storage facilities secure and protect from theft and vandalism	167 (680)	4.1	Accept
ii	The cooperative has easy access to their stored items	167 (646)	3.9	Accept
	Sufficient Flow of Farm Produce			
iii	Cooperative are able to meet the demand of their farm produce	167 (551)	3.3	Accept
iv	The cooperative has made plans to monitor market sales trend	167 (603)	3.6	Accept
	Grand Mean		**3.7**	**Accept**

Source: *Survey report, 2023.*

From the analysis, the respondents agreed that storage facilities help secure and protect from theft and vandalism as reflected in the mean value of 4.1. They also agreed that the Cooperative have easy access to their stored items as indicated by the mean value of 3.9. On the aspect of sufficient flow of farm produce, the respondents agreed that cooperative societies can meet the demand of their farm produce which is reflected in the mean value of 3.3. They also agreed that the cooperative has made plans to monitor market sales trends as indicated by the mean value of 3.6. Table 3 indicates the extent to which savings leads to the acquisition of household assets. The grand mean of 3.7 is acceptable and this is because it is above the threshold of 3.0. The findings therefore indicate that storage facilities in the farmer's multi-purpose cooperative lead to sufficient flow of farm produce.

Testing Hypothesis

In this section, the research hypothesis earlier formulated states that "Advanced tools and equipment have no significant effect on farmers' productivity", as tested using Pearson's Product-Moment Correlation Analysis. Questions i – iv of Table 2 were used to test the hypothesis.

Table 4: Observed Frequency from Table 2 to Summarize the Hypothesis

X	*Y*	*XY*	*X2*	*Y2*
60	60	3600	3600	3600
7	15	105	49	225
17	25	425	289	625
80	52	4160	6400	2704
3	15	45	9	225
167	167	8335	10347	7379

Source: *Survey report, 2023.*

$$r = \frac{N\sum xy - \sum x \sum y}{\sqrt{[N\sum x^2 - \sum x)^2)\,][N\sum y^2 - (\sum y)^2\,]}}$$

where N= sample size

$\sum X$= the sum of x (independent variable)

$\sum y$ = the sum of y (dependent variable)

$\sum x^2$ = the sum of square x values

$\sum y^2$ = the sum of square y values

$\sum xy$ = the sum of the product of x and y

$$r = \frac{5(8335) - 167 \times 167}{\sqrt{[5\times 10347 - (167)^2][5 \times 7379\,(167)^2]}}$$

$$r = \frac{41675 - 27889}{\sqrt{(51735 - 27889)\,(36895 - 27889)}}$$

$$r = \frac{13786}{\sqrt{(23846)(9006)}}$$

$$r = \frac{13786}{\sqrt{214757076}}$$

$$r = \frac{13786}{14655}$$

= 0.9407 which is approximately 0.941

The Correlation coefficient r = 0.941.

The table of critical values of the Pearson product-moment correlation coefficient was used to test the hypothesis. The critical value for r, at N – 2 degrees of freedom is 0.878 where N = 5.

The decision is the rule: Accept the null hypothesis (Ho) if calculated r is less than the critical P- value at 0.05 level of significance, otherwise reject H_0. Hence H_0 is rejected and H_1 accepted.

Decision: The result of the computed hypothesis shows there is a positive relationship between the use of advanced tools and equipment from farmers' multi-purpose cooperatives and farmers' productivity with calculated r= 0.941 and a critical P-value of 0.878(r > p). Therefore, we reject the null hypothesis and accept that advanced tools and equipment have a significant effect on farmers' productivity.

Summary of Findings

The study examines the effect of achieving food security through agricultural mechanization. The findings of the study are summarized below:

The study further reveals that most Farmer's Multi-purpose cooperatives engage in large-scale farming which has a significant effect on adequate food supply. This is represented by a grand mean of 3.8.

The respondents accepted that advanced tools and equipment are provided by the Cooperatives. The majority also confirmed that advanced tools and equipment help increase their productivity.

The grand mean of Table 3 is 3.7 and is accepted. It is an indication that the majority of the respondents confirmed that their cooperative provides storage facilities that enable the sufficient flow of farm produce.

The result of the calculated hypothesis reveals that advanced tools and equipment by the Farmer's Multi-purpose Cooperatives have a significant effect on farmer's productivity with a calculated Pearson product-moment correlation analysis of r= 0.941

Conclusion

The general objective of the study is to examine the effect of achieving food security through agricultural mechanization. The findings revealed that large-scale farming, advanced tools, and equipment and storage facilities are key elements in addressing adequate food supply, farmer's productivity, and sufficient flow of farm produce. It is therefore evident that food security has a significant positive influence on agricultural mechanization.

Recommendations

The following recommendations were made based on the findings of the study;

i. It is recommended that more farmers' cooperatives be formed in private institutions by promotion exercise of the Director of cooperative. This is to ensure adequate food supply, farmer's productivity, and sufficient flow of farm produce to both public and private farmers.

ii. Farmer's multi-purpose cooperatives should establish an advisory committee or the existing ones should sit up to duty and render advice to farmers on the use of advanced tools and equipment. This is to ensure that members' skills are put to productive use bringing about business expansion.

iii. The divisional cooperative officers are encouraged to create more awareness of the benefits of cooperatives and encourage people to join and form farmer's multi-purpose cooperatives to enjoy the benefit of increased farm produce which is a result of large-scale farming.

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